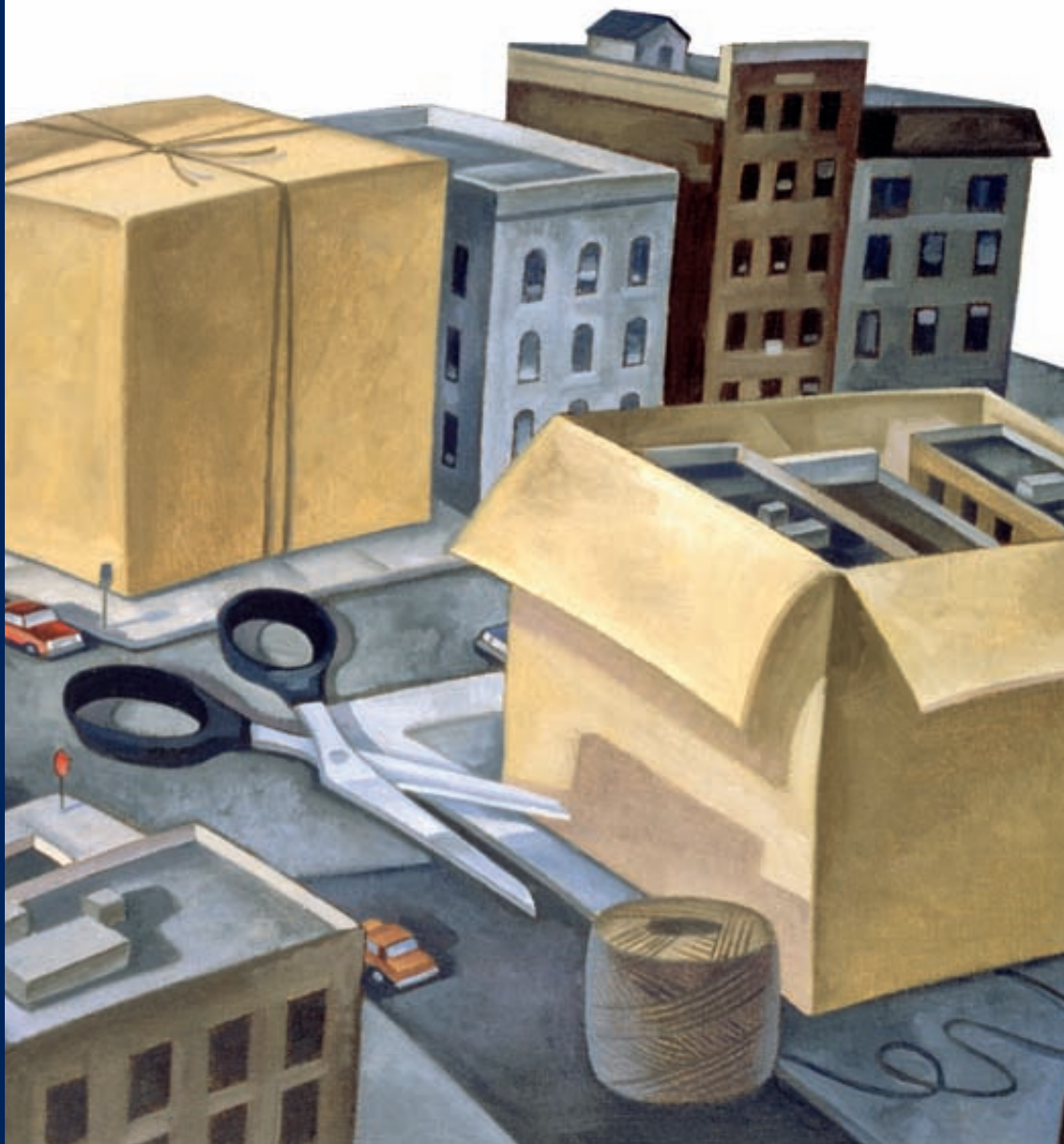
LUÍS CARVALHO

Knowledge Locations in Cities

Emergence and Development Dynamics



Knowledge Locations in Cities

Emergence and development dynamics

Knowledge Locations in Cities
Emergence and development dynamics

Kennislocaties in steden
Ontstaan en ontwikkelingsdynamiek

Thesis

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus

Prof.dr. H.G. Schmidt

and in accordance with the decision of the Doctorate Board
The public defense shall be held on

Thursday 24 January 2013 at 13.30 hrs

by

Luís Miguel da Costa Monteiro de Carvalho

born in Porto, Portugal

Doctoral Committee:

Promoter:	Prof.dr. L. van den Berg
Other members:	Prof.dr. G.A. van der Knaap
	Prof.dr. J. van der Borg
	Prof.dr. M.P. van Dijk

Erasmus Research Institute of Management – ERIM
The joint research institute of the Rotterdam School of Management (RSM)
and the Erasmus School of Economics (ESE) at the Erasmus University Rotterdam
Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM PhD Series in Research in Management, 274
ERIM reference number: EPS-2013-274-S&E
ISBN 978-90-5892-320-2

Design: B&T Ontwerp en advies www.b-en-t.nl

This publication (cover and interior) is printed by haveka.nl on recycled paper, Revive®.
The ink used is produced from renewable resources and alcohol free fountain solution.
Certifications for the paper and the printing production process: Recycle, EU Flower, FSC, ISO14001.
More info: http://www.haveka.nl/greening

ACKNOWLEDGEMENTS

I formally started my PhD studies in October 2007, when I was awarded a 4-year doctoral scholarship from the Portuguese Foundation for Science and Technology (FCT-Doctoral Grant Number 36343/2007). Yet, the idea to begin this journey is about one year older – it started to mature when I was invited to take part in a study on the changing role of manufacturing in European cities, under the setting of the European Institute for Comparative Urban Research (Euricur). During this time, I was fortunate to meet and have the support of many persons, who contributed to this journey in different ways, making it not only possible but much more rewarding and enjoyable.

I am honoured to have Leo van den Berg as promoter. Leo gave me the invaluable opportunity to participate in different research projects under the setting of Euricur and was always very supportive throughout these years. His passion for urban dynamics and urban management has been very inspirational since the first lecture. I can only be grateful to Leo for sharing his long academic and professional experience (and good laughs!) with me. Leo, it has been a great pleasure to work with you and to actively participate in the "Euricur way of life".

Moreover, doing a PhD was only possible because of the trust put on me by Willem van Winden. Willem was the supervisor of my master thesis and the person who initially brought me to the Euricur. I still remember the first case study we conducted together, on the shipbuilding cluster in Turku. Since then, Willem has always closely mentored my research, giving excellent ideas on how to tackle the many challenges and difficulties that popped up in the way. Many of the ideas in this thesis are actually joint-productions from our always inspiring talks and field visits conducted over the last years. I learned immensely from Willem and hope to keep learning in the years to come.

I am also grateful to other persons who deeply influenced my perspectives on academic research, science and scholarship. First, to the professors and fellow PhD students at ERIM and at NIG – Netherlands Institute of Government. The excellent ERIM courses on Advanced Qualitative Methods (Pursey Heugens) and Advanced Topics of Research in Strategy (Justin Jansen) were important turning points in this respect. Second, I am very grateful to Ron Boschma for having organized an outstanding international course in

Economic Geography in Utrecht, in which I had the privilege to participate and meet many other leading scholars and PhD colleagues. Ron Boschma is not only a brilliant professor and leading scholar, but one of the most accessible and kind persons I had the privilege to meet – Ron, many thanks for taking the time to discuss and comment on my research. Third, I am also indebted to the many persons I had the chance to meet and share ideas with during different international conferences, namely the ones of the Regional Studies Association (RSA) and the Association of American Geographers (AAG). A special thanks goes to Mário Vale, who invited me to work with him in the EURODITE project. Some results from that study are part of this thesis (the case of Biocant). We ultimately became good friends and kept cooperating in different projects. As an economist, it is great to have the chance to discuss regional development and economic geography with a passionate geographer like Mário Vale.

It would be unfeasible to carry out this research without being in an environment such as the one at the Department of Urban, Port and Transport Economics (RHV). The first person I met at the H-12 floor (September 2004) was Giuliano Mingardo. Giuliano was a great course coordinator during my first year in Rotterdam and always incentivized me to keep the links with the department after graduation. I am very happy that Giuliano accepted to be a paranymph in my PhD defence – he is not only a good friend but he also had an important role in my decision to start this journey. I am also very grateful to the colleagues who kindly received me at RHV and to all the others I had the chance to meet there during these years, namely Alexander, Bart, Erik, Eva, Jan van der Borg, Jan van der Meer, Jeroen Klijs, Larissa, Marco, Marlies, Michiel, Monique, Patricia, Peran and Wouter. I am particularly thankful to Ankimon Vernède. Ankimon was always incredibly supportive throughout my PhD time, helping in many ways. She was there all the time to have a good chat and to foster some social interaction.

On a more personal level, there have been a number of dear friends who made my social life in Rotterdam much more pleasant. In the early times of my PhD, I was fortunate to meet Christian, Cesar, Slavic and Vicky, with whom I shared uncountable times of great companionship. Also, our trips and short-breaks in Europe were amazing moments of pure fun that I will always remember. Christian, thanks for being such a good friend, housemate, and for bringing this group together with your permanent programme

suggestions. I am very happy to keep in contact with you all, even though we ended up moving to other cities since then. I am also very happy for still having the chance of sharing good moments in Rotterdam with Jeroen, Francisca, Martijn, Viola, Rachel, Dong Dong and Irina – it is always enjoyable when we have the chance of coming together and share some good jokes around the dinner table. Naturally, a big thank you goes to my friend Nuno Camacho. As Nuno said before, we climbed this mountain together since we first moved from Porto to study in Rotterdam. Nuno is not only one of my best friends, but also an enthusiastic researcher with whom I always learned a lot, namely when we discussed cross fertilizations between our research topics – something I am sure we will keep doing in the future. Finally, it is difficult to find words to thank Erwin van Tuijl for all the friendship and support during these last years. Erwin has always been one of the persons putting more pressure on me to conclude this PhD and to avoid delaying it too much. More than kindly offering his (already famous) red couch, Erwin was always a good friend and a great sushi eating companion. I conducted more case study visits with Erwin than with any other person, and those have always been moments of great enjoyment.

I am also very grateful to a number of persons in Porto, for supporting my PhD and for shaping my views on urban development in many ways. I thank my colleagues at Quaternaire Portugal with whom I learned a great deal about urban and regional policy and planning, in a "hands-on" fashion. A very special acknowledgement goes to António Figueiredo, who largely inspired my thinking on economic development since my undergraduate studies in Economics. I am extremely honoured to have had the chance of working closely with António Figueiredo and for having him as a mentor and professor. I can never thank enough for all the knowledge and wisdom I received from him. I am also very grateful to Artur Costa and Elisa Babo, for making it possible to start this PhD while still working at Quaternaire; to Isabel Leal, for her coaching during my early days at the company; and to Paulo Alves and Rodrigo Meireles, with whom I learned a lot about local development in general and knowledge locations in particular. I am also very grateful to Teresa Sá Marques for supporting my PhD application and for involving me in the geographer´s community. A special thanks also goes to Ana Paula Delgado, for being always very supportive of my early interest in urban economics; and to José Costa, for being an excellent professor and for giving me the valuable opportunity to teach at the

School of Economics. Finally, sincere thanks go to António Lacerda, Isabel Santos and Luis Delfim Santos, for making it possible my internship at the Municipality of Porto (Studies and Planning Unit), where I first learned a lot about socio-economic development projects in cities and policy.

I could only conduct my PhD studies because I always had the love, care and support of friends and family, especially from my mother and from my (now!) wife Ana Paula. My mother always gave me the best education and strongly incentivized me to pursue a doctoral education. She always inspired me to do my best. And I can never thank too much Ana Paula for patiently waiting for the conclusion of this thesis, for the love and for supporting me in all the possible ways, despite all the frequent physical distance. This thesis is dedicated to them.

Porto and Rotterdam, November 2012

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

This thesis focuses on understanding the emergence and development of *knowledge locations*: planned area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district. The concept of knowledge location encompasses a number of manifestations such as science parks, technology hubs, knowledge campuses or creative districts, with a deliberate element of planning and policy aimed at promoting such agglomeration[1].

The development of knowledge locations is nowadays among the most popular local economic development tools worldwide. In general, agglomerating knowledge-intensive activities in a particular location is believed to have a number of advantages for firms and organisations. Knowledge locations provide opportunities for resource and facility sharing (e.g. expensive facilities such as laboratories, test-beds or advanced services) and are expected to facilitate networking and face-to-face contacts leading to knowledge exchange. They are also assumed as good settings to foster linkages between entrepreneurs, industry and local knowledge institutes, as well as favourable environments to start-up new ventures. Moreover, knowledge locations are often intended to foster new, "progressive" urban images and identities, reason why many local governments try to integrate them into marketing and promotion strategies.

The development of knowledge locations is a highly contemporary phenomenon, but its first occurrences have already some decades now. One of the first knowledge locations – which perhaps explain part of its popularity – was initiated in 1951 at Stanford University, when the Dean Frederick Terman supported the development and leasing of some land plots in the university for start-up companies. This would turn into the well-known

[1] Large "innovation valleys" or cities as a whole are not considered as "knowledge locations" for the purposes of this thesis. The same goes for exclusively private real-estate and property-based developments.

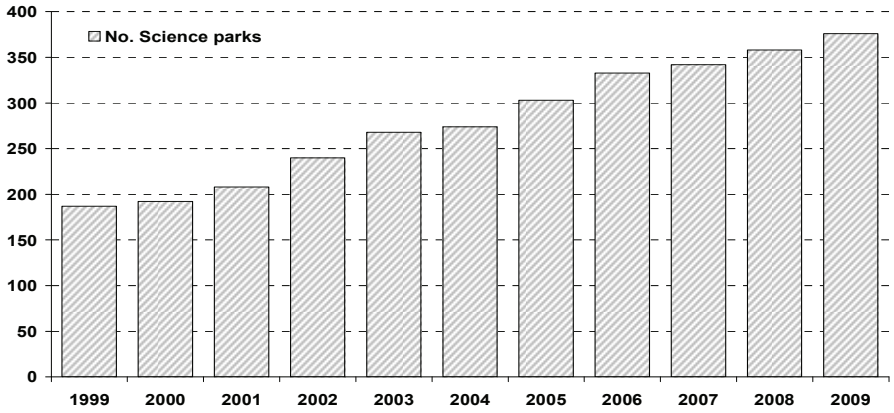
Stanford Research Park, home of many leading companies in Silicon Valley. Inspired by the concept, the first European science park was established in Cambridge (early 1970s) to host research and technology intensive firms from Trinity College. During the 1980s, the development of science and technology parks became widespread in Western Europe and in the US (e.g. Monck et al., 1988; Link and Scott, 2006), and now are also increasingly so in fast growing, technology-driven Asian economies (e.g. Koh et al., 2005; Miao, 2012).

The earliest studies focusing on the genesis and development of knowledge locations – more concretely on science and technology parks – date from that period and explore the phenomena in the UK (e.g. Massey et al., 1992). The seminal book *Technopoles of the World* by Manuel Castells and Peter Hall (1994) was the first international comparative study on the issue. By that time, in contrast with the "industrial era", such places had been dubbed as the new *mines and foundries of the informational age*:

> "There is an image of the nineteenth-century industrial economy (…): the coal mine and its neighbouring iron foundry, belching forth black smoke in the sky, and illuminating the night heavens with its lurid red glare. There is a corresponding image for the new economy that has taken place in the last years of the twentieth century (…). It consists of a series of low, discrete [office] buildings, usually displaying a certain air of quite good taste, and set amidst impeccable landscaping in that standard real-estate cliché, a campus-like atmosphere. (…) Scenes like these are now legion on the periphery of virtually every dynamic urban area in the world." (Castells and Hall, 1994, p.1).

As the new "informational" economy unfolded towards the 21st century, Castells and Hall (1994) anticipated that such new economic and innovation hotspots were likely to keep proliferating. In fact, by the late 1990s, Storey and Tether (1998) already estimated the existence of more than 300 science parks in Europe, hosting approximately 15.000 firms. Until now, the number of science parks kept growing. During the last decade, the IASP – International Association of Science Parks (2010) – reported a two-fold increase in the number of registered members, suggesting a much steeper growth in the total number of such locations worldwide (Figure 1).

Figure 1. *Number of science parks registered at the International Association of Science parks (IASP)*



Source: Own elaboration, data from IASP (2010)

Knowledge locations are not only growing in number; they are becoming qualitatively different and more complex. Beyond standardized science and technology parks, many are mutating towards new hybrid forms (e.g. Phan et al., 2005), pursuing diverse objectives, proportional to the increasing number of involved stakeholders. For example, some knowledge locations increasingly focus on a concrete "knowledge theme", targeting specific industries such as biotechnology or audiovisual. Moreover, beyond office space, advanced services and firm incubation, knowledge locations are increasingly planned to provide diversified housing, consumption and leisure possibilities (e.g. Evans, 2009). In this vein, a growing number of knowledge locations are developed in (or close to) the cores of large urban regions, following the re-urbanisation patterns of residents and firms (van den Berg, 1987).

Societal demands put on knowledge locations are increasing. Beyond providing quality working space, society increasingly demands knowledge locations to add more value to their local and regional economies, e.g. by promoting synergies among tenants, changing routines and unleashing new rounds of innovation – i.e. creations of economic significance (Edquist, 1997). Recently, van Winden (2010) placed the development of knowledge

locations at the core of a "knowledge turn" in urban policy in Europe. As urban policy agendas are progressively aimed at retaining and attracting highly educated people, promoting entrepreneurship and new industries, knowledge locations are seen as instrumental to those aims.

1.2 Problem statement

However, despite the announced benefits and popularity of knowledge locations, the empirical evidence of their achievements is not very encouraging (see chapter 4; also Tamasy, 2007). For example, a number of studies on the benefits of science parks concluded that, in many respects (e.g. job creation, financial results, survival and R&D investments), the performance of firms located in science parks is not better than off-park firms. The same goes for the creation of start-ups, firm spin-offs and promotion of entrepreneurship – in reality, many newly developed locations remain half-empty and the synergies found between their tenants are marginal. Moreover, from a regional perspective, Shearmur and Doloreux (2000) found no link between the opening of a science park and regional employment growth in high-tech sectors.

For these reasons, and already in the early 1990s, Massey et al. (1992) suggested that many science and technology parks resembled "high-tech fantasies". As the phenomena unfolded during the decade, Stankiewicz (1998) felt that knowledge locations faced an "identity crisis" and called for further research to assess their benefits. Their roles in society were unclear: were they intended to attract firms from elsewhere, to support interactions between firms and universities or to steer profit-oriented property development? On a more pessimistic tone, Tamasy (2007) and Macdonald (2012) argued that public money should no longer be poured into such locations[2], the latter considering that the supposed benefits

[2] In the present times of global economic contraction, austerity and budget contractions, this plea has certainly many supporters around the world.

of science parks and knowledge locations are not more than just "myths", whose development can only be justified on the basis of "faith".

Despite such harsh criticism, there are reasons to believe that the phenomena of knowledge locations in general and their outcomes in particular are still insufficiently and inadequately understood. On the one hand, not all knowledge locations turn into high-tech fantasies: there is considerable heterogeneity (e.g. Albahari et al., 2012) and some of them grow significantly. On the other hand, evidence on some of their theoretical outcomes is contradictory, namely their relevance for fostering synergies among tenants – results seem to vary across locations. However, the recognition that knowledge locations are no panacea for local economic development seems to have eclipsed the need for a clearer understanding of the ways in which such locations emerge and develop; the same goes for the conditions – and potentially different paths and mechanisms – under which their outcomes are achieved. The literature provides some hints in that respect, but also many open questions.

First, there are indications that the development of knowledge locations is associated with their *spatial-economic context* (Koh et al., 2005). Evidence shows that the large majority of "successful" science and technology parks (i.e. growing and/or showing interactions among tenants) prosper in dynamic and large urban regions (Tamasy, 2007); yet, there are cases of rather dynamic, fast-growing locations in smaller regions with limited urban scale and declining industries, but with good universities (see, e.g. Hommen et al., 2006; Vale and Carvalho, 2009; 2012). This suggests that the development and outcomes of knowledge locations over time are not necessarily a question of urban scale, but perhaps of the fit between the location's design and the spatial-economic context in which it is located (which is dynamic in itself). Moreover, the characteristics of the knowledge location itself also seem to play a role. Link and Scott (2006) found out that technology parks in the US grew larger and faster when "specialized" in a certain field (e.g. ICT and biosciences) but called for further research to clarify the causes. However, to the best of our knowledge, there are no studies yet exploring the growth and agglomeration phenomena in "theme-specific" knowledge locations.

Second, Van Geenhuizen and Soetanto (2008) consider that there is limited knowledge on potentially *hidden outcomes* of knowledge locations such as the creation of new regional *images* and *cooperative arrangements* in the region where they locate. The nature of "success" is not consensual nor is the type of market or system failure that knowledge locations may be addressing (e.g. Hansson et al., 2005; Phan et al., 2005). Moreover, since the literature provides mainly static analysis of such locations (Hommen et al., 2006) it remains unclear through which causal paths did the location's outcomes unfolded, and which other phenomena where eventually unleashed through the process.

Third, as the development of knowledge locations (increasingly) involve many stakeholders with potentially different interests, the *governance processes* involved in their design has also been pointed as an important research issue, but one in which there is a dearth of research (e.g. Phan et al., 2005). The same is true for the management of the location, and the extent to which it contributes to its performance. Although literatures in the field of urban development have continuously highlighted the need for public-private partnerships in economic development initiatives – like the development of knowledge locations – the fact is that the functioning of those governance processes remains very much a black box (Link and Scott, 2003). In this context, Van Geenhuizen and Soetanto (2008) make a plea to analyse knowledge locations and their governance in a dynamic fashion and in coherence with a broader set of shifting networks and connected projects of the involved actors. The fact that policymakers and stakeholders are not perfectly informed but *adaptors* (e.g. Boschma, 2009) hint towards trial-and-error and learning as important phenomena to consider in the development of knowledge locations.

Fourth, since most of the literature focuses on science parks (traditionally located in city suburbs), there is limited knowledge on the role played by the *urban integration of a knowledge location* in their agglomeration outcomes. As societal preferences change and quality of life becomes an important location factor (Van den Berg, 1987), some authors suggest that an appropriate integration of a knowledge location in the urban fabric is important to generate, at least, sound agglomeration outcomes (van Winden, 2011). Yet, it remains to be clarified what an appropriated urban integration is (e.g. a vibrant urban

setting? a calm and green environment?) and to which extent the spatial preferences of tenants might be sensitive to different types of activities.

1.3 Research objectives, questions and central arguments

All in all, a major gap in the literature is the absence of an integrated framework and theory to understand the development of knowledge locations. An important challenge thus relies on i) understanding the dynamic nature of such phenomena, ii) the different paths and variables leading to outcomes and iii) the relations between knowledge locations and the wider spatial contexts in which they are inserted.

This thesis contributes to shed light on these issues. Its central objective is to **develop a theoretical framework to understand the emergence and development of knowledge locations**. This objective can be broken down in two objectives:

First, it wishes to understand the processes that underlie the formation and development of knowledge locations. Namely:

i) Why are knowledge locations increasingly moving to the urban fabric (yet with the persistence of many manifestations in greenfield areas);

ii) How does the profile of a knowledge location emerge (e.g. a specialization in a certain knowledge field; the type of management, its urban-spatial integration) and evolves over time.

Second, it wishes to better understand the drivers and mechanisms that lead knowledge locations to grow and agglomerate knowledge intensive activities over time. By doing so, it proposes to shed light on mediating processes and hidden outcomes underling the development of knowledge locations.

Therefore, the main research question of this thesis is:

How do knowledge locations emerge and develop over time?

The answer to this research question will be provided by elaborating on an integrated set of propositions (theoretical and empirically grounded – see Section 5 and Section 10), that can inform a theory on the emergence and development of knowledge locations in cities

and urban regions. In order to achieve this objective, this thesis systematically addresses some of the previous research challenges. The research is structured along the following research questions:

- What are knowledge locations, and what are their main features? (*theoretical analysis*)
- How can we explain the growing and revitalized attention for knowledge locations, and why are (some of) them moving back to cities? (*theoretical analysis*)
- What kind of effective benefits do knowledge locations provide for firms and urban regions? (*theoretical analysis*)
- How does the emergence of a knowledge location relate to its spatial-economic context? (*theoretical and empirical analysis*)
- How does a knowledge location´s vision and features change over time? (*theoretical and empirical analysis*)
- Which factors contribute to growth and agglomeration in a knowledge location? (*theoretical and empirical analysis*)
- Which intermediate outcomes and mechanisms are associated it? How do they operate? (*empirical analysis*)

By progressively answering the research questions above, this thesis brings forward two central arguments:

First, it argues that the emergence and development of knowledge locations is better understood in the context of the spatial-economic dynamics of their host regions. On the one hand, emergence results from the coupling of interests and power of individuals and organizations; however, their actions are deeply influenced by the character of the region´s production-innovation dynamics and policy-planning traditions. Thus, it is misleading to think of knowledge locations as the sole result of the action and free will of visionary (or short-sighted) decision makers. On the other hand, the vision and design for a knowledge

location can hardly be once and for all – they evolve over time in multiple rounds of decision making. Again, those changes do not necessarily result from good or bad planning, but from the coupling of 1) external-to-the-location changes and actor´s self-organization with 2) the progressive co-evolution between the location and its spatial-economic context. This means that their design and development can hardly be understood as the predictable result of a linear, well-defined set of actions.

Second, contrary to what is suggested in the literature, it argues that the growth and agglomeration outcomes of a knowledge location do not directly or exclusively rely on the economic or sector-specific dynamism of its host city or region. Those features are certainly important moderators – constraining or fuelling it further – but not necessarily drivers. To explain growth and agglomeration in a knowledge location (its most basic outcome), this thesis puts forward three factors: specialization, urban-spatial integration and management/entrepreneurial leadership. An important conclusion is that there are multiple pathways to growth and agglomeration – no single factor has to be always present to explain it at a certain point in time. Moreover, the three factors proved relevant, but in different ways. They are relevant to the extent that they contribute to the formation of two key mediating processes that explain growth and agglomeration: *image formation* (associated with the identification of a concept) and *ecosystem formation* (associated with exchange and learning among tenants and organizations). Those processes provide two different paths to agglomeration, but they are not mutually exclusive. Their interaction largely influences the development of a location over time.

1.4 Scientific and policy relevance

> "*It feels to me that investing on it [some knowledge locations] is like building outstanding auditoriums but then lacking the money to hire a pianist. In that case, I prefer having the pianist playing in a tent*"
>
> (Quote from a young industrialist when asked about his expectations and desires for a new "creative factory" in his region, June 2012)

Despite the considerable literature produced over the last two decades on science and technology parks and similar developments, the last years witnessed very limited

theoretical and empirical advance. There is a generalized feeling in the (disperse) community of economists, planners and economic geographers interested in the field that research has largely come to a halt (Phelps et al., 2012). As previously referred, the bleak conclusions of previous studies – *high-tech fantasies* – raised a generalized criticism about the added value of science parks and their roles in urban and regional economic development. This seems to have slowed down the interest in a research project, notwithstanding the recognition that our knowledge on the phenomena is still considerably limited (e.g. Phan et al., 2005). Recently, a special session headed by Sir Peter Hall in the 2012´ *Annual Conference of the Regional Studies Association* (in which parts of this thesis were presented) was dedicated to revisit the seminal study "Technopoles of the World" (Castells and Hall, 1994), but essentially to improve further our understanding about old and recent international occurrences of the phenomena.

This thesis intends to contribute to this revitalized interest in the study of knowledge locations. First, without losing sight of conventional types of science park developments, it pays attention to the emergence and development of new hybrid forms of knowledge locations, built in the urban fabric, specialized in activities beyond "high-tech" – there is considerably less research on these types of locations. Second, it places the development of knowledge locations within the dynamics of their urban-regional context. To do so, it intends to start linking the study of knowledge locations to a broader research agenda on evolutionary theorizing in economic geography (e.g. Boschma and Frenken, 2006; MacKinnon et al., 2009), understanding the development of knowledge locations within the long-term dynamics of cities and regions. Moreover, in order to contribute to a theory on the emergence and development of knowledge locations, it combines insights from literatures on economics and economic geography, urban studies and planning, innovation studies and public management. Finally, it contributes to complement a recent wave of quantitative studies on the heterogeneity of knowledge locations and firms´ performance (Albahari et al., 2012) with qualitative insights on the causal mechanisms beyond the development of knowledge locations and differences across cases.

From a policy perspective, the situation is completely different. If the understanding of knowledge locations in academia paints them "black", the perception in the policy sphere

tends to paint them "white". Indeed, rather than a generalized suspicion, the benefits of knowledge locations for cities and regions have generally been taken almost at face value. Policymakers place big hopes on them to improve the local economic situation, namely in places where many other local economic policies failed. In the fast-growing emerging world, huge sums of money are being invested in the development of entirely new "knowledge cities". Throughout Europe, there have long been public investments in knowledge locations, often supported by EU structural funding and considerable debt.

In the last few years, best-practice exchange networks and forums for the development of knowledge locations in cities proliferated around the world, and particularly in Europe[3]. One of the effects of such networks has apparently been to moderate the uncritical confidence on knowledge locations, providing policymakers with more nuanced views on the phenomena. There is a growing recognition among the local policy community that best-practice and successful "valleys" are hard to copy, and, thus, new knowledge locations should be attuned to the local context. Yet, in practice, this new "recognition of context" has not resulted in much more than adjusting the size of the investment and giving it a thematic banner.

This thesis intends to influence and contribute to more informed policies, namely by providing decision-makers with policy-relevant knowledge in the shape of a middle-range theory – i.e. a theory that helps explaining a specific set of a phenomenon, in this case the emergence and development of knowledge locations in cities. More concretely, although the resulting theory can be in principle generalized to the study of different manifestations of knowledge locations, it is particularly suited for knowledge locations that intend to specialize in a "theme".

On the one hand, such a theory can help by making use of variables which policy-makers can effectively influence in a knowledge location (e.g. specialization, urban integration,

[3] During the last 3-4 years, the author of this thesis has been involved as researcher, guest speaker and ultimately "observer" in different policy forums and discussions on the development of knowledge locations in The Netherlands, Portugal, Ireland, South Korea, Spain and Denmark.

management dimensions), understanding that other variables are potentially out of their control, at least in the short-medium run. Moreover, it can clarify which pathways mediate causes and effects. With a theory, policy-makers can avoid relying exclusively on single cases when facing new situations.

On the other hand, complementarily, this thesis also believes on the policy relevance of contextualized case studies of specific instances of a phenomenon. In practice, case studies have a key role bridging the gap between scholarly and policy-making, illustrating the applicability of a theory and also the complexity of real-world situations, supporting more informed judgements (e.g. George and Bennett, 2005; Flyvbjerg, 2006). In this sense, this thesis also provides in-depth explorations of four case studies that can support policymakers reflecting on their own experiences and challenges associated with creating knowledge locations in their own cities.

1.5 Outline of the thesis

This thesis is organized into ten chapters, including this introduction. Figure 2 presents a schematic outline.

Chapter 2 answers the first research question of this thesis: *What are knowledge locations, and what are their main features?* It introduces the concept as it is used during the thesis, and reviews other definitions considered in the literature. Subsequently, it introduces the most common, "pure" manifestations of the phenomena (notably science and technology parks and creative districts) and presents the theoretical rationales underpinning the development of knowledge locations.

With this initial background in mind, **Chapter 3** focuses on understanding *how can we explain the growing and revitalized attention for knowledge locations, and why are (some of) them moving back to cities?* To do so, it places the development of knowledge locations within a broader framework of urban and regional dynamics. Moreover, it relates the revitalized interest in knowledge locations with recent fundamental societal developments. Before concluding, the chapter theoretically explores reasons behind the nuanced spatial "preference" of knowledge locations for different areas within functional urban regions (e.g. city cores vs. greenfield locations).

Chapter 4 explores the literature about the performance of knowledge locations or, as phrased in the research question, *what kind of effective benefits do knowledge locations provide for firms and urban regions?* It places the focus on economic and innovation-related objectives, yet acknowledging that the objectives of knowledge locations largely depend on the types of stakeholders involved. The chapter critically reviews the relations between knowledge locations and performance of their tenant firms; moreover, it explores the available evidence on their benefits for host cities and regions. The chapter concludes providing a bridge towards the development of a theoretical framework.

Chapter 5 unfolds central constructs and propositions underlying the theoretical framework of this thesis. It provides an initial understanding of the drivers behind the emergence and development of knowledge locations, whose mechanisms and causal processes are to be further explored during the empirical chapters. The framework considers two main levels of analysis: the *knowledge location* and the *host region*, which interact with each other. More concretely, it provides first theoretical answers on *How does the emergence and development of a knowledge location relate to its spatial-economic context?* (Section 5.2); *how does a knowledge location´s vision and features change over time?* (Section 5.3); and *which factors contribute to growth and agglomeration in a knowledge location*? (Section 5.4). It concludes with a visualization of the theoretical framework.

With the previous framework in mind, **Chapter 6** explains the methodological procedures followed during the research. It explores the reasons behind the use of a (multiple) case study methodology, assuming the interactions between deduction and induction during the research. Subsequently, it explains the rationales behind the selection of the case studies, as well as the data collection and analysis strategies. Additional methodological considerations are provided in the beginning of each empirical chapter.

Chapter 7 "opens up" the empirical part of the thesis, providing an initial snapshot of each of the four knowledge locations under study (Arabianranta, Biocant, The Digital Hub and PIA). For each one, it sketches i) the profile and performance of their host regions; ii) their overall vision and concept; iii) their profile and features, more concretely its specialization,

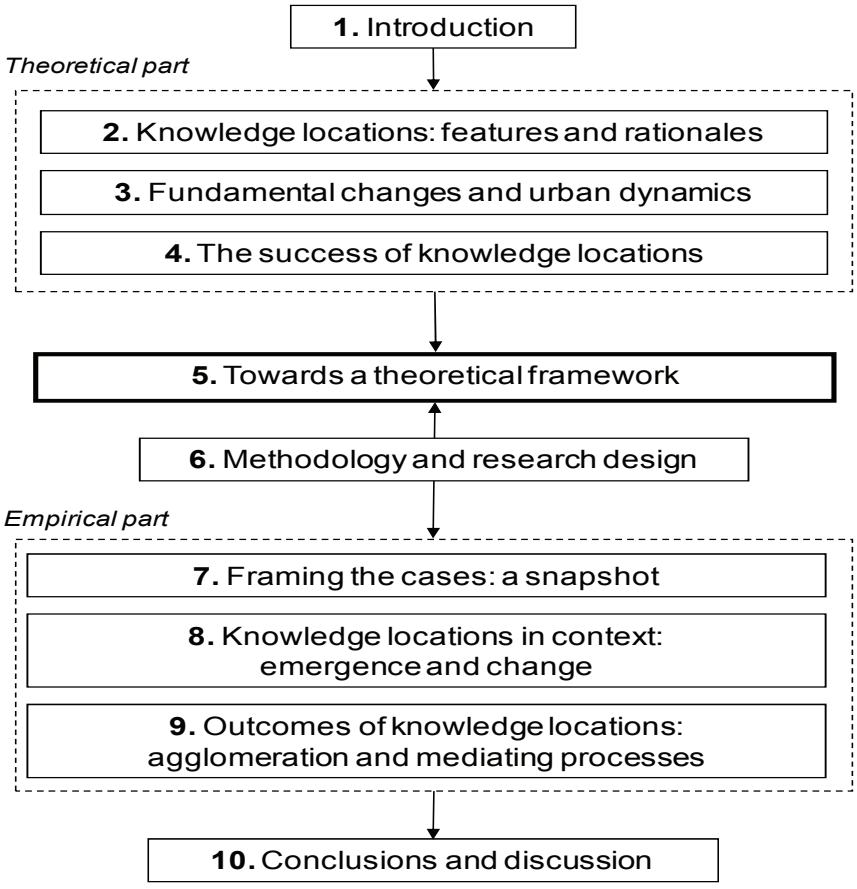
urban-spatial integration and management services and iv) an assessment of their capacity to agglomerate knowledge-intensive activity.

Chapter 8 takes the empirical research through, and studies emergence and change in knowledge locations. Section 8.1 places the emergence of each knowledge location in relation to the networks of actors and the context underlying their emergence, and answers the question of *how does the emergence and development of a knowledge location relate to its spatial-economic context?* It explains how a location's features and profile are intimately related with a region´s institutional setting and the power exerted by the actors involved. Section 8.2 takes a more dynamic perspective and analyses *how does a knowledge location´s vision and features change over time?* More concretely it explores how the underlying vision and features of a location changes over multiple "rounds" of decision making, resulting from external changes in context coupled with the co-evolution between the location and the its spatial-economic context.

Subsequently, **Chapter 9** puts the growth and agglomeration outcomes of knowledge locations central and empirically explores *which factors contribute to the growth and agglomeration in a knowledge location?* In line with the theoretical framework, it provides empirical support for the role of three factors, while tracing back the causal chains linking each factor with agglomeration: specialization (Section 9.2), urban-spatial integration (Section 9.3) and management features (Section 9.4). By doing so, it empirically explores *which intermediate outcomes are associated with it* [growth and agglomeration] and *how do they operate?* Hence, it concludes by bringing to the fore two hidden mediating processes involved in the growth and agglomeration of knowledge locations – "image formation" and "ecosystem formation" – and their relation with the previous features of a knowledge location.

Chapter 10 wraps up by synthesizing the main conclusions of the thesis in an integrated way and provides summaries of its findings. It concludes suggesting research avenues for an agenda on the development of knowledge locations in relation with their host cities and regions.

Figure 2. *Outline of the thesis*



2. KNOWLEDGE LOCATIONS: FEATURES AND RATIONALES

2.1 Introduction

What are knowledge locations, and what are their main features?

This chapter introduces the concept of knowledge location as it is used in thesis, as well as the nature of its most common manifestations. It starts by putting forward a definition that is flexible enough to encompass different manifestations of the phenomenon, but bounded enough to bring it operational and of scientific and policy relevance (Section 2.2). Subsequently, the chapter presents the characteristics of their most widely studied types, notably science and technology parks and creative districts (Section 2.3 and Section 2.4). Following this description, Section 2.5 provides some initial theoretical rationales underpinning the development of knowledge locations. Section 2.6 concludes.

2.2 What are knowledge locations?

The extant literatures in economics, management or planning do not provide a unified definition for *knowledge location*. However, they present many definitions for particular manifestations of the phenomena, notably *science parks* (e.g. Phan et al., 2005; Queré, 2007; van Geenhuizen and Soetanto, 2008) and *technopoles* (Castells and Hall, 1994). We start by exploring some of those notions in order to capture common features for a synthetic definition.

Most of the definitions focus on science and technology parks. Queré (2007) defines science and technology parks as areas where knowledge creators and knowledge-based companies are located, as well as supportive services for their interaction (e.g. technology transfer). Zhang (2005) refers to property-based initiatives that have formal and operational links with a university or major centres of research; this is in line with the definition of Link and Scott (2006) for university research parks, as "...cluster [s] of technology-based organizations that locate on or near a university campus in order to benefit from the university´s knowledge base and on-going research" (p. 44). Other definitions focus on the parks' desired *functions*. For example, Hommen et al. (2006) defined a science and technology park as a "…learning site, combining in a pre-established

territorial area productive, scientific, technical, educational, and institutional agents, based on the assumption that the co-location of these agents is expected to enhance the technological and innovation capability of the host region" (p. 1333).

In a recent review, Van Geenhuizen and Soetanto (2008) identified three central attributes of science and technology parks, cutting across most definitions: 1) a property-based initiative, in the proximity of a university or other learning organizations; 2) the presence of high-quality premises for businesses and 3) the link with multi-stakeholder policy initiatives envisaging innovation and economic impacts of the park in the local and regional economy. This definition represents well the features of most science and technology parks and is flexible enough to encompass new hybrid types of knowledge locations. Moreover, it does not *a priori* assume the existence of linkages and interactions between the tenants, leaving it up to research to find out whether those exist or not.

Another well-known notion in the literature is the one of *Technopoles*, popularized by Castells and Hall (1994) as "…deliberate attempts to plan and promote, within one concentrated area, technologically innovative, industrial-related production" (p.8). This definition is rather synthetic and encompassing but poses some shortcomings for the purposes of this study. On the one hand, it puts too strong a focus on technology and high-tech production, which is too restrictive for some contemporary knowledge locations that largely thrive on the production of e.g. designs, images or symbols, alone or in combination with other technologies. On the other hand, the authors bring the notion of "area" an all-inclusive one, also considering *technopoles* places such as Silicon Valley, Boston's Route 128 and even cities and regions as a whole (like Paris or Bavaria). Moreover, we are still in need of a definition that does not conflate the developments in-location *strictu sensu* from its impacts and relevance in the economic and innovative dynamics of the host region.

To sum up, all the previous definitions bring forward important features of knowledge locations, to be explored in the next sections. However, while some of them are too narrow, placing too strong assumptions and risking ignoring contemporary manifestations of the phenomena, others are too broadly defined and jeopardize the operationalisation of the concept. All in all, for the objectives of this thesis, a notion of knowledge locations

should be synthetic and flexible enough to encompass different manifestations of the phenomenon, yet bounded enough to bring it operational, as well as of scientific and policy relevance.

Therefore, this thesis adopts the following notion:

> *Knowledge locations are planned area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district. The concept of knowledge location encompasses a number of manifestations such as science parks and quarters, technology hubs, knowledge campuses or creative factories and districts, with a deliberate element of planning and policy aimed at promoting that agglomeration.*

This notion of knowledge location comprises the previously identified manifestations and features, clarifying some important dimensions. Firstly, it stresses the *planning dimension* involved in knowledge locations. Under this definition, there must be an associated planning and policy dimension, involving public or public and private stakeholders, willing to foster agglomeration and steer new knowledge and innovation dynamics in the urban and regional economy. Hence, this definition excludes *fully* profit-oriented, private property-based developments such as business parks.

Secondly, it considers knowledge locations as *area-based initiatives*, including the development of premises and services for firms and other organizations within, but also associated public spaces, living possibilities, etc. It does not require the existence of "gates" or "walls", but presumes the existence of some kind of zoning. Thus, this definition excludes large "innovation valleys" or cities as a whole as knowledge locations.

Thirdly, the previous notion has a broader understanding of knowledge that goes beyond science and technology and "high-tech". It considers that knowledge-intensive activities may rely on different types of knowledge bases: not only science and engineering based – dominant in conventional science and technology parks – but also artistic, aesthetic and cultural based (Asheim et al., 2007), more observable e.g. in creative factories and districts.

To grasp the features of knowledge locations further, it is important to know the characteristics of their most well-known "pure" types, which have been mutating towards new hybrid concepts of knowledge locations (Phan et al., 2005). We turn to that in the next sections.

2.3 Science and technology parks[4]

Science and technology parks are the best known and well documented type of knowledge locations. They are often located outside the city, close to rings and roads, containing a mix of premises for businesses, start-ups and research institutes. Typically, there is no housing or leisure function. Often, science parks are managed by public or semi-public companies, with most of the shares in the hands of the (local) government or the state. Universities and research institutes are frequently key stakeholders and joint initiators, establishing a number of formal and informal links with science and technology parks (e.g. Massey et al., 1992; Vedovello, 1997; Malecki, 1997).

The first known initiative to develop a science park (although not in a "formalized" way), was taken by Stanford University's Dean Frederik Terman, who developed and leased University's land for start-ups in the early 1950s. This would turn into the well-known Stanford Research Park, a cornerstone of Silicon Valley. In 1959, a number of public and private stakeholders and three renowned Universities in North Carolina – Duke, State and Chapel Hill – joined forces to set up the Research Triangle Park (perhaps the first truly planned knowledge location in the world), still nowadays one of the US's most well-known and vibrant technology parks (Link and Scott, 2003).

In 1970, Cambridge Science Park was formally established in the United Kingdom. It is the UK's oldest and most prestigious science park. Its development was led by Trinity College, which limited the admission to technology and research firms. Recently, it was home to over 90 high-tech companies and 5,000 personnel, but its start was slow: 2 years after its official opening, it had only 7 tenants, and only 20% of the designated area as

[4] This section is largely based on Van Winden, W., Carvalho, L., Van Tuijl, E., Van Haaren, J. and Van den Berg, L., *Creating Knowledge Locations in Cities*. Abingdon: Routledge, 2012.

developed (Koh et al., 2005). It focuses on basic and applied research, and many of the companies are led by researchers and scientists rather than typical entrepreneurs. In the late 1980s, the science park concept became widespread in Western Europe (Monck et al., 1988) and it is currently a fully-fledged reality throughout the world (IASP, 2010).

Science and technology parks come in several shapes and can have different initiators and business models. They have "identifiable administrative centres, focused on the mission of business acceleration through *knowledge agglomeration* and *resource sharing*" (Phan et al., 2005, p.166, our emphasis). Some focus on particular technologies, economic sectors, or science fields; others are more generic. Overall, science and technology parks often pursue multiple goals simultaneously, which tend to have different emphases according with the involvement of different stakeholders (see Table 1).

Table 1. *Main goals of the various stakeholders in science parks*

Stakeholders	Main goals
Universities & research institutes	Science Parks serve to strengthen knowledge transfer (interaction) between university research and industry, particularly to derive funding for future research. It also includes commercialization of research results, eventually through academic spin-off firms and utilization of idle land of the university. In the knowledge economy: meeting targets from government policy.
National and local (regional) government and (public) business support organizations	Science Parks support the restructuring of the local (regional) economy. They generate new firms, high-technology jobs, income and tax. Also, they serve to improve the image of the city (region), particularly international recognition.
Real estate and financial institutions	Science Parks are seen as a business opportunity. They serve as real estate investment projects to raise profits. In addition, the firms that settle may serve as investment projects.
Firms on Science Parks	Science Parks are seen as favourable environments, in terms of supply of facilities, the positive image associated with it and network opportunities with the university and other park tenants.

Source: Van Geenhuizen and Soetanto (2008, p. 94)

An important role ascribed to science and technology parks is to increase knowledge spillovers and to improve connections between universities and the industry. Typically, science parks contain incubation facilities, where young science-based firms are helped to develop. By locating on a science park, firms gain access to structural elements provided

by the science park, e.g. infrastructure and supporting facilities, providing opportunities for synergy between high-tech firms (e.g. Phillimore, 1999). Chan and Lau (2005) make a distinction between two types of support: *basic* structural *support* (shared office services, business assistance, rental breaks, business networking, access to capital, legal and accounting aid, advice on management practices), and *technology-related* structural support (labs and workshop facilities, R&D activities, technology transfer programmes, and advice on intellectual property).

There are several types of science parks. Some focus primarily on basic research, and have strict admission criteria (e.g. Cambridge). Others are more oriented towards applied research, and also allow manufacturing and workshops at the premises. Some science parks have a thematic or technology focus (e.g. biotechnology), others are more generic. Typical tenants of science parks are university departments, start-ups, technology companies, but also public research institutions and private research labs. Some science parks focus on production-oriented technology, and have close links with manufacturing firms. A good example is Taiwan's Hsinchu Science Park. It has developed as a "brain" centre for the manufacturing of semiconductors and other electronic components, but also manufacturers locate at the site (Lee and Yang, 2000).

Over the last decade, many Asian countries invested in science parks with an eye to attracting knowledge-intensive foreign investment. The establishment of Singapore Science Park in the 1980s became an example for many other Asian countries. It was created to provide an infrastructure to host multinational corporations and other businesses that benefit from proximity to higher educational institutes. Moreover, the Park was planned to become the R&D hub of the city state, and was meant to signal the country's ambitions to become a leader in the knowledge economy (Koh et al., 2005).

Throughout Europe, mainly in former industrial regions, science parks have ambitions to signal processes of economic diversification. They develop prime conditions and infrastructures to attract new knowledge-intensive FDI, and often host the "crown jewels" of regional economic diversification, such as new lead firms, high-tech start-ups and internationalized knowledge institutes (Carvalho, 2009).

2.4 New types of knowledge hubs and the creative district[5]

The focus of science and technology parks typically ranges from basic and applied science to product development and sometimes even manufacturing. However, during the last decade-and-a-half, new types of knowledge location have been developed in thematic fields beyond science or technology. This reflects the growing recognition that the knowledge economy is not restricted to the technological realm. Notably, the "creative industries" (such as fashion, design, audiovisual, multimedia, etc) have been identified as promising knowledge-based growth activities, with a strong urban orientation and symbolic content (Scott, 2000; also chapter 3). Consequently, many cities have developed a wide variety of area-based concepts to facilitate the development of these industries, e.g. through creative city plans and through the development of new dedicated "spaces" and locations (e.g. Laundry, 2000).

In the 1990s, Manchester was early to support the development of a "creative quarter" in the city's Northern district (van den Berg et al., 2001). It targeted the concentration of designers and artists in a multi-functional area (with shops, restaurants and living possibilities). There are many more examples, particularly in Europe (Evans, 2009b)[6]. Another well-known case is Barcelona's "@22 district", in which former industrial land is being transformed into a multi-functional "innovative district". This new location counts with the strong involvement of many local universities research institutes, willing to expand and relocate their activities in the area, mixing e.g. in biosciences, design and multimedia. In the Netherlands, the City of Eindhoven has been supporting the reconversion of former Philips´s premises towards a mixed-use *creative factory* called "Strijp-S".

---

[5] This section is largely based on Van Winden, W., Carvalho, L., Van Tuijl, E., Van Haaren, J. and Van den Berg, L., *Creating Knowledge Locations in Cities*. Abingdon: Routledge, 2012.

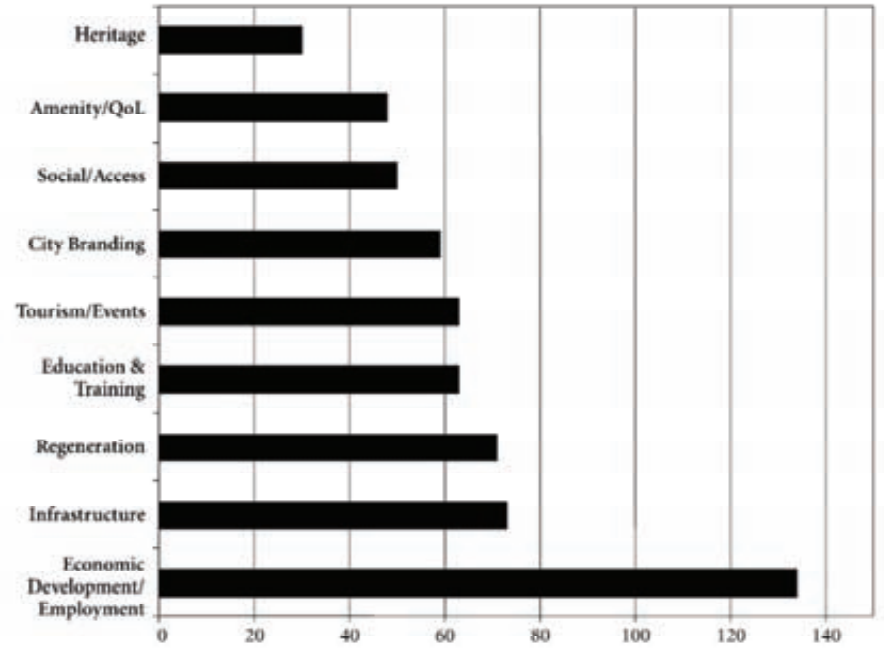
[6] Asian cities increasingly provide examples of this phenomenon as well (e.g. Keane, 2009; van Tuijl and van der Borg, 2012).

There are similarities and shared objectives between these new knowledge hubs and the more "traditional" science parks described above. Typically, universities and other knowledge institutes (e.g. media departments, schools of design) are involved in the development; also, many have incubation facilities, start-up support, and seek to develop local networking as a means to promote innovation and new product development. Moreover, there is often the participation and co-location in the area of intermediate institutions such as cultural centres, development agencies and other organizations with responsibilities in fostering networks between firms and educational institutes.

However, what clearly distinguishes such locations from science and technology parks are their urban felling. Unlike traditional science parks, creative hubs do not look like mono-functional business parks. Many can be found in city centres and/or regenerated industrial areas, and have a more urban and lively ambience. Contrarily to the typical science park model, these new hubs have usually a strong aesthetic and visual drive encompassing cultural facilities, museums, architecture quality, heritage preservation, public art and trendy streetscapes, event hosting, with housing and living possibilities (e.g. Van Winden, 2011).

In a recent global survey to "creative-related" knowledge locations, Evans (2009a) synthesized the dimensions and policy objectives involved in the planning of such locations, which he called "creative spaces" (see Figure 3). Indeed, like in science and technology parks, also economic development, agglomeration and investment attraction, entrepreneurship and job creation are dominant objectives, as well as the development of clusters of knowledge-intensive and creative activities. However, they also include the urban pay-offs resulting from the regeneration or worn-out areas, branding, tourism promotion, as well as physical and environmental revitalization and social inclusion.

Figure 3. *Policy rationales*



Source: Evans (2009a); note: the Figure represents a sample of 230 "knowledge and creative city" strategies.

2.5 Knowledge locations and policy rationales

Why does society (namely government authorities) invest in knowledge locations? Beyond the popular policy discourse and glossy promotional leaflets announcing the creation of new jobs, companies and places to "live, work and play", there are a number of general underlying theoretical arguments for policy intervention.

The most widely acknowledged is the *market failure* argument (e.g. Phan et al., 2005). Under this argument, social returns and positive externalities associated with (parts of) knowledge locations exceed private returns. Therefore, there is a risk of under-provision of the good and public authorities invest to reduce that risk. Governments assume that there

are many public benefits that cannot be entirely appropriated by the private sector, but that accrue to society.

Those benefits can be knowledge and innovation-related. A central argument for investing in knowledge locations posits that the agglomeration of a critical mass of knowledge intensive activities in a location can contribute to reduce transaction costs and increase overall *collective efficiency* (e.g. Phan et al., 2005). This can be e.g. associated with search for information (e.g. reducing information asymmetries between R&D institutes and the industry), technology transfer and access to rare services such as laboratorial facilities or intellectual property advising.

Also for creative industries, Evans (2009b) suggests that the concentration of knowledge intensive actors can lead to cost-savings along production chains and information access, e.g. through workspace sharing. Moreover, some knowledge locations are also increasingly justified by their incompletely appropriable benefits in neighborhood development and rejuvenation, social inclusion or heritage preservation as public goods.

However, in the face or recent socio-technical evolutions (e.g. wide diffusion of information through ICTs, consolidation of virtual markets, market-provided cooperative workplaces), some authors casted doubts on whether most of the reasons behind an innovation and information-related market failure still hold (Phan et al., 2005). From a regional innovation perspective, some authors inclusively argue that correcting market failures should not be a policy target, since knowledge asymmetries are part and parcel of any economy and provide the incentives to invest in knowledge creation *per se* (Boschma, 2009).

In this vein, there is another set of justifications underpinning the development of knowledge locations, largely related with the notion of *system failures* (e.g. Edquist, 1997; Bergek et al., 2008), supported by the literatures on evolutionary economics, innovation systems and its regional extensions (e.g. Cooke, 2001; Henning et al., 2010). These approaches consider that innovation hardly results from a linear and unidirectional process "from-R&D-to-commercialization", but much more from an interactive process between knowledge producers and knowledge users, supported by a number of organizations (e.g.

sector associations, venture capitalists, government) and shared institutions, such as norms, practices, joint visions and interaction routines.

Under this literature, knowledge locations are often considered important elements of a *regional innovation system*, namely as they play the role of an intermediate organization providing advanced services and access to resources such as venture capital, market information and knowledge brokerage (e.g. Tödtling and Trippl, 2005). Phan et al. (2005) suggest that knowledge locations can sometimes fill institutional voids or "missing links" in innovation systems. For example, knowledge locations can foster new linkages between knowledge producers and users, support information exchange or the development of new routines and supportive services for the interaction between knowledge users and producers.

Finally, beyond market and system failures, there is a third group of reasons beyond the development of knowledge locations, associated with the phenomena of *policy circulation and discourse building*. On the one hand, knowledge locations are deeply embedded in political systems and discourses (Van Geenhuizen and Soetanto, 2008). They become "physical proof" of larger knowledge-based economic development strategies; therefore, they can be (partly) justified for their role uniting stakeholders in cities and regions around shared concerns and development of joint visions for economic change.

On the other hand, knowledge locations can play a role in political processes of investment legitimation. For example, investments in "creative-driven" urban policies and associated quarters/"factories" legitimize local spending in the fields of education, culture and infrastructures (increasingly difficult to justify under tight municipal budgets) since they become associated with business development and tax revenues from real estate valorisation, therefore perceived as contributing to extra revenues rather than to extra costs (Hansen and Nyansil, 2009; Peck, 2005).

2.6 Conclusion

This chapter presented a notion of *knowledge location*, essential to frame and guide the next research steps: knowledge locations are *planned area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district*. In order

to clarify what a knowledge location is and what their main features are, the characteristics and objectives of some of their more common manifestations were depicted. As illustrated above, knowledge locations are being developed for a number of reasons, which first and foremost is local knowledge-based economic development. Knowledge locations are seen as instrumental to the agglomeration of knowledge-based activities in cities, to the promotion of synergies and joint learning between them and, ultimately, to new rounds of local and regional development.

The chapter provided some initial theoretical arguments underlying the development of knowledge locations, but at this point we still know little about the reasons and fundamental developments behind the growing societal interest in this policy tool and the evolutions of its features over time. Remaining puzzles are also the reasons behind the nuanced spatial orientation of knowledge locations within functional urban regions. Why do some tend to emerge and succeed in greenfield environments while others increasingly have a strong urban orientation? We turn to these issues in the next chapter.

3. FUNDAMENTAL CHANGES, URBAN DYNAMICS AND KNOWLEDGE LOCATIONS

3.1 Introduction

How can we explain the growing and revitalized attention for knowledge locations, and why are (some of) them moving back to cities?

This chapter frames the development of knowledge locations within a broader theoretical framework of urban and regional dynamics. It explores the relation between the fundamental societal changes of the last decades, the phenomena of re-urbanization, and the emergence and consolidation of this popular policy *provision* (Section 3.2). Moreover, it relates recent societal developments such as i) new stages of the ICT technological revolution (3.3.1), the consolidation of global economy with strong knowledge mobility (3.3.2) and the features of the so-called knowledge economy (3.3.3) with changes and adaptations in the "design" of knowledge locations, as well as with the revitalized policy interest in such investments during the last decade. Moreover, while acknowledging a general "urban turn", the chapter explores reasons behind the observed (nuanced) spatial "preference" of knowledge locations for different areas within functional urban regions – e.g. city cores vs. greenfield locations (3.4).

3.2 Urban development dynamics and the urban life cycle

In order to understand the growing attention to knowledge locations we first need a general analytical framework to understand the development dynamics of their host cities and urban regions. Van den Berg's (1987) theory of urban dynamics and the urban life cycle provides a neat and appealing starting point to do so. It is particularly useful here as a device to theoretically conceptualise the *catalysts* behind the steady emergence of knowledge locations from the early 1980s onwards.

In line with van den Berg's rationale, the emergence of a new knowledge location can be understood as a new government *provision*, responding to the changing demands and preferences of urban actors (residents, companies). Another important feature is that van den Berg´s underlying theory considers urban change – including the development of new

infrastructures and policies – as a joint result of both actor's *self-organization* dynamics and preferences (which on their turn respond to fundamental societal changes), but also of deliberate *policy and planning* action (from the government) to accommodate those new preferences.

In a nutshell, van den Berg's theory provides an integrated framework to explain urban dynamics (concentration and de-concentration of people and jobs within urban regions) as a result of changes in the behaviour of urban actors in space: residents, companies and government. According with the theory, those actors seek to increase their welfare functions, which depend on the match between 1) the supply of welfare elements in place (e.g. living facilities for families; location factors for companies; social welfare for the government) and 2) the actor's preferences, which are associated with current economic, social, political or technological societal structures. The spatial behaviour of each group of actors is initially propelled by new preferences, and in turn associated with progressive and fundamental societal changes (e.g. diffusion of the car in society, increasing value attached to the living environment), but subsequently also by changes in the location potentials provoked by actions of the other actors (e.g. decisions of migration, transport use, industrial relocation, etc.). In a similar vein, the government reacts to these changes in order adjust policies and provisions that fit the residents and companies new demands (e.g. housing, infrastructure or economic policy).

Van den Berg (1987) recognises that the demanding-following nature of government's behaviour often steers further the spatial behaviour of other actors, leading to chains of circular and cumulative causation. An example is the downward spirals of city centres, accentuated by the provision of new infrastructure in sub-urban locations, which over time became detrimental to urban regions as a whole. Conscious of this tension, in subsequent work and from a policy perspective, van den Berg and colleagues (van den Berg et al., 1997; van den Berg and Braun, 1999; van den Berg et al., 2007) made a plea towards the adoption of a more proactive and anticipatory (vs. reactive and demand following) urban management orientation.

The abovementioned theory of urban dynamics explains the development patterns of urban regions through four different historical stages from the industrial revolution until mid-

1980s: *urbanisation*, *sub-urbanisation*, *dis-urbanisation* and *re-urbanisation*[7]. The urbanisation's stage is associated with a fundamental development (industrial revolution) and has led to the concentration of companies and residents in fast growing cities. Over time, the increasing pollution, land prices and nuisance of the industrial city progressively led a sub-urbanization stage in which residents steadily moved to suburbs (the city's hard ring) while keeping most of the jobs in the central city; this spatial change has been underlined by another set of fundamental developments – associated with the diffusion of car use – and was further propelled by government provision of urban infrastructures such as roads and urban services in the suburbs.

The next stage – dis-urbanization – is of further de-concentration as residents and jobs both leave the core city and the hard ring towards a "soft ring" of small and medium sized municipalities, free of congestion and nuisance and with lower land prices. According with van den Berg's analysis, this stage in underpinned by the growing value attached by society to the living environment[8], followed by the new government's support for further infrastructure and housing development. This shift originated the consolidation of metropolises with diverse fully fledged cores and rings, closely-knit and interdependent, working as functional urban systems.

By the early-mid 1980s, as some old cities in large metropolis started to attract back companies and residents, van den Berg (1987) identified the beginning of a general shift towards a new urban development stage – re-urbanization – primarily linked with the emergence of a new "informational economy". This new informational economy, thriving of immaterial inputs and outputs, entailed new location factors and preferences. For example, companies were growing smaller in size and becoming increasingly reliant on immaterial inputs and highly-qualified, educated workers. In turn, those highly-qualified workers (who are also residents) increasingly attached a premium to the quality of the

---

[7] Namely the dynamics of urban concentration and de-concentration in the US and Western Europe.

[8] This development is associated with the preference for "freedom" from generalized nuisance, while still being able to access jobs and consumption amenities.

living environment. On the face of these trends, van den Berg predicted growing competition between different cities within the functional urban region to attract the highly-qualified residents and companies, through a number of provisions to cope with actors' (people and companies) new demands.

What does this imply for the study of knowledge locations? In line with this theoretical framework, from the 1980s onwards, one of the government's *reactions* to cope with the new set of preferences has been the *provision* (alone or together with other stakeholders) of knowledge locations[9]. Science and technology parks have been perceived since then as a good fit to cope with and support the demands of new information-based industries (e.g. ICTs, biotechnologies). They provided e.g. facilities for smaller companies with moderate office rents, in physical proximity to information and knowledge (e.g. universities, other companies), in an often clean and nuisance-free environment.

The development of science parks and knowledge locations are still seen today by local governments as a distinctive provision in the competition between urban regions, but also many times between different municipalities within a functional urban region. As Turok (2009) puts it:

> "In the face of growing competitive pressures, cities in Britain, the United States, and other advanced economies have been exploring new ways of promoting their distinctiveness to increase local prosperity. All sorts of devices [such as science and technology parks and related locations] have been deployed in attempts to generate greater interest, investment, jobs, and population" (p.13).

[9] Naturally, not only local governments have been involved in the provision of knowledge locations, but also regional and national level governments. Namely for science parks, national science and innovation polices policies have been extremely influential fostering their development (Stankiewicz, 1998).

3.3 New fundamental developments, socio-economic change and knowledge locations

Can we see changes in the fundamental developments that propelled the development of the first generation knowledge locations during the 1980s? By that time, Castells and Hall (1994) argued that the development of knowledge locations was part and parcel of three fundamental developments with profound impacts on the playing field of cities: 1) a *technological revolution* based on information technologies; 2) the formation of a *global economy* and 3) the emergence of new modes of production based on *information and knowledge*[10].

As the authors put it, knowledge locations did not emerge by accident or fashion. They represented deliberated planning attempts by public and private parties "to help [to] control and guide some exceedingly fundamental transformations [affecting] society, economy and territory, [that were] beginning to redefine the conditions and processes of local and regional development" (p. 2). The interest in knowledge locations gained momentum towards the late 1990s as the previously identified trends consolidated and the global competition to attract and retain investments and companies gained a strong urban and regional dimension (e.g. Lever, 1999).

But what has happened since then, namely in the last decade-and-a-half, and which new societal evolutions impacted on the development of knowledge locations? We have seen that knowledge locations proliferated and diversifying their features; they did so in more nuanced spatial settings, beyond the science park model and the quiet peripheries of cities towards more urbanized areas (chapter 2). Which are the drivers behind such change? We turn to some of the most significant issues in the next points, and Table 2 synthesizes that analysis.

---

[10] Those trends supported the emergence of new, network-based modes of industrial organisation. Examples are the shifts from in-house and single location production of large industrial corporations towards networks of flexible specialization among smaller firms (Scott, 1988) and the internationalisation of production (Dicken and Thrift, 1992).

Table 2. *Fundamental developments, recent evolutions and hybrid types of knowledge locations*

	Castells and Hall (1994)	Recent developments
Technological revolution	Technological silos (e.g. ICT, biotechnology)	Technological convergence (e.g. ICT, media, audiovisual, health)
	Intermittent Technology transfer	Permanent and unpredictable information and knowledge mobilization
	Restricted number of innovation actors (firm, university)	Large number innovation actors (including users)
Globalisation	Integration of global value chains	Mobility and circulation of knowledge
	Multiple production sites and a single R&D base	Multiple production and R&D sites
Informational economy	"High-tech"	"Analytical, synthetic, symbolic"
	Scientists and technicians	"Creative class"
	Production vs. consumption	Interaction production-consumption
Knowledge locations	**"Science and Technology Parks"**	**"Hybrid types of knowledge locations"** (e.g. creative districts, knowledge and technology hubs)

Source: Own elaboration (also partly inspired by Crevoisier and Jeannerat, 2009)

3.3.1 New developments within the technological revolution

Among the most significant developments of the technological revolution referred by Castells and Hall (1994) were the diffusion (and increasing capacity) of the personal computer, the internet and other forms of mobile telecommunications, biotechnology and genetic engineering. Beyond their impact in society at large, such technologies became growing industries in their own right. An important characteristic of these new technologies, at least during their early development (1980s and early 1990s), was the

heavy reliance on basic research, developed in universities and (national) research labs, before they could spill out to industry and commercialization, in a linear fashion[11].

Hence, science and technology parks were progressively created to increase the economic impact of scientific research. Their emergence reflects the notion (and society expectations) that science is not only valuable in its own right, but also a catalyst to economic growth: it would contribute to innovation and the development of high-tech firms (Guston, 2000). At the same time, universities discovered commercialization as a new source of income, and increasingly considered science parks as effective instruments to tap on them.

Under this paradigm, technological developments and innovations largely developed in isolation, in separated industrial settings. Innovation involved a limited number of players, namely R&D centres and industrial players, under the frame of science and technology policy. Knowledge transfer happened in an intermittent fashion, relying on highly formalized projects over long time spans, in a rather unidirectional way (again, from the R&D lab to the firm commercialization). In the late 1980s and during the 1990s, and from an urban and regional perspective, knowledge locations (notably science and technology parks) were seen as instrumental "fixing" declining industrial regions through high-tech developments.

However, during the last decade, a number of trends and evolutions paved the way to more nuanced modes of industrial organization and innovation. One of the most significant evolutions has been the consolidation of the so-called Web 2.0, i.e. using internet as a dynamic interaction platform between people. Associated with this is for example the convergence between ICTs and media for service provision in platforms such has the ones found in smart phones and tablets (internet, media, audiovisual, etc). This has been hand-

[11] Under a linear assumption, innovation is equated with R&D and spills "down the ladder" from R&D in university (basic) and company labs (applied) towards industrial commercialization and diffusion (see Godin, 2006, for a review). Biotechnology is perhaps the most evident example, but the same goes for many ICT applications, with origins in many US military-related national research programmes.

in-hand with the proliferation of social networking platforms such has *Facebook, Twitter* or *blogging* practices (e.g. Jones et al., 2010), which brought information accessibility and diffusion much faster.

The former developments facilitated a more fluid and permanent knowledge mobilization and diffusion. They also opened room to the involvement of a larger number of actors in innovation processes and new product´s development, such as users and consumers. Examples are the proliferation of *crowdsourcing* practices (Howe, 2006) – companies and organizations using "everyday people (…) to create content, solve problems, even do corporate R&D" (p.1) and the growth of *open-innovation* processes, i.e. companies using knowledge and technologies developed outside the company and even outside R&D units "proper" (Chesbrought, 2003; von Hippel, 2005)[12].

These recent developments accentuate the shortcomings of a linear, "from-R&D-to-commercialization" innovation model which underlined the early development of science parks, e.g. based on the development of semiconductors or new drugs (Massey et al., 1992). Presently, new-generation knowledge locations are being planned to cope with the challenges and opportunities opened by the new ways through which people and organizations interact towards new products and technologies. Examples are the provision of interactive media and communication platforms as part of the "service package" of a location, or the provision of joint labs and pilot facilities to test convergence potentials and new combinations between different technologies (van Winden and van den Klundert, 2009). Some knowledge locations, e.g. in South Korea are being designed to become real-life test-beds of new technologies and services (e.g. urban services related with energy or mobility), requiring the interaction between every-day users, firms and other innovators (Carvalho, 2011).

[12] A recent example of the latter is the development of "living labs" in European cities and neighbourhoods (e.g. Almirall, 2008), i.e. real-life technological platforms and test-beds in which companies and other partners jointly develop and test new technologies in close interaction with the ordinary citizen (e.g. health monitoring applications).

3.3.2 Consolidation of a global economy with knowledge mobility

From the 1990s onwards, globalisation (i.e. the interdependency between globally spread regions) increased sharply. The previous identified technological revolutions in ICT[13] converged with a number of *political developments* (e.g. EU integration, global trade liberalization) and *transportation innovations* (e.g. containerization; rise of low-cost air carriers) opening room to the increasingly global circulation of people, goods and capital. These developments have been extensively documented elsewhere (e.g. Friedman, 2005; Rodriguez-Pose and Crescenzi, 2008) and led to new forms of production organization across space – e.g. the consolidation of global value chains organized through the out-sourcing and off-shoring operations of large multinationals (Gereffi et al., 2005).

A result from the abovementioned is the increased mobility and circulation of knowledge (e.g. Crevoisier and Jeannerat, 2009). First, the development of *globally networked R&D departments* progressed as the role of multinationals in the global output, trade and capital circulation increased, e.g. through mergers and acquisitions (Dunning, 2009). Moreover, also smaller companies increasingly spread R&D and innovation "antennas" in cities and regions beyond their home location. Some do it from the start-up stage, the so-called "born-global", a growing phenomenon in the corporate world (Tanev, 2012), in order to early access localized resources such as technical and market knowledge, venture capital or simply to benefit from localized symbolic assets, e.g. local "brands" (Doz et al., 2001; Carvalho et al., 2012)

Second, beyond inter-firm networks of international managers and technicians, global knowledge mobility also takes place through the circulation of scientists and other individuals such as *transnational entrepreneurs* (Drori et al., 2009). Saxenian (2007) called these mobile workers the "new Argonauts"; she provided evidence of their role in the development of new industries in their home regions, through the mobilization of knowledge sourced elsewhere. One of the most well-document cases explores the development of the advanced semiconductor and venture capital industry in Taiwan, which

[13] Including also e.g. e.g. file-sharing, video-conference, e-mail and diffusion of platform software.

started out of the technological relations between Silicon Valley and Hsinchu Science Park in Taiwan, bridged by expats Taiwanese engineers with previous working experience in the Valley (Saxenian, 2007; 2008; Lee and Yang, 2000). Those returnees found in park ample room (e.g. flexible and "mouldable" institutions, bureaucracy exemptions) to establish new businesses involving technology and even institutional transfer (e.g. venture capital and managerial practices) from Silicon Valley. The park supported the formation of new communities that ended up spilling out to shape a broader Taiwanese semiconductor innovation system, with new rules and innovation-favourable institutions.

Third, and related with the previous two dimensions, is the emergence of a *project-based economy* (Ekstedt et al., 1999). It refers to the fact that multidisciplinary teams from different companies frequently cooperate intensely towards new solutions, on a temporary basis and in ever-changing network configurations. The literature provides manifold examples of industrial development and innovation projects organized on a global scale, between companies and organisations located in different countries, in very diverse fields (e.g. Van Winden et al., 2010; Moodysson, 2008). As a result, cities and regions are becoming places of intense transnationalism and mobility, reason why (international) accessibility is of utmost importance. Accordingly, new knowledge locations are increasingly designed envisaging expat-friendly amenities and services, placing efforts in the general integration of the location with global networks, often through very active brokerage and "boundary spanning" practices of the location´s managers. East Asian knowledge locations – e.g. in Singapore – emphasise these trends (e.g. Mae Phillips and Yeung, 2000; Koh et al., 2005).

3.3.3 From the informational to the knowledge economy

Castells and Hall (1994) start their analysis of "technopoles" contextualizing the *emergence* of a new form of economic production based on information, knowledge and

their recombination[14]. During the last decade-and-a-half, the *diffusion* of such a new mode of economic production expanded widely in most of the western world, but also in the most dynamic metropolis of the "global south". The notion of "informational economy" – largely associated with the development and diffusion of ICTs – evolved towards a broader notion of "knowledge" or simply "new economy", in order to stress its fundamental differences vis-à-vis the former "Fordist", physical, production-based economy.

The OECD (1996) defined knowledge economies as "economies which are directly based on the production, distribution and the use of knowledge and information". In Europe, this definition influenced the strategy behind the "Lisbon Agenda" under which national governments committed themselves to invest in ICT, increase R&D spending and promote knowledge commercialisation. The development of science and technology parks were seem as spearheads in such strategies.

More recently, the more narrow and linear understanding of knowledge and innovation (still influential in policy circles) has been giving ground to a broader understanding of the knowledge economy. Under this perspective, economic added value and innovation is associated not only with new high-tech industries, but cuts across "traditional" manufacturing activities (e.g. Asheim and Coenen, 2005; van Winden et al., 2010), also including the production of symbols and experiences e.g. associated with fashion or design (Scott, 2000). For this reason, Asheim et al. (2007) made a plea to avoid high/low tech dichotomies and recognised that knowledge is increasingly embedded is all forms of innovation, yet with different characteristics: analytical (science-based), synthetic (engineering-based) and symbolic (artistic-based). Innovative activities primarily rely on different types of knowledge, even if they are increasingly intertwined in a product or service (think, e.g. on a smart-phone, or on functional food).

[14] The key contours of this development had been identified a decade before in the US context (e.g. Naisbitt, 1984; van den Berg et al, 1987), but had likely been already at play before, as the evolution of the US productivity suggests (Romer, 1986).

The knowledge economy has other important characteristics. First, it thrives on accelerated development paces (Golder and Tellis, 2004) as well as fast obsolescence of products and services (Powell and Snellman, 2004). Second, in opposition with standard designs and mass production, multiple designs of the same core product are usual; competition takes places not exclusively through price but increasingly through differentiation (Scott, 2006). Hence, society increasingly puts a high premium on entrepreneurship and innovation (e.g. van den Berg et al., 2005) – an objective explicitly pursued by many knowledge locations.

Such characteristics go hand-in-hand with fundamental changes in labour markets. Routine functions – either "blue" or "white" collar – become increasingly automated while the largest shares of economic added value rely on an "elite" of workers capable of advanced problem-solving, relying on high qualifications and diplomas but also on social interaction and skills. This is reflected by the increasing relevance of scientific and technology-based jobs in the labour force of developed economies, as well as management, analysis and diffusion of information and production of images, symbols and experiences (e.g. Scott, 2006).

This new group of workers has been popularized by Richard Florida (2002), as the "creative class". According with Florida, quality of life (and not necessarily the highest salary) plays a central role in the location decisions of the creative class (see also van den Berg, 1987). They tend to choose tolerant and diverse places where it is easy to socially plug-in, change jobs and access diverse amenities such as cultural and advanced consumption opportunities. Moreover, some segments of the creative class (e.g. artists, designers, researchers) follow unorthodox working schedules, not anymore from "nine-to-five" but mixing living and working in time and space (e.g. Evans, 2009a).

The former dimensions led to new expectations and roles for science and technology parks and knowledge locations in general. For example, they explain the increasing popularity of new types of knowledge hubs such as creative districts (Miles and Paddisson, 2005). New hybrid knowledge locations still have many of the key features of science and technology parks (e.g. premises for companies, entrepreneurship promotion), but with a focus on new types of activities (e.g. media, design, audiovisual), a carefully designed public space,

explicit concern to promote functional mixes and a whole new set of amenities and living possibilities, in line with the new desires and working preferences of the "creative class".

Overall assessment

All in all, in line with van den Berg (1987) and Castells and Hall (1994), changes in societal demands – in turn leading to changes in preferences of residents/workers and companies – have been placing strong pressure on policy *provisions* such as knowledge locations. The increased attention for such a provision results from the coupling between 1) actor's *self-organization* in search for welfare potentials in space and 2) deliberate *planning attempts* (by governments) to cope with society's new demands.

We analysed above some on-going changes in the features of knowledge locations in response to a number of fundamental developments and recent trends. However, we did not fully explain yet the strong orientation of knowledge locations for urban regions. Why do the large majority of knowledge locations locate within or in the close proximity of large urban regions (e.g. IASP, 2010; Evans, 2009a)? And why do we find old and newly developed knowledge locations in different areas of functional urban regions (core cities and greenfield locations) even if we are in the presence of a generalized "urban turn", in which knowledge locations move from isolated campus to more urbanized, centrally located settings (van Winden, 2011)? We explore this issue in the next section.

3.4 The role of cities and the "urban turn" in knowledge locations

Despite the increasingly complex geographies of knowledge circulation, there is nowadays plenty of evidence that knowledge creation and innovation still largely occurs in concrete places (namely in cities and urban regions), where rich multi-functional learning interactions can unfold, backed by social, institutional, cultural and cognitive proximity between economic actors (Boschma, 2005; Crevoisier and Jeannerat, 2009). As economic development becomes increasing reliant on immaterial inputs and ideas, there is nowadays a broad consensus among economists and economic geographers that the role of cities as economic and innovation engines has been largely reinforced (e.g. van Winden et al., 2007; McCann, 2008).

There are a number of reasons why cities reinforced their role as *locus* of the knowledge economy. First, innovation requires adequate endowments of human and physical capital, and investments in R&D requires a minimum dimension and scale to become effective; hence, the concentration of highly skilled individuals, educational infrastructures and companies in urban regions give them incomparable advantages (e.g. Rodriguez Pose and Crescenzi, 2008).

Second, as long emphasised by Jane Jacobs (1969), large cities and urban regions provide for a diversity of environments, persons and companies, and that diversity provides ample room to explore knowledge complementarities and exchange of ideas across industries, namely in activities whose skills and competences differ but are related to each other (Boschma and Frenken, 2011).

Third, notwithstanding the potential of ICTs for information diffusion (Blum and Goldfarb, 2006), there is plenty of evidence that knowledge spillovers and the diffusion of innovations are still highly concentrated in space (Audretsch and Feldman 1996; Breschi and Lissoni, 2009). This is, again, backed by the presence of social linkages, cognitive and cultural understanding. Moreover, the concentration and density of people and activities make cities perfect arenas for rich ecologies of face-to-face contacts and exchange of complex pieces of knowledge (Storper and Venables, 2004).

Fourth, as previously mentioned, urban regions are particularly well endowed with amenities generally required by the creative class (Florida, 2002), such as advanced cultural consumption possibilities, leisure activities, "partner-matching" possibilities, flexible working arrangements, etc. Moreover, qualified and well-paid workers tend to put a higher premium in advanced consumption possibilities, often provided in large cities (Glaeser et al., 2001).

Finally, urban regions are also the most internationally well-connected places, in many ways (Mahroum et al., 2008). The presence of knowledge institutions, companies and decision makers make them important nodes for knowledge, capital and influence networks. Cities are often places of high connectivity and international interaction. In this sense, large urban regions are not only places of multi-functional learning and interaction

in “proximity”, but also (and due to that) hubs and attractors of international knowledge networks (Bathelt et al., 2004).

All in all, during the last decades, agglomeration became increasingly important for economic success. As explored in chapter 5, the concentration of skills, knowledge institutes, entrepreneurs and innovative companies in large urban regions often pushes and motivates the development of knowledge locations to steer these dynamics further. Even if to some extent knowledge locations try to emulate the success and agglomeration dynamics of cities and urban regions in a “smaller scale”, their emergence and development ultimately rely and are motivated by the conditions offered in urban regions, and by the requirements of their actors. However, the development of knowledge locations requires at least a minimum level of knowledge endowments (knowledge producers and/or economic base), and those are almost invariably present in some kind of urban-based agglomeration.

3.4.1 The “urban turn” and the persistence of diversity

The abovementioned forces implicitly refer to “cities” as functional urban regions – the relevant scale at which most of those forces operate. Yet, functional urban regions are composed by different cities, suburbs and less/non urbanized, still rural areas. Therefore, at this stage, we still known little about why some knowledge locations are “moving back” to the urban fabric of core cities while others locate and are being developed in greenfield suburban locations. When societal demands seem to be pushing towards the “re-urbanization of knowledge” and the emergence of new knowledge locations in old urban cores (van Winden, 2011), it is puzzling that contemporary knowledge locations are still developed in greenfield zones, with limited immediate urban ambience. Is it associated with weak-sighted policymakers, failing to understand the demands of firms, workers and residents, or are there other arguments?

The urban life cycle theory helps to answer part of the question. As predicted by van den Berg (1987), the former development of functional urban regions coupled with new location factors of the knowledge economy (e.g. quality of the living and working environment) resulted in increasing inter-municipal competition to attract skills and companies. In a context of increasing accessibility within the functional urban region (only

mitigated by raising congestion), a number of facilities and "welfare potentials" can be accessed from different locations, giving rise to what van den Berg (1987) called a "spatial indifference curve" for choosing a location within the functional urban region. By the early 1980s, not surprisingly, the spatial orientation of the first knowledge locations favoured greenfield locations within large functional urban regions, with lower land prices, good accessibility, pollution-free and close to the (already) suburbanized and de-urbanized university campuses.

However, as re-urbanization trends intensified during the 1990s and 2000s, a more nuanced spatial picture emerged, and the attractiveness of the urban fabric for the development of knowledge locations increased. On the one hand, it has been associated with the preferences of knowledge workers for amenities, leisure, consumption and new, more interactive working-living arrangements (van Winden, 2011). For example, as innovation increasingly relies on face-to-face interactions and temporary projects concentrated in time, the worker's preferences call for an environment that facilitates meetings and interaction, not only during office hours but also after. Moreover, beyond office and laboratorial space, workers increasingly call for interaction, meeting and leisure possibilities in lively urban settings.

On the other hand, namely in Europe, a reason for the development of knowledge locations in the urban fabric has been associated with the opportunities opened to regenerate empty spots left vacant by the closure of manufacturing sites of large companies. Despite the high costs for cleaning the soil (as a consequence of previous industrial activities), it is often still beneficial (and profitable for real estate developers) to redevelop these sites due to high demand for the scarce space in central urban locations.

The previous arguments explain the reasons behind an "urban turn" in the development of knowledge locations, but do not yet fully explain the persistence of diversity in the location of such spaces within larger functional urban regions. If *provisions* such as knowledge locations respond to the preferences and demands of residents/workers and companies (van den Berg, 1987), an answer for why knowledge locations are still developed in greenfield places should also consider that knowledge workers and knowledge-intensive companies are not a homogeneous whole, but have perhaps different

understandings and perceptions on what the "quality" of the living and working environment is. This means that they must have different "spatial indifference curves", showing different sensitivities to distance and access, and that different locations within a functional urban region are not perfect substitutes for each other.

Recent work of Asheim and colleagues (Asheim et al., 2007; Asheim and Hansen, 2009) confirms this perspective and provide hints to solve the puzzle. Based on the distinction between three general types of knowledge – analytical (science-based), synthetic (engineering and problem solving based) and symbolic (aesthetic and artistic based) – they review and analyse the *revealed* location preferences of knowledge workers whose specializations differ across those types[15]. Overall, their empirical work concludes that there are indeed significant differences on how knowledge workers weight their living and working preferences within large urban regions.

The preference for city centres and urban cores are more significant for workers and activities relying on symbolic knowledge (artistic and aesthetic). Design firms, architect agencies, media companies do prefer environments with a distinct and urban identity (Florida, 2008). On the one hand, work and living are mixed up in time and space. Workers think more in terms of projects rather than on fixed employers (Grabher, 2002); free-lancing and temporary working is frequent and often relies on public and urban facilities as meeting places (e.g. restaurants, cafes). Such activities are often deeply involved in cultural production and consumption, and thrive in a lively and diverse urban environment, often associated with inner and core city atmospheres (Pratt, 2000; Hutton, 2004). Taste and images are often "negotiated" and "constructed" in such places (Asheim and Hansen, 2009). "Buzzing" cities are important places for knowledge transmission and innovation in these industries to the extent that they favour easier access to strategic rumours, gossip and know-who (Asheim et al., 2007).

---

[15] Naturally those are "pure" types, and most of the activities and innovations actually rely in more than one type of knowledge base. It can be however demonstrated that each type of activity relies on a dominant type of knowledge base (the one "it cannot live without").

The story is rather different for workers and activities relying on synthetic and analytical knowledge bases. Engineers working in e.g. advanced machinery industries tend to prefer living in more quiet suburbs (see also Asheim and Hansen, 2009). In engineering-based activities, frequent "face-to-face" contacts and user-client interaction is vital in problem solving and innovation (e.g. Gertler, 2008), but that can often easily be achieved within the setting of the functional urban region, not only because of physical proximity but also backed by mutual understanding and social proximity. City centre locations are not only often unnecessary, but frequently incompatible with the physical needs of such industries. Overall, evidence shows that workers in these fields put more value of the "business climate" (presence of knowledge and businesses ensuring cash flows) than on the "people's climate" of core cities, with cultural and leisure amenities (Asheim and Hansen, 2009).

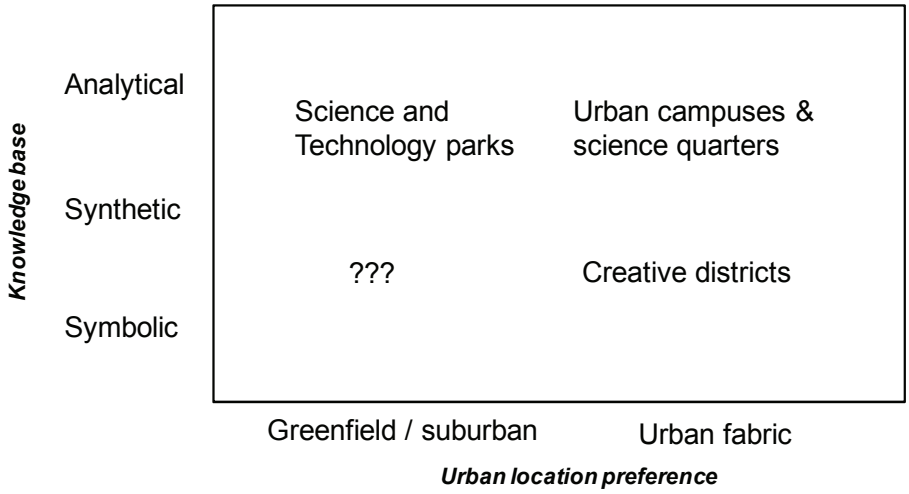
The preferences of scientists relying on analytical knowledge are somehow in-between. The key location factor is the proximity to renowned research groups and state-of-the-art laboratories (e.g. physics, biology, etc.), often found in large urban regions but not necessarily in city centres. All the rest being equal (i.e. access to such facilities and research colleagues), evidence suggests that this group reveals preference to live in dynamic and lively city centres, as the general "creative class" theory suggests (Asheim and Hansen, 2009).

The former evidence on the preferences of residents/workers and companies provide a more complete and nuanced answer on the reasons for the persistence of diversity of knowledge locations with large functional urban regions, or in other words, *why many knowledge locations (but not all) are moving back to cities centres*. In a nutshell, although there is a visible "urban turn" in the spatial placement of knowledge locations, actor's (workers, companies) preferences – which vary across different types of knowledge base – impact on the spatial placement of planned knowledge locations within urban regions.

Moreover, a knowledge location is a "negotiated" provision, not a fully "owned" government provision: the location and design of a knowledge location is negotiated between actors (firms, entrepreneurs, developers, land owners, universities) within an urban region – and those have different preferences for location. Out of the relation

between different types of knowledge base and actor's preferences for urban settings, different types of knowledge locations emerge. Figure 4 illustrates this with a simple typology.

Figure 4. *Typology of knowledge locations: knowledge base and urban location preferences*



Source: own elaboration.

The preferences of companies and workers primarily relying in analytical and synthetic knowledge bases (such as e.g. biotechnology or machinery engineering, respectively) are generally well-fulfilled in *science and technology parks*, typically located in quiet greenfield areas and limited urban ambience, but often concentrating laboratorial facilities, partner research institutes, and with good accessibility within the functional urban region.

The urban variant of science and technology parks, also for activities primarily relying on analytical and synthetic knowledge base are the *urban campuses & science quarters*. Such locations have similar characteristics, with the key difference of being well embedded in the urban fabric, often in (or in the proximity of) city centres. Frequently designed to cover up old industrial plots, they also thrive in activities related with science and engineering,

concentrating not only research units and labs, but also offices and incubation space for related activities.

For activities primarily relying on symbolic knowledge (e.g. fashion, design, audiovisual, multimedia), but also with relevant synthetic components (e.g. ICTs) the *creative district* is the most frequent manifestation. The urban atmosphere and associated amenities is in the "DNA" of the creative district. As analysed in chapter 2, creative districts focus on facilitating adequate working-living conditions for such types of industries (studios, shared workspaces) and often host educational organisations as well, but, contrarily to the typical science park model, they have an aesthetic and visual drive encompassing cultural facilities, architectural quality and heritage preservation.

However, knowledge locations with a strong focus on symbolic knowledge in greenfield locations are very rare types. To our knowledge, there is no evidence of such manifestation. In line with the theory underlying this typology, this has to do with the clear preferences of companies and residents/workers with regard to urban atmospheres and places with "identity" for their activities. This is not to say that activities and innovations primarily reliant on symbolic knowledge base cannot take place outside of the urban fabric. The cases of goods such as gourmet food, tourism products or luxury watches are some examples (Jeannerat and Crevoisier, 2011). However, the actors involved in such types of activities do not seem to show enough preference for a public policy *provision* such as a knowledge location (as we define it), which probably makes limited sense to their activities.

Naturally, in the same way that most activities innovate by using different types of knowledge, there are also many grey zones and hybrids between the suggested "pure" types. The empirical part of this thesis analyses knowledge locations that closely fit, but not completely, in each of these types.

3.5 Conclusion

This chapter started by framing the development of knowledge locations within a broader theory of urban and regional dynamics, in which the preferences of residents, firms and governments interact to shape urban development patterns (van den Berg, 1987). In line

with this approach, it is possible to understand knowledge locations as a government *provision* to accommodate the changing preferences of residents (who are also workers) and firms, looking for welfare potentials in space. Thus, knowledge locations result from government action, but also from the other actor's *self-organization* dynamics and preferences, which in turn respond to fundamental changes.

The initial broad interest in knowledge locations from the 1980s onwards (mainly science and technology parks) has been catalysed by fundamental societal changes such as the technology revolution, globalisation and the emergence of the informational economy. As such fundamental changes became consolidated realities and new trends emerged (e.g. permanent knowledge mobilization, talent mobility, user-involvement in innovation, work-life mixes, etc.), the visions and designs for knowledge locations evolved accordingly to cope with preference change, giving rise to new hybrid science hubs, creative factories, etc.

In the face of such challenges, the chapter recognised a general "urban turn" in the development of knowledge locations, and explored reasons behind the persistence of locational diversity within urban regions (city fabric vs. greenfield). Again, the reason can be found in the combinations of actor´s preferences. Government preferences may influence the choice (land and redevelopment objectives, influence from similar developments by their international peers), but other actors´ living and working (heterogeneous) spatial preferences play a role influencing the "location of the location".

Thus, this hints that the spatial integration of the location within functional urban regions might play a role in its capacity to attract activities. However, we still did not explore what is known about the success of knowledge locations, and how "success" is usually assessed. This is the focus of the next chapter.

4. WHAT DO WE KNOW ABOUT THE SUCCESS OF KNOWLEDGE LOCATIONS?

4.1 Introduction

What kind of effective benefits do knowledge locations provide for firms and urban regions?

Previous chapters explored the many objectives, as well as the increasing demands put on knowledge locations. But what do we know about their effective performance and benefits? Naturally, this appraisal depends on the objectives of the different involved stakeholders. Universities may be interested in knowledge diffusion and incubation, or to generate licence income through spin-out companies; investors and real estate developers want high occupancy rates and rising property values. City administrations are often interested in the number of jobs created at the site, in raising the city profile, attracting foreign investment, or in urban regeneration outcomes. Tenants may look for specific facilities, network opportunities and quality of the living and working environment.

In the face of such diversity of objectives – and potential contradictions! –, the benefits of knowledge locations are still far from consensual, and there is a way to go to define more encompassing success assessments (Monck and Peters, 2009; Van Geenhuizen and Soetanto, 2008). However, what by definition is transversal to the objectives of knowledge locations are the development of agglomeration and innovation-related outcomes (and, with them, jobs and economic prosperity) for cities and regions. This chapter focuses on such dimensions.

To do so, this chapter critically reviews and analyses the literatures on the development of knowledge locations such as science and technology parks and other hybrids types of knowledge locations. The aim is to better understand the nature of performance and the different types of agglomeration-related benefits (or drawbacks) associated with knowledge locations. The chapter also provides some initial hints on the *drivers* and *processes* underlying those benefits, which will be considered later on in the development of a theoretical framework.

The chapter proceeds along three sections. Section 4.2 analyses the relations between knowledge locations and performance of their tenant firms (*firm level*). Section 4.3 examines the benefits of knowledge locations for their host cities and regions, focusing on two dimensions: i) agglomeration of tenant companies and organizations and development of synergies among them (*location level*) and ii) change in the regional "systems" of actors, networks and institutions that support innovation, policy-making and planning (*urban-regional level*). Section 4.4 concludes and provides a bridge for the definition of the conceptual building blocks of a theoretical framework.

4.2 Knowledge locations and firm's development[16]

The majority of the literatures analysing the benefits of knowledge locations focuses on comparing tenant firm's behaviour and performance vis-à-vis other firms outside the location. It originates mainly from evaluation studies of science and technology parks, but there is already some emergent evidence on firm's development in creative districts. This section reviews the key findings of these literatures along three dimensions: employment and sales growth; resources sharing and networking and; new firm creation and research commercialization. It concludes with an overall assessment.

4.2.1 Do science parks favour employment or sales growth?

Monck et al. (1988) made one of the first comparisons between the performance of firms on science parks and a sample of firms located outside it. They found out that the firms located on science parks generated fewer jobs than comparable firms "off" science parks. Why? Are science parks actually hindering business development? Lindelof and Lofsten (2003) suggest an alternative explanation: a large proportion of the science park entrepreneurs are academics and ex-academics, and they are less inclined to be entrepreneurial and grow a large business; moreover, large businesses often have enough scale to develop their own premises. In a more recent study, Siegel et al. (2003) also compared the performance of firms "on" and "off" science parks. They found no

[16] This section is largely based on Van Winden, W., Carvalho, L., Van Tuijl, E., Van Haaren, J. and Van den Berg, L., *Creating Knowledge Locations in Cities*. Abingdon: Routledge, 2012.

significant difference between employment growth rates of firms located in science parks and those located off science parks.

A Swedish study had a different outcome. It compared the development and performance of young technology firms on parks and off parks (period 1994-1996). Firms on park performed better: they had higher sales growth, employment growth, and profitability (Lofsten and Lindelof, 2001). The authors suggest that the park's milieu might have a positive impact on firm performance and the development of links with universities, notwithstanding the fact that science parks seem to attract the already more "motivated" firms (Lofsten and Lindelof, 2002). However, they attribute an important role to the park's managers in these outcomes, yet not exploring its concrete dimensions and attributes. Firms on parks also proved to be more internationally oriented in this study.

From a different viewpoint, Westhead and Storey (1994) suggest that many firms locate in a science park for the image and prestige of the site, rather than to benefit from local facilities or network opportunities. Wright et al. (2008) on the contrary, note that for firms, locating on a science park has drawbacks in terms of image. It may reduce a firms' commercial credibility, signalling to the market that their activities are more focused on academics than on commercialization. Science parks are too much associated with universities, and therefore with bureaucracy and lack of practical and business commercialization experience. University science parks may also provide less access to commercially oriented expertise and contacts than a non university-affiliated park.

In an international study on the development of creative districts worldwide, Evans (2009a, b) also raised concerns about the development of creative companies in such planned spaces. With honourable exceptions, he observes that the creative activities and clustering processes in new (and not-so-new) planned locations are often in rather embryonic stages and frequently dependent on public subsidies to survive.

4.2.2 Do science parks promote resource sharing and local networking?

One believed advantaged of sitting in a knowledge location is the opportunity for facility sharing (i.e. the joint use of expensive facilities such as labs, workshops and advanced equipment). This helps to cut costs and allows for more investment, keeping facilities up to

the state-of-the-art. Moreover, sharing facilities may spark serendipitous encounters between tenants and result in knowledge exchange and other synergies. This latter claim is not verified in the literature, but the other benefits of facility sharing are generally confirmed. Garnsey and Hefferman (2005) find that firms on science parks are relatively heavy users of labs and similar facilities. Feldman (1994) identified that small firms specially benefit from shared use facilities. The sharing of workspaces is also often pointed as an important advantage for small firms in the creative industries (Evans, 2009b).

The impacts of knowledge locations on local network enhancement and synergies are more contested. Despite a few positive indications that firms within science parks have stronger relations with universities than other firms (e.g. Detwiller et al., 2006; Chan and Lau, 2005) there is no strong evidence that firms on science parks are more likely to collaborate or exchange information with local universities or neighbouring firms on-site. Bakouros et al. (2002) studied formal and informal linkages between firms and university on Greek science parks, and found very modest synergies. Similar results were found in an early study of university-industry linkages on science parks in the UK (Quintas et al., 1992). In Sweden, Lindelof and Lofsten (2003) found that on-site firms even collaborate less with local partners.

The spatial dimension of such networks is also questioned. Fukugawa (2006) found a relatively high propensity of firms on science parks to engage in joint research projects with knowledge institutes, but the linkages were not local. In the Cambridge Science Park, many actors claim that global links are more important than local ones (Garnsey and Hefferman, 2005). In most creative districts and hubs, the transactions and interactions between "creative" firms take place at much wider scales than the district itself (Evans, 2009b).

Firms in science parks are not better informed about research that is conducted in local universities. Among the most significant interactions with local universities are the searches for new graduates (e.g. Verdovello, 1997). Concerning inter-firms networks, Sternberg (1999) found that contact to other firms is especially important for young firms. The later in their lifetime, the more important become networks outside the park. There might also be sectoral nuances in such network building. For example, within the Sophia-

Antipolis science park, Ter Wal (2008) found that knowledge networks between firms were denser in ICT than in biotechnology fields; moreover, no evidence of pure knowledge spillovers was found: most of the (limited) knowledge circulation in the park seems to work through formalized processes of labour mobility and firm spin-offs.

4.2.3 Do science parks favour start-ups and research commercialization?

Business incubation – nurturing young firms – is a key objective of science parks and knowledge hubs[17]. How do they perform in this respect? Sternberg (1999) investigated the success of business incubation programmes in Germany. Success was defined as the degree to which the incubators reached their objectives, most commonly the number of supported of start-ups, the creation of high skilled jobs, and the increase of knowledge transfer. Their results play down the significance of incubators. The study found low levels of start-up activity and potential, and many of the start-ups were in low-level service activities rather than in knowledge intensive businesses. Almost 20% of the firms were not really start ups, but had existed for 2 years when they entered the incubator, and only 3% report that they would have not have started the firms without the existence of incubators.

A study on US incubators (Luger and Goldstein, 1991, in Tamasy, 2007) yields similar results. In addition, the study found that older incubators perform better than newer ones. Similarly, McAdam and McAdam (2008) show that older incubators are more successful at the stage of a firm's life cycle when it searches for independence and autonomy. Hansson et al. (2005) are not surprised about the poor record of science parks as engines for commercialization, arguing that science parks are often based on a rather narrow linear

[17] Independently of their effective benefits in this realm, it is important to stress that the levels of commercialization and licensing of academic research is structurally very low in Europe, and slightly higher in the US. The average US University earns a modest 2.8% of their total research budget while this value is only 1.1% in the UK. The number of spinout companies from universities is also low. Leading US universities annually spin out 2.8 new companies per institution. Only four US universities spin off more than 10 companies annually. In the UK, the average for all universities is a bleak 1.3 spin-out per institution per year (Huggins et al, 2008).

innovation model (see chapter 3). The road from basic science to marketable products is not a straight one; new academic knowledge may or may not end up in new products. Successful product innovation is a highly interactive process of mixing and recombining existing knowledge.

4.2.4 Overall assessment

The empirical evidence on the success of knowledge locations fostering different dimensions of firm's performance is rather bleak. Science parks and knowledge locations in general do not seem to provide a fast track for firm's development, innovation or market achievements. Despite heavy public and private investments, many of the objectives and ambitions are not met, at least in several cases. In many respects, the performance of firms located on science parks is not better than that of firms off parks and such investments seem to provide minor stimulus for creating businesses. Research is not consensual on the potential of knowledge locations steering new networks and cooperative dynamics within, nor the reasons why this is likely to happen (firm's own capacities? Or any specific attribute of the location?). With this in mind, Tamasy (2007) made a plea to stop pouring public money in incubators, science parks and other similar investments.

However, if we are to better understand the impacts of knowledge locations – namely for their host cities and regions – the previous literatures have important shortcomings. In the one hand, they tend to look at knowledge locations as a collection of tenants and "sum" their independent behaviours to judge on the performance of the location. As we will see, there are a number of benefits and "provisions" of knowledge locations that are better analysed at the level of the location itself but also in relation with its broader spatial-economic context. Moreover, most of the former literatures are rather static, analysing effects in a single moment in time. To better understand the benefits behind the development of knowledge locations, its underlying processes and causal chains, we need to consider a more dynamic perspective.

The next section provides some hints in this direction and explores the benefits of knowledge locations for their host cities and regions, beyond the sum of firm´s performance indicators at a certain point in time. When analysed through this lens, a number of other benefits can start to be identified, namely the ways through which such

developments contributed to support the emergence of new activities and productive combinations at the regional level, as well as through supporting experimentation that ultimately led to institutional change in cities and regions.

4.3 Knowledge locations and the host region

Many science parks, incubators and other types of knowledge locations do not survive – they turn into half-empty, ordinary business parks. Mortality rates are high, and many of the "survivors" fail to meet their targeted growth, job creation and innovation objectives (Huggins et al., 2008).

Yet, there are also cases of considerable success, at least assessed through their growth dynamics and concentration of new knowledge-intensive activities (e.g. Link and Scott, 2006). The growth and agglomeration of tenants in a new knowledge location (or their *revealed preference* to locate there), when controlled for price levels and economic-innovation potential of the region, suggests that the location provides benefits for their tenants, which make them willing to locate there. Such benefits may come e.g. in the form of sharing facilities, access to proactive management teams and entrepreneurs, external visibility and image, but also in the form of learning effects (e.g. access to networks, leaning-by-observation of similar activities) and other kinds of synergies.

From a regional perspective, it is not easy to rule out whether the growth of a location and its results in business development and innovation would have occurred anyway without the location ("deadweight" effects) or whether the knowledge location is simply shifting activities and jobs from different areas in an urban region ("displacement" effects). A study on Canadian science and technology parks (Shearmur and Doloreux, 2000) fear this happens more often than not. The authors found no link between the opening of a science park and regional employment growth in high-tech sectors, since the most dynamic science parks open in regions that are already strong in such sectors. The study suggests that the benefits of a science park are mainly relevant at the local (intra-metropolitan location of firms) and global level (a new identifiable innovation node in the global map, an "address" of international recognition), rather than at the regional level: "…the advantages which a park offers, although important for intraregional location decisions, may be insignificant at

a wider scale when set against the characteristics of a region's workforce, institutions, location, and economy" (p. 1080).

This is a sensible finding, yet risking treating all parks and knowledge locations as homogeneous entities[18]. A recent study of Albahari et al. (2012) assessed the impacts of different science and technology parks´ features on the innovative performance of firms located within. Among others, the study finds that a parks´ age, dimension, the region where it locates and management are associated with the innovative performance of their tenants. This hints towards significant park´s heterogeneity in the ways they affect a firm´s innovation output. The region-related finding is particularly interesting: firms in less technologically developed regions seem to benefit more from locating in the park, and the authors hint that this has to do with the fact that the park compensates for the lack of other assets in the region.

Other authors argue that knowledge locations can bring important innovation-related advantages for their host regions, contributing to justify their societal added value. First, Van Geenhuizen and Soetanto (2008) suggested that knowledge locations may play an important role in the formation and implementation of knowledge and innovation-based regional policies. More concretely, they can become "symbols" and "tangible proof" that unite regional policymakers and stakeholders. Since the results of such strategies are uncertain and manifest themselves in the medium and long-run, knowledge locations provide a bridge between a distant future and short-term results, essential to keep the policy going. Knowledge locations can thus become "anchor references" of a more fully-fledged economic development strategy.

Second, and related with the former, is the potential of knowledge locations in supporting the emergence of new activities in their host regions. For example, Monck and Peters (2009) report the relevance of the Tamar Research Park (Plymouth, UK) unleashing the development of new health-related and advanced engineering activities in a former shipbuilding region. The reported advantages had been related with the attraction of an

[18] Let alone overlooking other eventual effects besides high-tech employment growth.

important medical research institute to the region and the new leadership in the development of inter-firm networks and innovation platforms for health-related innovations. In this case, naturally the location´s buildings did not do the entire job: the region had already latent research skills in the field. A lot had to do with the leadership of the park´s managers and entrepreneurs, but the location helped to un-lock such forces in the region, empowering them.

The former literatures suggest that under some conditions (e.g. leadership, some specialization) knowledge locations may contribute to solve problems in place-based *innovation systems*, i.e. those "...parts of the economy´s structure and the institutional conditions that influence innovation" (Lundvall, 1992, p.12), more concretely the relations between firms, knowledge producers and supportive organizations (see next section for more detail). The development of knowledge locations may contribute to tackle *failures* in the fluid relation between those organizations at the regional level (e.g. Tödtling and Trippl, 2005; Boschma, 2009; Henning et al., 2010): *absence of key resources* (such has brokering organizations, venture capital); *fragmentation* (lack of shared visions, lack of inter-firm networks and information on regional capabilities) and negative-lock in (when parts of a regional economy get "blind" to external impulses by supporting declining yet influential industries when global markets change).

The conditions under which the former roles might be accomplished are less well known. In principle it requires the knowledge location to gain some critical mass and regional influence. But before that, the design of the location and the creation of environments for learning and experimentation are likely to play an important role. The case of the famous Hsinchu Technology Park provides some hints (e.g. Koh et al., 2005; Lee and Yang, 2000). It was designed by the Taiwanese Government to promote the return of high-qualified technicians and expatriates from Silicon Valley; to this effect, it offered many flexible arrangements such as one-stop facilities, reduced bureaucracy and local contact brokering, by the time unique in Taiwan. Out of the interactions between the park and the new entrepreneurs, new institutions were built (cooperation routines, regulations, business practices, policy strategies) that ended up forming the cornerstone of Taiwan's modern semiconductor industry.

Policy and planning routines

Finally, as knowledge locations require the involvement of multiple stakeholders signalling their preferences when designing the location´s profile, such developments become associated with organizational learning (e.g. in the public administration) and new cooperation routines in cities and regions for knowledge-based economic development policies. The development of a knowledge location is a complex project that requires a large number of resources, skills and organizing capacity (van den Berg and Braun, 1999). It involves many people within the public administration sphere, requiring new routines and organization models, eventually more flexible to cope with the project requirements.

These learning effects, by definition, are dynamic and may turn into new competences. Not only technical staff needs to cope with complex demands, but they also need to work in a flexible fashion with other departments within the (bureaucratic and rigid) administration. The acquired skills and competences (e.g. how to develop and integrated knowledge location) can be used for the development of similar or related projects. Learning can also take place in case of failure, if the reasons are evaluated and understood by the location's promoters. Moreover, new social capital (Putnam, 2000) is developed between the administration and other stakeholders involved, increasing mutual understanding.

4.4 Conclusion

Despite the promoted benefits of knowledge locations, the literature has been very sceptical on its benefits, at least when analysed through comparisons of companies inside and outside a location (notably science parks). Although insightful, such studies present significant shortcomings. First, there is a lack of consideration and understanding of the relation between the knowledge location and the spatial-economic context where it locates; second, by mainly considering "snapshots" of the location and its tenants, the underlying processes and causal chains leading to outcomes over time are disregarded. Moreover, parks and locations are often considered as homogeneous entities, whose designs and features are similar and have also similar (marginal) impacts in their tenants firms and host regional economies.

However, when analysed beyond the sum of firm´s performance at a certain point in time,

a number of other benefits can start to be identified, namely the emergence of new activities and productive combinations at the urban and regional level, as well as changes in the institutional setting that supports innovation and associated policies.

Such relevant outcomes for cities and regions naturally do not emerge simply because a new knowledge location is planned. A lot has to do with its capacity to become an urban/regional "actor" on its own right and, agglomerating entrepreneurs, firms and organizations, and supporting the development of synergies among them. However we still have not explored the drivers that may lead to such developments at the level of the location. When controlled for some factors such as prices and the dynamics of the host region, growth and agglomeration of a location tend to suggest that "something" relevant is happening there, potentially related with a set of external effects and benefits for tenants. Moreover, we still lack an integrated framework dynamically linking the emergence and development of knowledge locations with the specific contexts of its host cities and regions. We turn to this in the next chapter, unfolding the building blocks of the theoretical framework that will guide the empirical part of this thesis.

5. HOW DO KNOWLEDGE LOCATIONS EMERGE AND DEVELOP?

5.1 Introduction

Grounded on the previous insights, this section presents a theoretical framework that brings together a set of constructs and propositions, guiding the empirical part of this thesis. It provides an initial understanding of the drivers behind the emergence and development of knowledge locations, whose mechanisms and causal processes are to be further explored during the empirical chapters. The framework considers two main levels of analysis: *knowledge location* and *host region*, which interact with each other.

At the level of the *host region* we consider:

- Its ***spatial-economic context,*** formed by two related systems (*production-innovation system* and *policy-planning system*);
- The ***governance arena*** in which the visions and features of a knowledge location are negotiated.

At the level of the *knowledge location* we consider:

- Its ***key features***, namely its *specialization*, *urban-spatial integration* and *management*; and
- *Its* ***growth and agglomeration*** *outcomes*

By doing so, we provide first theoretical hints to answer the following research questions:

- *How does the emergence and development of a knowledge location relate to its spatial-economic context?* (Section 5.2; P1)
- *How does a knowledge location´s vision and features change over time?* (Section 5.3; P2)

- *Which factors contribute to growth and agglomeration in a knowledge location?* (Section 5.4; P3, P4;P5)

Section 5.5 synthesizes the propositions underlying the framework.

5.2 Spatial-Economic context

How does the emergence and development of a knowledge location relate to its spatial-economic context?

We expect that the way knowledge locations emerge and unfold – i.e. their profile, but also their development dynamics – to be highly related to their specific spatial-economic context. We conceptualise this context as composed by two related yet different systems, each of them encompassing a number of interacting actors/agents and structures/institutions: i) production and innovation system and ii) policy and local planning system.

The notion of "system" here refers to the presence in place of a number of actors (e.g. entrepreneurs, firms, knowledge institutes, supportive organizations, government units) *plus* the interactions established between them. Both the actors and their interactions are largely influenced by institutions. In line with North (1990) and Edquist (1997), institutions are here defined as the "rules of the game" (e.g. laws, norms, culture, routines) that influence actor´s behaviour, e.g. by reducing uncertainty. Actors, their interactions and institutions altogether form the "system". As we shall see, the referred systems are path-dependent, change slowly and tend to be highly localized in space (e.g. Cooke, 2001; Moulaert and Seskia, 2003); for the sake of simplification, we conceptualise and analyse them at the urban-regional level, relating them with the emergence and development of knowledge locations.

5.2.1 Production and innovation system

This system is composed by a set of actors, economic activities and competences developed overtime in a specific place, backed by an institutional environment. It shows path dependent features as human action (e.g. entrepreneurs, academic researchers), organized structures (e.g. firms and its routines, industries, universities and their curricula)

and surrounding environments (e.g. established social relations, industrial policies and supportive industrial organizations) interact and co-evolve with each other (Maskell and Malmberg, 2007). Van Winden et al. (2007) approximated this system as resulting from the interaction of a urban region's economic base and knowledge base: its characteristics are shown to set the degrees of freedom for the progress of different types of cities and regions in the knowledge economy, by continuously producing (positive or negative) external economies of scale and scope.

In evolutionary thinking to economic geography (Boschma, 2004: Boschma and Frenken, 2006), three combined sets of mechanisms underlie the place-based reproduction of this system: i) labour mobility, e.g. through the knowledge and skills embodied in employees that change jobs in the region in the within the same or related industries (Almeida and Kogut, 1999; Boschma et al., 2009); ii) knowledge spill-overs, e.g. through localized social networks (Breschi and Lissoni, 2001) and casual interaction and exchange between firms and other organizations just by "being there" (Gertler, 2003; Maskell and Malmberg, 1999) and iii) spin-offs (e.g. Wenting, 2008), e.g. when new firms inherited the competences, knowledge and routines of rooted "parent" organizations, like older established firms or research institutes. A consequence from the previous is that the system is not likely to change dramatically, at least in the short run, but to evolve towards related activities that make use of former regionally accumulated competences and institutional settings (Boschma, 2004; Boschma and van der Knaap, 1999)[19].

[19] The textbook example of the previous dynamics is the continuous reinvention of Silicon Valley since the 1950s from military industries to semiconductors, computers, peripherals, software and recently web 2.0 applications. These dynamics have been supported by sound entrenched competences and attraction of new talent, but also by the powerful institutions associated with venture capital industry and the Valley's entrepreneurial culture (Kenney and Patton, 2006). Other examples are the development of industrial design and high-tech machinery in former textile and steel regions (van Winden et al, 2010); the sustained evolution of audiovisual and film technologies in the proximity of Hollywood, as well as the related development of fashion design, furniture and jewellery activities in Los Angeles (Scott, 1996).

This system is thus *path dependent* in the sense that its current state at a moment in time, i.e. its composition of activities, industries and institutions, is explained by what it has been before (Dosi, 1997; Martin and Sunley, 2006). However, it is not deterministic – there is room for human and organizational agency to make new activities emerge, changing, redirecting or diversifying the course of events, eventually leading to new self-reinforcing paths (Martin, 2010).

On the one hand, change in the system can happen from within, e.g. when a firm or an industry responds to new market needs, through new entrepreneurial efforts or, e.g. when influential and motivated individuals (entrepreneurs, academics) mobilize other actors and shape the development of policy networks to tackle emergent opportunities (e.g. the development of a new knowledge location). On the other hand, change can also be set in motion by certain events, external to the system, or from the development of linkages with other systems, in other regions – in the evolutionist literature, the access to "variety" (Gertler, 2008).

We expect the structures and dynamics of this system to influence the emergence and development of new knowledge locations. The system's path dependencies *influences* and simultaneously *limits* the degrees of freedom for the emergence and development of new activities in a certain urban region, and thus the type of activities that may agglomerate and prosper in a certain knowledge location. But at the same time, organizations and individuals within the system may have a particular interest in new institutional arrangements (e.g. the emergence of new regional economic and innovation niche) and shape the direction of events by e.g. proposing, initiating or endorsing the creation of a new knowledge location.

These individuals and organizations may do so by leveraging resources and exercising different types of power (French and Raven, 1959). They can, e.g. mobilize new competences and privileged information about the type of location that should be developed to cope with emerging economic and innovation challenges, act as charismatic supporters and attract other parties to the project or, on the contrary, exert resistance to the project. For example, industrial lobbies and leader firms may exert power to defend their vested interests; or a specific research group within a university may steer the development

of a new location to commercialize an emergent set of new technologies. Some actors may even play dual roles in-and-out of the system's structures. For example, tenured professors may play within the University's rigid structures and simultaneously support the emergence of new commercialization platforms of academic results, e.g. through the development and take-off of science parks and knowledge locations.

5.2.2 Policy and planning system

Knowledge locations are not solely dependent on economic and innovation dynamics and their actors. Unlike regular firms and organizations, the emergence and development of knowledge locations are highly embedded in political competences, discourses, bargaining and influence (Clarysse et al., 2005; Wong and Bunnell, 2006). Despite some exceptions, and due to its perceived character of "public good" not efficiently supplied by the market (see chapter 2), the development of knowledge locations is usually under the responsibility of sub-national government tiers, namely local governments, articulated or not with regional or national authorities. Indeed, actors and organisations within the policy and local planning systems have significant resources for the development of knowledge locations: land, financial resources, as well as legitimacy and legal power to intervene.

Like in the former production and innovation system, also the policy and local planning system can be conceptualised as formed by a set of elements, structures and institutional environments, the latter being less prone to change in the short run. It encompasses i) policymakers and related agents (e.g. mayor, elected politicians, directors, advisors and consultants), as well as other players like real-estate developers and citizen groups ii) formal organizational and administration systems, or what Carlsson (2000) calls the "formal political and administrative skeleton" (e.g. local and regional parliaments, municipal departments, development agencies) and iii) specific formal and informal institutions. Examples of the latter are local administrative procedures and planning regulations; procurement methods; municipal laws, but also informal networks with other organizations within and outside the public administration system (e.g. other municipalities, regional and national governments, developers); routines of cooperation between different municipal departments; openness to ideas from outside the formal administrative system and capacity to plan and organize large development projects (van

den Berg et al., 1997)[20].

Likewise, this system is also path dependent to the extent that past structures and history determines its present features. Structural features change slowly overtime and influence actors' behaviour, yet co-evolving with it in the medium and long run. However, individual actors and organizations have some freedom to operate and creature institutional ruptures and change. Literature shows many examples of the typical "entrepreneurial mayor" or the "visionary planning director" who provoked tension in the system, established new networks, changed procedures and established new structures. But more agents in the system are in the position to act in-and-out simultaneously. For example, regional development officers are part of administrative systems but simultaneously mobilize networks and informal contacts, "seducing" policy makers towards certain policy decisions and new innovative projects (Sotarauta, 2009).

A new knowledge location may thus emerge from the action of agents and organizations within the policy and local planning system. It can happen in isolation, e.g. when municipalities independently develop land and infrastructure to be leased to new activities, contracting it out to other parties and managing it centrally. However, implicitly or explicitly, the resources for the planning and development are not solely confined to actors within the system, reason why other actors from other systems (e.g. production and

[20] Note that while some of the formal institutional features stem from national policy and administration systems (e.g. national land and planning regulations, public enforcement power), others are specific of local policy and local planning systems, and vary within a country. For example, in industrial-oriented cities such as Eindhoven or Goteborg, there are strong networks and policy discussion platforms established over time with the local industry, influencing policy and planning decisions and lobbying with national and supra-national governments (e.g. van Winden et al, 2010; Carvalho et al, 2012). In Spain, some autonomous regions and cities (e.g. Barcelona, Bilbao) developed rather distinctive strategic planning routines (van den Berg et al, 1997) over time, as a response to external threats and specific opportunities. In Brazil, where urban planning is known as reactive and left to the private initiative, over the last 40 years the city of Curitiba managed to develop a highly integrated and proactive urban planning system, with strong planning departments and inter-department cooperation routines (Mingardo et al, 2009).

innovation players) are involved in shared efforts to bring a new knowledge location into existence (Phan et al., 2005), nudging actors from different systems to entail in joint policy efforts, collective action and governance arenas.

Summing up:

Knowledge locations emerge and develop in concrete socio-economic landscapes, with history and texture. In the one hand, a region's production and innovation system (e.g. through the alignment of agents, institutions and their vested interests; through the action of "out-of-the system" agents or combinations of both) influence its emergence and profile. On the other hand, also the political and planning system has an influence, namely through the specific dynamics of the policy making processes, cooperation routines and planning traditions. There might be different gradients of influence of the systems (depending on the involved actor´s power and influence), but they implicitly or explicitly interact to make a knowledge location emerge, influencing its design, i.e. its vision and features. Formally:

P1: *The emergence of a knowledge location results from a governance process in which actors from two localized systems engage: production-innovation system and policy-planning system. The location´s design depends on the coupling between actor´s power and the region´s institutional setting.*

5.3 Governance arenas, dynamics and change

How does a knowledge location´s vision and features change over time?

In the previous section we suggested that new knowledge locations emerge and unfold under place-specific contexts, framed by the structures and dynamics of two systems. Those systems frame the actions of the actors and organizations responsible to envisage and develop a knowledge location, in isolation or through collective efforts. This section is about conceptualizing the governance dynamics established out of the interplay between those actors in the process of developing a knowledge location.

In a context of rising societal challenges, the policy and local planning system lacks the resources (information, skills, finance) to fully organize large development projects by

itself, a reason why "partnerships" and "governance" are now part of the lexicon in public administration spheres (e.g. van den Berg et al., 1997). The development of knowledge locations is a good example. There are often multifaceted power relations between various actors - like government authorities, universities, business associations, developers and local communities - giving rise to intricate and dynamic *governance arenas*, i.e. *networks of interdependent actors involved in a common venture*.

How do these governance arenas come to life? There are two broad sets of catalysts/"sparkles", which often happen in combination. First, there are *catalysts from within the system(s)*. Those refer to actions and responses motivated by specific internal dynamics of the two abovementioned systems (Martin, 2010). Examples are the perception of policymakers and other players of local and regional economic decline, or, alternatively, growth pressures and opportunities to lever the development of emerging sectors and new activities. Other examples include the pressure to regenerate old districts and develop empty spots left by de-industrialization, develop new growth areas, "green the city" or attract new activities and organizations.

Second, there are *catalysts from outside the system*. These refer to incentives or pressures from outside the localized systems (e.g. national government framework, law or funding incentives to develop a science park, creative factory or technology transfer centres, macro-economic developments or the announcement of the establishment of a large leading firm or international research institute, peer pressure), but also, more generally, to respond to global fundamental trends and developments in living lifestyles, working and innovating (see chapter 3).

Actors' interests and interaction modes

Since these catalysts are often diverse and manifest themselves in several different possible combinations, also the actors involved in the planning of the location are likely to be diverse, representing different interests and holding different knowledge and resources to bring to the process. Thus, partnerships and governance processes towards the planning and development of knowledge locations – the "focal problem" (Carlsson, 2000) – represent exemplary policy arenas for joint action, where actors struggle to align a set of interests, common or divergent, into a single compatible denominator, allowing for formal

and informal coordination.

The level of involvement and "object" of cooperation may however vary substantially, over time. On the two extremes, there might be situations of effective joint cooperation and resource sharing – e.g. in the case of having strongly committed partners from public administration, industry and university –, or, instead, simply one sided "self-referential organizational decisions" (Teisman and Klijn, 2002). Whether one or other side of the gradient prevails is likely to impact the physical and organizational *profile* of the new knowledge location (e.g. the location's specialization; the services rendered and management of the location; its spatial integration in the urban and regional fabric).

Some examples illustrate frequent tensions emerging in this type of governance arena. For example, while the central interest of private developers might be to maximize the rents from new tenant firms, municipal governments may be interested in assuring a certain functional mix and diversity in the area, at the expense of office space; while universities might prefer to establish technology transfer centres close to their campuses, city administrations might want to ensure some decentralizing of functions to the inner city; while some policy makers might want to develop a broad and more "open" entry criteria in the knowledge location, some industrialists and knowledge institutes might claim for a more specialized location to guarantee cognitive proximity between tenants and better possibilities of interaction; while mayors and cultural elites might prefer to embed the new location in trendy streetscapes and landscape architecture, the local community might be interested in avoiding gentrification, social polarization and find suitable jobs (e.g. Ponzini and Rossi, 2010). Even within the municipal administration tensions might arise, e.g. between the Economic and the Planning department, for alternative land uses and infrastructure development.

Therefore, the interests of the actors with the resources needed to effective plan and develop the knowledge location will hardly be really convergent, even if they may look like at the first glance. Different actors, namely public and private, have fundamental different interests, and nothing guarantee that an effective partnership will emerge, and that it will be established once-and-for-all. It is true that some different interests might become compatible and mutually adjustable after a number of negotiation rounds, but, in this case,

the evolution of these arenas should better be seen as a series of punctuated equilibriums where actors exert their power over distinct negotiation "rounds", rather than fixed and once-and-for-all governance schemes (Teisman and Klijn, 2008).

Changes in context might require new governance arrangements (e.g. the opportunity to access to a new subsidy, entrance or exit of an actor, changes in the political agenda). Moreover, the very own evolution of the location over time might require the change of involved players in its development, or the emergence of new decisions out of learning and trial-error processes (Schwerin and Werker, 2003), or the influence gained by the location and its managers in regulatory frameworks and the very own spatial-economic context (e.g. innovation policy; local planning decisions). Hence, for the purpose of analysing the governance arenas involved in the development of knowledge locations, one should account for the complexity and dynamics involved in the process, which are beyond a linear sequence of activities and decisions (Kelly and Palumbo, 1992), but likely to change over time. Thus, in line with Teisman and Klijn, (2008) we look at governance processes and their arenas as "timelines of interrelated actions developed by a variety of action systems (managers and organizations) leading to complex and dynamic changes in landscape, content and action" (p. 295).

Summing up

Out of a number of negotiation rounds an initial design for the location emerges. The interests, influence and exerted power of the involved actors determine the location's profile and features, such as specialization, management dimensions and the spatial integration in the urban and regional fabric (see next section). But this design is not static and once-and-for-all. New external developments and catalysts may imply further changes. Moreover, the vision and design may evolve as the location's dynamics unfold and as the location becomes part of the socio-economic landscape and thus influencing further governance and development rounds.

P2: *The location´s vision and profile evolves over time, in multiple rounds of decision making; that evolution results from the coupling of external-to-the-location changes with the progressive co-evolution between the location, its spatial-economic context and the governance arena.*

5.4 Growth and agglomeration outcomes and the location´s profile

Which factors contribute to growth and agglomeration in a knowledge location?

By definition, the development of knowledge locations primarily targets economic development and innovation objectives in their cities and regions, e.g. through the development of new supports, synergies among firms and organizations and progressive change in the institutional settings[21]. However, before the emergence of such outcomes, the location has in principle to grow and agglomerate a certain number of activities. Hence, studying the drivers and processes behind agglomeration in knowledge locations over time is an important step to shed light on other relevant outcomes.

What do we know about the drivers and growth and agglomeration of knowledge intensive activities in a knowledge location? Some authors suggest that it is associated with the size and economic performance of the host urban region (see, e.g. Tamasy, 2007). However, the literature presents cases of rather dynamic knowledge locations in regions with limited urban scale and/or declining industries, but with good universities and available skills. The famous Research Triangle Park in North Carolina was just like that in their early years (Link and Scott, 2003), but there are more examples (e.g. Hommen et al., 2006). This suggests that the development of knowledge locations overtime is not necessarily a question of urban scale, but perhaps of fit between the location's design and the its spatial-economic context.

Therefore, Stankiewicz (1998) suggests that science parks grow because they locate in technologically dynamic regions (not necessarily bigger), i.e. endowed with good R&D infrastructure, pools of skilled workers and associated industries. Universities do not inevitably need to be involved in the location's design or administration (though they often

[21] Naturally, as analysed above, the concrete set of objectives of a knowledge location will vary according with the stakeholders involved in the process. However, economic and innovation objectives are almost per definition at the core of the visions for such developments, even when in some cases other objectives may gain strong relevance, such as urban regeneration. This thesis concentrates the analysis of a range of objectives under the umbrella of economic and innovation-related outcomes.

are), but only to provide the skills that will feed the location with entrepreneurial and innovation dynamics. In a study on creative quarters in Sheffield, Brown et al. (2000) suggest that when "creative" dynamics are not in motion before, the outcomes of planned locations may be disappointing. In this (not rare!) case, the City invested heavily in infrastructure, facilities and marketing expecting companies to follow, but no significant new activities were developed and the few companies attracted remained heavily publicly subsidized.

The influence of the regional production and innovation context is likely to be even more relevant for locations that intend to specialize in specific knowledge domains. A city and region's antecedents and history ("what it is good – and frail – at") naturally influences and moderates the capacity of a location to attract and nurture such activities. For example, when a region is traditionally strong in industrial design, with an aligned system of firms, organizations and institutions, a new knowledge location in the region with the aim of steering design activities further is more likely to succeed (i.e. agglomerate design-related activities), re-enforcing the very own regional system of production-innovation, in a circular and cumulative fashion (e.g. Storper and Scott, 2009). On the contrary, if the region has no knowledge production or entrepreneurial tradition in the field, promoting a knowledge location can be like "throwing seeds in the desert". Hence, the productive and innovation history of the region, if not a blockage, seems to be a powerful moderator of the growth and agglomeration potential of knowledge locations (Stankiewicz, 1998).

However, beyond size and the regional dynamism, the reasons why some knowledge locations manage to grow more than others are still contested. A number of factors are pointed out, but the causal chains linking them with agglomeration are not always clear. The management features of the location and its specialization profile have been suggested in the literature as potential determinants, but also increasingly the urban-spatial integration of the location.

5.4.1 Specialization

A knowledge location's *specialization* refers to the degree to which it proposed and effectively maintained a thematic focus on related activities and services (e.g. biotech, digital media) instead of a broad entry criterion (e.g. "knowledge industries" or "high-

tech"). Comparing the development of a large number of science parks in the US, Link and Scott (2006) found out that parks specialized in a certain technology domain (e.g. ICT or biotechnology) grew more, but called for further research to identify the causes. This hints that knowledge locations may be able to attract more firms and create more value to their tenants if they can provide access to specific and unique resources to their activities (a certain type of lab, a "brand", expectation of contact with like-minded individuals in concrete fields), rather than general ones available elsewhere (e.g. office space or basic services).

Locations become specialized by controlling their tenant mix, which is related (yet not fully associated) with the clarity of the concept and the potential for synergies, and, hence, their growth and agglomeration potential. When a location hosts tenants with very different interests and knowledge competences, the clarity of the concept can be undermined and its attractiveness reduced (Stankiewicz, 1998). Moreover, as recent literatures on the geography of innovation suggest (Boschma, 2005; Boschma and Frenken, 2011), the best possibilities for synergies, learning and innovation may occur when co-located companies have *related* but not infinitesimal similar competences: it facilitates the emergence of knowledge exchange synergies and other complementarities, which attract more (related) tenants to the location. Hence:

P3: *The specialization of a knowledge location positively contributes to its growth and agglomeration potential*

5.4.2 Urban-spatial Integration

A knowledge location's *urban-spatial integration* refers to features such as its accessibility and the supply of adequate amenities for tenants at the level of the location and immediate surroundings[22]. Van Winden (2011) and Van den Klundert and Van Winden (2008) report

[22] Here we refer to the spatial integration of the knowledge location *within* the urban region, i.e. in its immediate surroundings (e.g. district level), naturally bearing in mind that a number of high-level amenities and other quality of life "assets" (let alone labour pools, etc) can and are generally accessed at the level of the functional urban region.

several cases where the spatial integration of the location, its accessibility and the quality of the working environment (e.g. available amenities) are declared as important in the preferences of workers (see also chapter 3), explaining not only the attractiveness for smaller firms, but also for larger firms.

Accessibility to the location is likely to be always an important feature in its agglomeration potential, but the role of amenities (apart from basic services such as e.g. catering and bars) and work environments might vary. Companies and workers in creative industries put a strong premium on diverse and lively locations, but for other types of industries, the access to clients and suppliers in a quiet sub-urban location can be highly valuable and the proper urban-spatial integration (Asheim and Hansen, 2009). Overall, the physical and environmental quality of the location and its integration with the surroundings (including e.g. safety) are a valuable asset that companies and workers tend to privilege (van Winden, 2011). Thus:

P4: *The perceived quality of the urban-spatial integration of a knowledge location varies by type of activity, and that perceived quality positively contributes to its growth and agglomeration potential.*

5.4.3 Management dimensions and "entrepreneurial leadership"

Link and Scott (2003) suggest that the growth of knowledge locations over time is associated with the management of the location, more concretely with what they call "entrepreneurial leadership", i.e. the action of the location's leaders and managers creating dynamic and innovative environments over time. They give the example of the constant concretization of visions and creation of unique physical and institutional settings in the Research Triangle Park, such has joint and interface research institutes that did not exist before. Companies would be eager to adopt the location's innovative environment and therefore the location would grow.

A recent study from Albahari et al. (2012) on Spanish technology parks found out that locations with larger, full-time management teams tend to host more innovative firms, also suggesting that the management team of the location has a role in providing unique resources for firms (see also Löfsten and Lindelöf, 2002). Other studies argue that the

development of such unique resources is often (at least initially) in the hands of individual agents, and not necessarily in formal organizations (e.g. Hommen et al., 2006). Evans (2009b) supports the view that the influence of key entrepreneurs is also essential for sustaining and attracting new companies and facilities to planned locations such as creative districts.

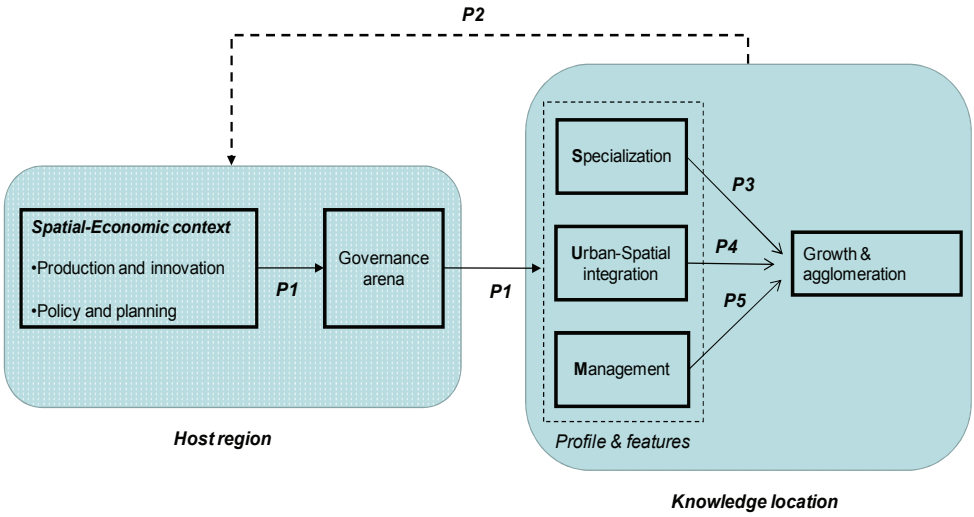
Thus, the "entrepreneurial leadership" management style reported by Link and Scott (2003) goes largely beyond day-to-day bureaucratic tasks, and may depend on key individuals. Entrepreneurial leadership of a location´s managers seem to require specific competences of those individuals, such as deep knowledge of the location´s fields of activity, peer recognition and connectedness – those are key characteristics that allow managers to connect tenants within locations and to the outside world, as well as providing innovative environments that facilitate synergies among tenants and joint learning. Formally:

P5: *Entrepreneurial leadership in the management of a knowledge location positively contributes to its growth and agglomeration potential*

5.5 Conclusion

This chapter presented the key constructs and propositions that will guide the next chapters of this thesis. The objective was to provide initial theoretical hints on the phenomena involved in the emergence and development of knowledge locations, to be further explored and consolidated during the empirical part of this thesis. To conclude, we bring together a visual representation of the research framework (Figure 5), as well as the compiled set of propositions that structure it.

Figure 5. *Research framework*



P1: *The emergence of a knowledge location results from a governance process in which actors from two localized systems engage: production-innovation system and policy-planning system. The location´s design depends on the coupling between actor´s power and the region´s institutional setting.*

P2: *The location´s vision and profile evolves over time, in multiple rounds of decision making; that evolution results from the coupling of external-to-the-location changes with the progressive co-evolution between the location, its spatial-economic context and the governance arena.*

P3: *The specialization of a knowledge location positively contributes to its growth and agglomeration potential*

P4: *The perceived quality of the urban-spatial integration of a knowledge location varies by type of activity, and that perceived quality positively contributes to its growth and agglomeration potential.*

P5: *Entrepreneurial leadership in the management of a knowledge location positively contributes to its growth and agglomeration potential*

6. METHODOLOGY AND RESEARCH DESIGN

6.1 Case study methodology

The key objective of this thesis is to better understand *how* do knowledge locations emerge and develop over time. As explained, it aims to confirm the applicability and explanatory ability of the previously developed theoretical framework, but also to "get closer" to the mechanisms and intermediate outcomes that underlie the proposed relations.

In order to do so, we followed a multiple case study research approach. A case study can be defined as rich, empirical description of a particular instance of a phenomenon (Yin, 1984). Hence, a case study approach relies on the "...detailed examination of an aspect on an historical episode to *develop* or *test* historical explanations that may be generalizable to other events" (George and Bennett, 2005, p.5; emphasis added). For this research we were particularly interested in both, i.e. *test* the applicability of a theory, but also to *develop* new insight on the functioning of the underlying relations, and case studies allow for a smoother connection between deductive and inductive research (Eisenhardt, 1989).

George and Bennett (2005) and Eisenhardt (1989) point at least three intrinsic advantages of case studies that fit well the purposes of this study:

- Case studies allow for testing (confirm, disconfirm) the applicability of a previously defined theoretical framework and their underlying causal mechanisms, while helping to extend and fine-tune those explanations with unexpected evidence from the cases (e.g. identifying conditions that activate a certain causal mechanism, or new mediating processes –"how"). Moreover, multiple case studies provide for more interactions between data and theory and thus more accuracy.

- Case studies are particularly well fit to study the phenomena of interest in relation with the context and setting in which it occurs (e.g. the history and spatial-economic dynamics of cities and regions). Likewise, case studies are also well suited to address and identify key events, decision-making processes or actions of individual actors, getting into the "texture" of the development processes of

knowledge locations and not only of their ultimate outcomes.

- Case studies cope well with the identification and formalization of complex relations, with multiple interactions and feedback loops. In this thesis, some of the proposed relations are of this kind, like the ones resulting from interactions between agency and structure (leading to structuration and *path dependencies*), or the presence of outcomes that can result from multiple different causes (*equifinality*). When a phenomenon can be explained by a plurality of causes, case studies can help to produce empirically-based theory to identify the associated causal patterns.

6.2 Research design and case selection

Thus, this thesis followed a multiple case study approach, focusing on four case studies – i.e. four *processes of emergence and development of knowledge locations in cities*. Each case study was dealt as a separated experiment, confirming or disconfirming inferences derived from the others. These case studies are:

- *Arabianranta* (Helsinki, Finland), focusing on "art & design" activities;
- *Biocant* (Coimbra-Cantanhede, Portugal), focusing on biotechnology activities;
- *Digital Hub* (Dublin, Ireland), focusing on digital media activities;
- *PIA* (San Sebastian, Basque Country/Spain), focusing on audiovisual activities.

Different as they are, they share three important features that make them suitable for the proposed research objectives.

First, they all belong to a "new generation" of knowledge locations that intend to specialize in a specific theme or activity sector. There is considerably less research on these types of locations. Simultaneously, they are representative of different types of locations (namely science and technology parks and creative districts), increasing the generalizability of the results within the category of "specialized" knowledge locations.

Second, they all grew substantially and managed to agglomerate a large number of tenants, in relation to their sizes, and already controlling for rental prices and the different dynamism of their host regions. Hence, the key tenet of the research design consisted on

theoretically choosing cases with similar results in the dependent variable (growth and agglomeration outcomes) and differentiated results in other dimensions of interest (such as the spatial-economic context, effective specialization of the location, urban-spatial integration and management features). This allowed identifying the presence of multiple paths leading similar outcomes and tracing back the mediating process involved; moreover, it allowed identifying 1) how and why did some variables mattered to this result and 2) the variables whose relevance to the outcomes seem more limited and why was that the case, at least in the absence of others.

Third, all the cases are cases of contemporary knowledge locations. All of them are currently operating and "opened doors" less than a decade ago (12 years in the case of Arabianranta), being now running for at least two years (in the case of PIA). Thus, this made it possible to 1) analyse their emergence and development over an already significant period of time (allowing to identify change in the location´s spatial-economic context), and, simultaneously, 2) reconstitute chains of decisions, events and actors associated with each location without significant recall bias.

In each of the case studies, we placed the knowledge location central and then 1) traced back their *antecedents* and 2) explored the *outcomes* resulting from their specific features, as defined in the framework. In this sense, we considered multiple units of analysis during the research. As it results clear from the framework, the host region and the knowledge location are the key units of analysis, but within those we still have actors and institutions (at the level of the host region) and other individuals such as tenants/firms and managers (at the level of the knowledge location).

6.3 Data collection and analysis strategies

The development of a theoretical framework largely helped to structure the data collection and analysis procedures, bringing all the case studies assessed from a similar lens, and with

a concrete theoretical focus. This allowed for systematic analysis and comparisons, while still leaving room for new relations and processes to emerge out of the data[23].

In practice, each case study started with a "soaking and poking" stage (George and Bennett, 2005), allowing for a deep dive in the story, rationales and general features of the knowledge location. In subsequent stages, more structured data was collected and each case was assessed through the lens of a number of features and relations established between them, following the structure and focus of the theoretical framework[24].

The evidence and data collected was mainly of a qualitative nature. We relied on the triangulation of vast arrays of primary and secondary data collected for each case study. As **secondary sources**, we analysed several reports and documents about the location´s vision, strategies and results, tenant´s lists and surveys, press releases, contextual reports on the location and the region, personal communications, other literatures, etc. As **primary data sources** we relied on in-depth, semi-structured and face-to-face interviews with many persons and representatives in each of the knowledge locations/cities, such as: firms and other organizations (e.g. R&D units, universities, incubators, venture capital companies) within and outside the location, directors and management staff of the location, government representatives, real estate developers, residents and members of the community association (when relevant), among other key informants.

---

[23] The evidence grounding this thesis was primarily collected under the setting of two international research projects in which the author was involved, namely "Developing Locations in the Knowledge Economy" (carried out by the Euricur – European Institute for Comparative Urban Research – and commissioned by the participating cities) and "EURODITE – Regional Trajectories to the Knowledge Economy" (FP6 project, EU consortium coordinated by the University of Birmingham). The basic theoretical framework and methods used to collect evidence under the case studies carried out under the two research projects was highly compatible.

[24] It is worth mentioning that the theoretical framework guiding this research was built out of the previously referred extant theory, but also inspired from the first analysis of the case Arabianranta (the first to be conducted, during 2008). Together with the extant theory, the insight emerging from this case helped to clarify constructs and variables of interest and potential relations between them, further analysed in subsequent cases and also when revisiting the evidence for Arabianranta.

Interview lengths varied between roughly 30 minutes and 3 hours; extensive interview reports were produced afterwards (Kincaid and Bright, 1957). Some interviews were rather ethnographic in nature (Spradley, 1979), in which we in-depth explored e.g. the nature of the daily routines of location managers. In each of the locations, some persons were interviewed more than once, and in different time periods – most of the interviews were conducted during 2009-2010, but an additional visit was paid to each of the locations during 2011-early 2012, in order to follow-up recent developments and the consolidation (or not) of previously identified phenomena and relations. Additional secondary data was also collected at this stage.

In total, we collected and analysed evidence on the basis of 86 interviews in the different knowledge locations-cities under study (Arabianranta – 26; Biocant – 20; the Digital Hub – 24; and PIA – 16; see annexed list). Triangulation of multiple interviewees (and between interviews and secondary data sources) was important in order to minimize a number of potentials biases. On the one hand, it allowed to make sense of different viewpoints and perspectives of the actors directly and indirectly involved in the location, as well as external observers. This helped to more consistently assess the constructs and relations proposed in the theoretical framework, without losing sight of potential controversies; moreover, it allowed moving way beyond the usual "stories in the brochures" and getting a much deeper understanding of the knowledge location´s emergence and development patterns. On the other hand, by interviewing multiple key stakeholders involved in different stages of the project (from the early beginning until the present times), we could significantly avoid recall bias and reconstitute chains of actors, events and processes involved in the location´s development; it also largely contributed to reduce a potential bias of overestimation of the relevance of political and institutional decisions (e.g. in official reports) vis-à-vis the multiplicity of actors and decisions effectively at play. Finally, a case-study report was sent to the interviewees in each location, in order to still prevent and correct potentially remaining interpretation bias.

We used different strategies to organize, analyse and make sense of the data. The whole research was based on a combination of theoretically-informed narratives supporting within-case analysis and cross-case analysis, combined with process-tracing methods.

However, other methods and strategies were used in combination, depending on the nature of the research questions and propositions being assessed.

- In order to understand the emergence and the evolution of the visions and features of a knowledge location over time (chapter 8), we used a temporal bracketing strategy (Langley, 1999), reconstructing a chain of events, decisions and co-evolving contexts for each case. As we were interested in governance changes and combinations of actors, we adapted a decision-making "rounds model" (Teisman, 2000) to the context of knowledge locations.

- In order to assess the drivers of growth and agglomeration, intermediate outcomes and mechanisms associated, we combined a within and cross-case analysis with process tracing-methods (George and Bennett, 2005). We operationalised each construct (specialization, urban-spatial integration, management/entrepreneurial leadership) through a number of variables, to which we attributed qualitative scores. Based on the collected evidence, those scores were given by the author and confirmed by other researchers involved and with deep knowledge of the case, assuring good levels of inter-coder reliability. Process tracing complemented the analysis by "fleshing-out" causal links between probable causes and outcomes.

Whenever relevant, more details on methodological procedures are provided in the beginning of each of the next empirical chapters.

7. FRAMING THE CASES: A SNAPSHOT

This chapter provides a first snapshot of the knowledge locations under study. Each knowledge location it is presented and contextualized through a narrative, where it is briefly sketched:

- The profile and past-present economic performance of the host city/region, as well as the character of its economic structure;
- The vision and concept of the knowledge location being studied;
- The locations´ profile (its specialization, spatial integration and management-services provided)[25];
- A first assessment of its proven capacity of agglomerating knowledge-intensive activity.

Table 3 below provides a synthetic overview of the case studies.

Table 3. *Synthesis: four knowledge locations*

Location	Urban Region	Inhabitants	Start-up year*	Tenants in early 2012**	% of the location´s capacity	Intended Concept
Arabianranta	Helsinki	1.4 M	1999	140+	Almost full	Art & Design
Biocant	Coimbra	284 m	2005	28	Almost full	Biotechnology
Digital Hub	Dublin	1.3 M	2003	97	Full	Digital media
PIA	San Sebastian	400 m	2009	35	50% capacity	Audiovisual

*Refers to the date when the first companies/tenants moved in.

**Tenants include firms, dedicated R&D units and other organizations related with the activities of the location but exclude basic services such as catering, leisure or eventual housing.

[25] The profile and features of each knowledge location will be explored in more detail in chapter 9.

7.1 Arabianranta (Helsinki)

Helsinki (1.4 million inhabitants in the metropolitan area) is the capital of Finland. During the last two decades, Helsinki has turned into one of the most prosperous European cities, with steady economic and population growth. It is considered a "knowledge star", well ranked by any type of knowledge and innovation indicator, with a highly educated workforce (e.g. van Winden et al., 2007).

In the past, the Finnish Economy was closely linked with that of the Soviet-Union, and primarily reliant on sectors like wood, pulp and mechanical engineering. After the fall of the Soviet regime and the economic recession of the early 1990s, Finland emerged as a well-known case of successful transition from a production-based economy towards a knowledge economy, namely through a diversification process led by ICTs and spearheaded by firms like Nokia (and many others, in associated fields). The key determinants of this successful transition are explored elsewhere (e.g. Sotarauta and Kautonen, 2007; van den Berg et al., 2005) and relate with the population´s high educational level, the proactive (and spatial sensitive) science and innovation policy, specific regulatory environments conducive to innovation (e.g. in telecommunications) and open attitudes of policy makers and industrialists towards innovation and cooperation. Beyond ICTs and engineering, Finland has a long and recognised tradition in furniture and related appliances, an art and design-intensive industry. Most of those company´s headquarters and design functions (the 'brains') locate in Helsinki, as well as the internationally renowned TaiK (Helsinki University of Art and Design).

The knowledge location under study here – *Arabianranta* – locates in the birthplace of the factory of Arabia, once one of the biggest porcelain companies in Europe, in the north-eastern end of Helsinki (one of its most polluted and deprived areas). After the plant was restructured in the 1980s, space and buildings became available for other functions, and this gave rise to one of the largest urban redevelopment projects in Helsinki. Arabianranta is nowadays a key reference for urban planners interested in "creative-led" urban regeneration. It is located in a former wasteland area and purposely combines different urban functions – such as living, working and studying – in a small-scale waterfront district (Ilmonen and Kunzmann, 2007). The redevelopment plan for Arabianranta was

drafted in the early 1990s and is now largely implemented. Arabianranta locates 5 km away from the city centre of Helsinki, well accessible by car and tram, combining an urban feeling with natural surroundings (lakes and forests).

Arabianranta was planned to host a diversified mix of functions around the broad topic of 'art and design', such as education, businesses and consumption. It was the first time that the City of Helsinki planned a fully integrated urban area development around a holistic theme. In 1995 a letter of intention was signed by the City of Helsinki and TaiK in order to create ADC – Art and Design City Helsinki, Ltd., a public-private company responsible for coordinating the developments in Arabianranta. ADC was (and still is) tasked with involving the relevant stakeholders (such as landowners, private parties, universities and the area´s inhabitants), in order to share and jointly develop innovative ideas for the area, conciliating the player's interests. The stated mission of ADC is bold: to 'make Arabianranta the leading centre of art and design in the Baltic Area' (City of Helsinki, 2007).

The broad "art and design" theme for Arabianranta has been kept until today. Since the late 1990s-early 2000s, various higher education institutions (HEIs) followed TaiK to Arabianranta, adding up to 12.000 students in 2011 (e.g. the Helsinki Pop & Jazz Conservatory, the Faculty of Culture and Services of the Helsinki Polytechnic Stadia, an audiovisual educational institution, the polytechnic school). Streetscapes are diversified and colourful: developers were required to invest 1-2% of total construction costs in public artwork, and this ranks among the most valued features of Arabianranta by its residents (Kangasoja and Schulman, 2007). Residents were more than 5.000 in 2011, from diverse nationalities, social and age groups. The area hosts Finnish and international design-related companies, as well as leisure and cultural facilities such as restaurants and museums. Owing to this diverse social and functional mix and to a number of pioneer ICT infrastructures (early broadband services; virtual platforms connecting buildings and households), Arabianranta pioneered the implementation of citizen-driven test-beds (dubbed as "Living Labs") for new products and services (e.g. Eriksson et al., 2005).

During the last decade, Arabianranta agglomerated a considerable number of knowledge-intensive activities. However, and despite the overall theme of the area (art and design), in

practice, there are no strict admission criteria: firms locating in the area´s premises should only fit the broad category of 'creative business' or 'knowledge economy'. Hence, the area is populated by firms with different sizes and sector profiles, broadly related to, among others, design, media, ICT, digital content and architecture, both Finnish and international. In early 2012, excluding catering facilities, restaurants and other supportive services, an approximate number of 140-150 "knowledge-intensive"/"creative" companies located in Arabianranta´s business premises[26], namely within:

- The Arabia building, which hosts showrooms and offices of some of the larger and most important furniture and interior design firms in the area (e.g. EFC, PENTIK). It also hosts the Arabia museum, expositions, shops and TaiK's premises;
- The office buildings of Portaali Business Park, which concentrate many firms in their premises. Besides general consultancy services, the space is dominated by firms in media and technology, ICT, and design. There are firms who relocated or opened new offices (e.g. selling and research/design antennas of larger corporate networks). The large majority are mature and well-implemented companies. Other buildings in the area tend to host smaller firms, but the overall prices are considered expensive for start-ups and smaller firms. As a result, sub-renting models emerged, e.g. many micro firms sharing one large privately-owned open space.

Until 2011, there was a "creative business" incubator in the area called Arabus, run by

[26] There is no official registry of the total number of "knowledge-intensive" firms in Arabianranta. Firms are spread across different office and business premises (which have different ownership schemes), and therefore there is no official registry of its concrete number. We calculated the number of 140-150 firms based on summing the firms registered in Arabianranta´s official business premises. This method provides an approximated overview, although it is likely to slightly under-represent the number of micro-businesses in the area, for example, single person companies.

TaiK. It hosted many start-ups (e.g. media, design, art craft, ICT), providing joint meeting rooms and other services like accountancy, legal support and mentoring. As TaiK merged in 2009 with the Helsinki Schools of Business and Technology to form the new Aalto University, so did Arabus (which became part of Aalto start-up centre). Thus, Arabus relocated operations to the city centre of Helsinki. In the coming years, TaiK (the first "anchor tenant" of the area) will also leave Arabianranta area for brand-new facilities in the campus of the School of Technology, to a totally distinct city area.

Despite this announced move and the global economic downturn of 2009, the district keeps buoyant as a distinctive "premium" location: the prices have been stable or even slightly on the rise, namely for the privately-owned real estate and business premises. New constructions and developments are taking place to fill in the last land plots; recently, a Finnish multinational working with industrial design-related activities expressed interest to invest in the area.

7.2 Biocant (Coimbra)

Mostly known by its University, Coimbra is a Portuguese medium-sized city with 140.000 inhabitants. Coimbra has a larger hinterland of mostly rural-industrial municipalities (adding up to 284.000 inhabitants), whose population has only slightly grown over the decade. Coimbra is nowadays a service-based economy (retail, horeca, education, public administration) and its manufacturing activity dramatically declined during the last decades (e.g. ceramics, food and textiles). Within the European context, Coimbra locates in a so-called *convergence* region, reflecting a structural economic underperformance vis-à-vis the European average, but also compared with the Portuguese metropolises of Porto and Lisbon (Vale and Carvalho, 2009).

Overall, the economic base of Coimbra is thus relatively fragile and has been on the decline. It was only during the last decade that the University of Coimbra started to visibly commercialize some applied research, namely in the fields of ICTs, giving rise to a number of indigenous, highly advanced "niche" IT companies, working e.g. with aerospace industry, as well as other providers of specialized software pieces. A similar start-up and spin-offing trend started to happen in the field of life-sciences. As a number of life-science start-ups emerged and grew in the region, there is currently a considerable "hype" around

such activities in Coimbra´s policy agenda and discourse, with investments in cluster policies and related city-marketing initiatives (Teotónio and Albergaria, 2011).

Yet, the first Municipality to support (and benefit from) the commercialization of Coimbra´s life-science research was Cantanhede. In the early-mid 2000s, the Mayor of Cantanhede proactively supported the development of a specialized biotechnology park called Biocant. Developed in a greenfield location (roughly 25 Km away from Coimbra´s city centre), Biocant was created through a partnership between the Municipality of Cantanhede and the Centre of Neurosciences and Cell Biology (CNC, a large national research centre linked with the University of Coimbra), with the mission of "leading the development of life science investments and economic activities in the region" (Biocant, 2012). Biocant is nowadays considered a successful example of a bottom-up initiative to foster knowledge and economic diversification at the local level (Faro, 2008).

The first building of Biocant opened in 2005, with 6 applied bio-research labs aimed at supporting technology transfer to biotechnology companies and other organizations. Biocant represents an atypical process of science park development, where the launch of R&D and technology centres preceded the firms and real estate pressure, targeting the development of research critical mass from the beginning[27]. Beyond office and state-of-the-art laboratorial space, Biocant provides distinctive services for its tenants, such as early-stage validation of biotechnology projects, informal brokerage and mentoring. Moreover, Biocant´s managers provide opportunities and actively support the relocation (and new firm creation) of international talented PhDs and star scientists, namely through the manager´s own personal and professional networks.

Contrarily to well-known cases of "high tech fantasies" that turned into generalist business parks (namely in regions with an unfavourable economic structure), Biocant has been capable of strictly maintaining its biotechnology focus over the last years, agglomerating a

[27] Coimbra´s agglomeration has other business and technology parks, but none is specialized in a specific technological field, following a more conventional generalist and top-down "condominium" model.

considerable number of related activities and resources for applied research. It presently hosts 8 specialized technology transfer centres, with around 50 full time researchers, ii) 20 dedicated biotechnology firms in start-up and early growth stages; iii) a dedicated biotechnology venture capital firm – Biocant ventures, and iv) a junior centre for life science learning.

During its first year, Biocant created immediately 60 direct high qualified jobs and a total turnover of 5 Million euro (Faro, 2008). Some entrepreneurs and lab directors are graduates from Harvard University and the MIT. Other indigenous firms were recently taken over by large North American multinationals; entrepreneurs from Porto and Lisbon are relocating to Biocant. The same did the National Association for Bio-industries. Biocant is currently developing two new buildings to cope with the demand and also to relocate the headquarters of CNC, moving out from the city centre of Coimbra. During 2011 Biocant labs reported a 30% increase in the volume of contract research (Biocant, 2012).

7.3 The Digital Hub (Dublin)

With roughly 1.3 million inhabitants in the metropolitan area, Dublin is Ireland´s largest urban agglomeration and national capital. It represents 40% of the Irish economy. Since the early 1990s and until recently, Dublin´s demographics went hand-in-hand with the well-known *Celtic Tiger* phenomenon, during which the Irish Economy grew at 6-8% rates. Benefiting from the strong momentum of the world economy, the foundations of the Celtic Tiger are well documented – presence of a highly educated population, favourable business climate leading to the attraction of (knowledge-intensive) investments, labour and social reforms, public finance stability and access to the EU single market (e.g. Cudden, 2011).

Despite the recent economic downturn (ignited by the US subprime crisis and the explosion of the Irish financial and real estate "bubble"), the export-oriented economy of Dublin has been doing well, supporting the recovery. The economic structure of Dublin is traditionally diversified (increasingly knowledge intensive, with advanced manufacturing and high-end industrial activities) and with a significant concentration of IT-related activities. Since the early 1990s, many IT North-American multinationals invested in the

Dublin region, not only for manufacturing but in knowledge intensive activities such as internet, new media and software development (IDA, 2012). On the face of a largely FDI-driven economy, a concern of the Irish government has been to support also indigenous IT activities (such as digital businesses) and their connections with local transnational subsidiaries and universities. Nurturing these links and supporting the development of a world-level digital media industry underlined the development of a new knowledge location in Dublin, called "The Digital Hub".

The Digital Hub started to be built in 2001, in Dublin´s Liberties area, more concretely on lands and buildings formerly owned by the Guinness breweries, in the west-end of Dublin´s city centre. The Liberties is one of the less well-off parts of Dublin, yet close to the many amenities of the city centre and lively districts such as Temple Bar. The development of the Digital Hub involved the revamping of former brewery premises (e.g. former depots and hop stores) to fit the needs of modern digital media companies, yet keeping its century-old, bricked-wall identity.

The Digital Hub envisages becoming the hotspot for digital media development in Ireland and beyond, agglomerating and linking the competences of Irish and international companies in the field. More than a centre of excellence for knowledge and innovation, The Digital Hub aimed at mixing enterprise with residential, retail, learning and civic spaces (Bayliss, 2007; The Digital Hub, 2009), in the middle of Dublin´s urban fabric. At the time of this writing (and largely due to the real estate and financial contraction), only 2 out of 9 acres have been redeveloped, more concretely for company premises and incubation facilities (e.g. the "Digital Depot").

Since its inception, the development and management of the Digital Hub has been in the hands of the Digital Hub Development Agency (DHDA), a special purpose vehicle initiated by the National Government in partnership with the Irish FDI agency, Enterprise Ireland, the District's Manager and a community representative. Beyond the improvement of infrastructure and services to the surrounding community, the DHDA and the Digital Hub has a central innovation-related aim: agglomerating digital media companies and fostering collaboration between digital media research and enterprise, exposing concepts and product innovations to other firms and consumers.

To ensure that the location´s profile is kept and its tenants have good chances of developing synergies and innovation-conducive interaction, the DHDA actively manages the mix of activities in the Hub – to locate there, more than the ability to pay (higher than average prices), companies and organizations have to show that their activities clearly fit in the hub´s intended profile. The DHDA does not provide formal meetings or directly manages networking among its tenants, although the Hub provides informal opportunities and ample room to do so. Among the provided infrastructures and services are e.g. flexible offices, workshop and studio spaces, formal and informal meeting rooms and dedicated space for product launches, receptions and exhibitions, as well as joint catering facilities. DHDA also offers opportunities for researchers to present their work to companies and consumers and provides a framework for social and educational developments and interaction with the surrounding community (e.g. a schools´ programme involving the Hub companies, aiming to equip local children with the skills needed to work in the digital media industry).

Up to date, the Digital Hub has already hosted a considerable number of companies (over 160 companies since 2003), both Irish and international such as Amazon or France Telecom. It is currently running at practically full capacity with 97 companies from related domains such as IT, gaming, animation, web-design and mobile applications. Moreover, among its tenants are the Irish Internet Association and the National Digital Research Centre, a collaborative institute of Irish Universities to translate research into commercial solutions.

Despite the economic downturn in Dublin, the demand to locate in the Digital Hub has kept strong. However, due to the sever contraction in real estate and finance markets, the DHDA and real estate developers have been unable to keep the redevelopment of offices and new premises apace. During the last years, large international new media firms such as Google or Facebook (among others) settled their European headquarters in Dublin, but not in the Digital Hub – they settled in the Docklands area, with brand-new, vacant and (post-crisis) cheaper office space, also in close proximity to the city centre.

7.4 PIA - Audiovisual Innovation Pole (San Sebastian)

San Sebastian is a distinctive seaside location in the North of Spain, more concretely in the

Basque Country, one of the autonomous regions of Spain. It is well-known for its international film festival. Together with Bilbao and Vitoria, San Sebastian is one of the most important cities of the Basque Country, with roughly 180.000 inhabitants (400.000 including neighbourhood agglomerations). San Sebastian is 30 km away from the French border and population in the city has been growing (Fomento San Sebastian, 2011).

The economic base of the city is structurally dominated by tourism and service industries. However, the region has other relevant activities: the Basque country is one of the most industrialized Spanish regions, with strongholds in engineering and electrical machinery, among others. During the last decades, , the Basque economy and San Sebastian saw the development of a number of smaller productive systems, e.g. related with TV production, film and audiovisual, closely linked with the opening of the public Basque TV in the early 1980´s. As the audiovisual industry in San Sebastian matured, the Economic Development Unit of the City – called *Fomento* – formalized a number of policies to support audiovisual companies, promote new entrepreneurship and linkages between traditional audiovisual firms and other new media activities. Among those supports is the development of a new knowledge location called PIA – Audiovisual Innovation Pole.

PIA was launched in the late 2000s and is presently composed by three physically connected buildings, designed to become the "face" for audiovisual-digital knowledge creation and innovation in the region. It offers flexible office space and many shared facilities, with an eye to fostering collaboration between agglomerated firms and organizations. Moreover, it envisages linking local technological institutes and companies. To "make sure" that there are good possibilities for this to happen, PIA controls the tenant mix, only allowing in audiovisual and media-related activities.

PIA is located in the Zuatzu Industrial State, a well-known business park just outside, but with good accessibility to the city centre. It is developed on land owned by the Municipality, and the buildings´ development benefited from a National Government´s loan. PIA has room for roughly 70 companies. Beyond office space, the PIA building offers a number of advanced facilities such as state-of-the-art audiovisual equipments, control and dressing rooms; real and virtual sets, a pitch room to screen film projects as in a small cinema theatre and a 3D stereoscopic auditorium.

PIA is entirely owned and run and managed by Fomento (i.e. City of San Sebastian). However, for some service provisions, it cooperates with Tecnalia, a Basque R&D unit specialized in Media and TV, as well as with the San Sebastian Film Commission (for liaisons with associations, external producers, etc.). Examples of services provided to firms are:

- Organisation of joint meetings and activities (e.g. PIA meetings);
- Establishment of a PIA dedicated research unit (run by Tecnalia), to strengthen the connection between market and science;
- Incentives to networking and internationalisation (through institutional contacts with other organisations, cooperation agreements, and promotional activities);
- Establishment of an "audiovisual observatory" (indicators on the industry´s evolution);
- Provision of specialist advice to companies, e.g. business management, finance, training, marketing, legal issues, etc.

Despite its early implementation stage (the location formally opened up in 2010), it is already working at half capacity, with roughly 35 companies and organizations, as well as a research unit of Tecnalia. PIA has been already visited by many international delegations; it managed to attract tenants from outside San Sebastian, e.g. from Madrid. Demand keeps strong, and new firms have filled in new applications to settle operations there.

8. KNOWLEDGE LOCATIONS IN CONTEXT: EMERGENCE AND CHANGE

How does the emergence and development of a knowledge location relate to its spatial-economic context?

How does a knowledge location´s vision and features change over time?

The previous chapter introduced and sketched the profile and main features of the studied knowledge locations. However, it did so with a prime focus on the knowledge location in itself, and in a relatively static way. In order to empirically ground the first two propositions put forward in chapter 5 (***P1*** and ***P2***), a more contextualized and dynamic approach is needed.

Hence, this chapter takes one step further, exploring the empirical groundings of propositions ***P1*** and ***P2***, related with the emergence and change in the design/profile of knowledge locations. By doing so, it highlights a number of micro processes that show up when we more closely analyse the development and change of knowledge locations over time. Those are related with mutations in governance arenas, trial and error and learning phenomena, actor´s power and the co-evolution between the location, its governance arena and the spatial-economic context.

Following this introduction, Section 8.1 places the emergence of a knowledge location in context and explores the processes leading to its design, namely the coupling between actor´s exerted power and the region´s institutional setting. Section 8.2 analyses how the design of a location changes over multiple rounds of decision making, as a result from external-to-the-location changes coupled the co-evolution between the location´s development, its spatial-economic context and the governance arena.

8.1 Emergence of knowledge locations in context

How does the emergence and development of a knowledge location relate to its spatial-economic context?

Literature hints that knowledge locations do not emerge and develop in vacuum, but in rather concrete urban and regional economic contexts, with history and texture. The

production-innovation and policy-planning context (their actors, but also their rooted practices and institutions) determine the emergence and design of a knowledge location. There might be different gradients of influence of the systems (depending on the involved actor´s power and influence), but they implicitly or explicitly interact to make a knowledge location emerge, influencing its design, i.e. its vision and features. Hence we put forward that:

P1: *The emergence of a knowledge location results from a governance process in which actors from two localized systems engage: production and innovation system and policy and planning system. The location´s design depends on the coupling between actor´s power and the region´s institutional setting.*

To analyse the empirical grounding of this proposition we traced back the history of the location, triangulating multiple data sources (see chapter 6). We developed a theoretically-informed narrative for each location, with a prime focus on contextualizing the actions and rationales of their proponents, the networks mobilized for the development and the underlying institutional setting. This methodology allowed demonstrating the mutual influences of elements from the two systems in the emergence of the knowledge location, even when it was not evident at the first glance.

Arabianranta in Helsinki clearly illustrates the logic behind the argument. Helsinki has a long tradition in art and design. It host a dynamic labour pool of design-related jobs, and 'produces' a large number of elite designers and craftsmen. The city hosts indigenous design-driven multinational companies (in industries such as furniture, pottery, ceramics, decoration, fashion) as well as many small-scale design offices and free-lancers. Moreover, other industries use design as a key component of their branding and differentiation strategies[28]. Long before the first plans to develop Arabianranta, Helsinki became an international reference in design and applied art, as Finnish brands such as Arabia (founded 1873), Artek (1935), Iittala (1881) or Marimekko (1951) played a major role in

[28] For example Nokia has 300 in-house designers, and sources design from specialised companies (interview source; 2009).

the country's exports (e.g. Design Forum, 2004). Internationally known designers such as Alvar Aalto or Kaj Franck inspired and directly trained many other Finnish designers, giving rise to a genealogy of design talent throughout the century. Over time, the educational infrastructure in Helsinki closely co-evolved with the needs of the industry – TaiK became a highly renowned design school in Helsinki and internationally, in domains such as applied art and design in ceramic and glass; spatial and furniture; fashion and clothing; textile art and design.

With no surprise, the vision for Arabianranta as an "art and design city" was directly influenced by actors from within this system, with strong interest in art and design. First, land plots and former building premises in the area were still owned by industrialists in the art and design field, with interest in developing a new "showroom" for their products while leveraging society´s interest for art and design. Second, related with the former was the role and influence of TaiK, who moved to the former premises of Arabia early in 1986, and was willing to strengthen their anchorage in the district, improving their surrounding physical and social environment while creating new markets for their students and promoting design in society. The role of TaiK in the area (thousands of design students) and the vision of the charismatic Dean Yrjö Sotamaa convinced the City of Helsinki and its policy makers of the potential of an "art and design" concept for the area.

However, the policy and planning system of Helsinki (actors and institutions) was also pivotal in the emergence and feasibility of the whole concept. The idea for the functional and social mix of the area was largely put forward by a proactive yet controversial planning director, who nudged his more conservative peers and the Mayor to adopt the concept in the early 1990s. However, the concept could only emerge (and be sustained) under a very concrete institutional framework of Helsinki´s planning system. First, Helsinki´s planning tradition of land ownership was largely in the hands of the City, hence allowing to better control for the mix of functions and overall concept. Second, the tradition of cooperation for large development projects: real estate developers were closely involved since the beginning in master planning for the area, avoiding redundancies, improving the quality of the concept and the implementation speed. Third, the specific local regulations for subsidized and price controlled housing (so-called HITAS regime),

avoiding market selection towards exclusively high-end real estate, and facilitating the social and functional mix in the area.

In the case of **Biocant**, the associated productive system in the region was practically inexistent at the time of the concept´s emergence: the region had no firms or relevant tradition in commercial exploitation of biotechnologies or life sciences. However, the University´s R&D centres and hospitals had international research skills and a stock of accumulated knowledge in the field. The vision and idea for Biocant directly owes to Prof. Carlos Faro, Vice-Director of CNC (Centre of Neurosciences and Cell Biology, University of Coimbra), whom in 2004 was in search of a "proper place" (read: outside the University´s "ivory tower" and bureaucracy) to commercialize research and support new ventures. In 2004, Prof. Faro convinced the Mayor of Cantanhede of the economic potential to develop a biotechnology park instead of a more conventional business location (as he was planning before). Having a scientific partner such as CNC was decisive to for the Municipality in successfully tendering for external European funding for the park´s development.

Prof. Faro was backed by the board of CNC but assumed a position "in-and-out" of the system, since, by the time, the University´s Dean was uninterested in the project. However, previous University experience in technology transfer (e.g. in ICT and engineering fields) indirectly influenced Biocant´s design. The management of Biocant´s applied research labs was inspired by other applied IT labs implemented by the University´s incubator (namely managed by an executive full time director plus scientific director associated with the University). This model assured the quality and visibility of the centres and helped to give the park an initial boost.

From the side of the policy and planning system, the Municipality of Cantanhede had been developing for some years an "experimentation" drive, largely due to an entrepreneurial, recognizably risk-taking Mayor. Moreover, the Municipality´s smaller size and availability of city-owned greenfield land speeded up the development. Despite being under the very same formal National planning regulations, developing "Biocant" in the Municipality of Coimbra would be blocked and slowed down by the rigid and bureaucratic functioning of a larger city administration, with limited experience in economic development initiatives and

too close bonds with the University of Coimbra; at best, the development would take much more time to emerge and ignite. However, despite this strong municipal support, the technical design and vision for the location was very much in the hands of the technical directors from CNC´s.

The case of the **Digital Hub** also illustrates the coupling of the two systems for the design of the location. Since the early 1990s, Dublin hosts a remarkably high number of European headquarters of North American IT multinationals and large FDI inflows. Leading Irish state agencies such as IDA (Industrial Development Ireland) and Enterprise Ireland have had a determinant role in providing an attractive business environment during the last decades, but have also shown increasing concern fostering linkages between such FDI subsidiaries, indigenous companies and universities. Under this setting, the idea to develop a leading hub for digital media companies was prompted by the National Government, on the face of the announcement that the MIT would create a European Digital Media Lab in Ireland/Dublin. The idea from national agencies and associated industrialists was to link the competences of the new R&D centre with new and old indigenous digital media companies.

Yet, and beyond the economic and innovation objectives of National Governmental Agencies, also actors from the policy and planning system influenced the location´s vision. The City of Dublin provided the urban planning framework, stressing that the Digital Hub should become a functionally mixed area, well integrated in the city fabric. This vision was inspired by the previous successful urban regeneration projects in Dublin (such as the one of Temple Bar, a former run-down area in the city centre now converted into a lively, functionally mixed district). Moreover, the involvement of the district's community representatives influenced the Digital Hub´s vision towards promoting educational initiatives to the benefit of the surrounding community.

Out of the four analysed cases, **PIA** is the one in which the influence of actors from the policy and planning system looks more evident at the first glance. However, it is also the one in which the City had stronger tradition supporting local companies, hence making the two systems more entangled than in the previous cases. The development of PIA has been lead from the onset (and financially supported) by the City of San Sebastian, but with

strong intermediation of its Economic Development Unit (Fomento). Among others, this development was led by an influential city official (Fomento's director), by the time championing the implementation of cluster policies in the city.

The idea for PIA did not emerge from scratch. It was not the first time the city took the initiative of developing buildings to support local economic activity. Fomento had already a long tradition of owning, managing and participating in a number of specific buildings and premises for different types of activities. Examples are the Miramon technology park (a business park for high-tech firms) or the ZENTEK building (for ICT firms). Moreover, Fomento had been active before supporting local companies and new entrepreneurs through several types of incentives, services and subsidies. The emergence of PIA originates from this umbrella of local economic development supports, now adding to it an "audiovisual face".

The talks behind the idea for PIA started through the involvement of the City´s Film Commission (a unit within the local administration structure), and their frequent contacts with the local audiovisual industry (local companies and associations). Out of a number of meetings and surveys, the industry "representatives" and the City converged on the relevance of developing a number of specific supports for the industry, namely the PIA building and associated services. The City had the land and capacity to gather financial resources (e.g. through the National Government), but limited expertise on the sector. Hence, the design and features for the location (e.g. audiovisual facilities, shared equipments and labs) was supported by a local R&D unit – Tecnalia – specialized and with interest in the TV and audiovisual field.

Summing up

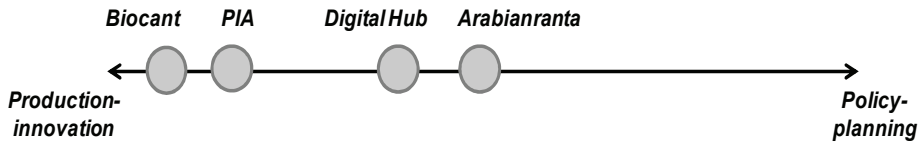
What can we conclude from the analysed cases? The four analysed cases provide empirical support for ***P1****: the emergence of a knowledge location results from a governance process in which actors from two localized systems strategically engage: production and innovation system and policy and planning system. The location´s design depends on the coupling between actor´s power and influence and the institutional setting of the region.*

Why is that the case? What other insights can be derived?

- First, the four cases illustrate that even when not evident at the first glance (i.e. when one or other system seemed dominant), actors from both systems influenced the emergence and negotiated the design of the knowledge location. In the four cases, the leading actor interested in the development of the location needed multiple resources (knowledge, funding, social legitimation) "owned" by others. Arabianranta illustrates the coupling of interests and influence from the city administration, design-related industrialists and knowledge institutes; in the Digital Hub, despite the strong production-innovation drive of digital media proponents, the urban planning framework and the early involvement of the community had significant influence in its design. Biocant and PIA illustrate a larger one-sided influence from knowledge institutes in its design, but in a context of strong support and alignment with the city administration and planning systems.

- Second, notwithstanding the combined involvement of actors from both systems, the four cases also illustrate different magnitudes of influence in the design of the knowledge location. It is not necessarily about which location has the "best" design, but which type of location fits the interests of the most influential players better. In the cases of Arabianranta and the Digital Hub, the actors from the two systems exerted their power in a relatively balanced way vis-à-vis one another. Hence, the combination of their insight and resources resulted in designs with a strong production-innovation drive, but also pursuing many urban integration and community-based objectives (functional mixes, social integration, impacts in the surrounding community, etc). In the cases of Biocant and PIA, the influence of actors from the production and innovation system was much more dominant, resulting is designs that clearly privilege, almost exclusively production-innovation related outcomes. Figure 6 tentatively illustrates the relative positioning of the four cases in respect with the influence from the two systems in their designs and objectives.

Figure 6. *Knowledge location: range of influence of two systems*



- Third, beyond the absolute magnitude of their influence, it can be observed that different actors tend to exert different types of power. On the one hand, actors from the production-innovation system tend to exert power by mobilizing their *expertise*, e.g. recognition and respect in the field, access to personal networks, often internationally. On the other hand, actors from the policy and planning system tend to make use of their *institutional position* (e.g. as planning authority, as representative of citizens) and *access to resources* (e.g. funding, deployment of incentives). However, another source of power can be identified, which has to do with the *capacity to convince others* for changes, introduction of new concepts, or seeing things in new ways. Our cases show this latter source of power tends to be better distributed among actors from both systems (e.g. often in the hands of respected professors, entrepreneurs and industrialists but also with economic and planning directors and other city officials).

- Finally, despite the role played by the previously mentioned actors, the four cases show that the emergent designs of the four knowledge locations largely owe to the "texture" of the regional institutional setting that underlie the functioning of both systems (e.g. planning regulations; cooperative culture and design tradition of Helsinki; previous initiatives of community involvement in Dublin; organization of applied R&D labs in Coimbra; local economic policy routines of San Sebastian). This illustrates that the notion of *system* (with actors *and* institutions, or "players" *and* "rules of the game") provides for a more complete explanation of emergence and design of a knowledge location. The strategies and visions of their proponents appear to be actively shaped by the institutions that together from the concrete spatial-economic context.

8.2 Governance rounds, change and co-evolution

How does a knowledge location´s vision and features change over time?

The previous section framed the emergence and design of knowledge locations in their respective spatial-economic context. It explored how their governance processes are influenced by the actors and institutions of two interacting systems, explaining a location´s vision and design. Yet, those visions and designs are not immutable; thus, this section takes one step further and explores the evolution of knowledge locations over time.

Literature hints that changes in a location´s vision and features are associated with mutations in governance arenas, taking place over multiple "rounds" of decision making. Those rounds occur due to external-to-the-location changes (e.g. the exit or entry of an important actor, a large national financial crisis), but also due to endogenous factors, namely as the knowledge location co-evolves with its governance arena and the regional spatial-economic context. Formally:

P2: *The location´s vision and profile evolves over time, in multiple rounds of decision making; that evolution results from the coupling of external-to-the-location changes with the progressive co-evolution between the location, its spatial-economic context and the governance arena.*

To make sense of the previous dynamics we used of a temporal bracketing strategy (Langley, 1999), dividing the "lifetime" of each knowledge location in successive periods. In order to identify such periods we used of a "rounds-model" framework (Teisman, 2000), according to which a new period (or round) begins and ends each time a new "problem-solution combination" and/or the involved actors change. Such framework organizes the information in order to have continuity in the location´s vision and profile within each period but discontinuity at their frontiers. By doing so, it allows for inter-temporal comparisons at the level of the location while considering changes in context, occurrence of key events and emerging trends. This strategy proved well fit for identifying and understanding the (potentially non-linear) development processes of knowledge locations, in which actions undertaken in one period lead to changes in context (actors and institutions) that affect action in the next periods.

Consequently, we placed the knowledge location central and traced back changes in the involved actors, visions and designs since the first idea until the present. We placed such changes in the context of key associated events (either external to the system or resulting from actor´s self-organization) and the progressive structuration of new spatial-economic contexts underlying the location, as explored in the next paragraphs. Table 4, Table 5, Table 6 and Table 7 synthesize the results of the analysis, presenting a timeline for each knowledge location, divided in a number of decision-making rounds and vision configurations. In some cases, the current round and its problem-solution configurations are still open at the time of this writing.

Arabianranta is often referred as an exemplary knowledge location by sticking to a consistent "art and design" concept over time. This is partly true, but not the whole story. Three different periods can be identified in the timeline of Arabianranta (plus one currently "open" period), over which the visions and concept for the location evolved (see Table 4). By the late 1980s, the first idea for Arabianranta – championed by land-owners and by a conservative branch of Helsinki´s planning department – was to develop a large urban park and high-end housing. Only by the turn of the decade this "*living and leisure*" vision changed towards the development of multi-functional "*art and design city*". To this contributed the Soviet collapse and the economic downturn in Finland (and the need to create jobs), but also the increasing influence of TaiK and its Dean in the area and in the City´s policy making, together with the innovative ideas of the City´s planning director. The "art and design city" was planned to be accomplished through a public-private partnership between the City, TaiK, industrialists and land-owners, mediated by a newly created special purpose vehicle called ADC. With these actors on-board, the progressive infrastructure development and early relocation of firms, educational institutes and residents unfolded during the mid-late 1990s (Table 4).

Despite the stability of the multifunctional art and design concept, a related yet slightly distinct vision for Arabianranta emerged and gained ground since the early 2000s – Arabianranta as a "*social innovation valley*". This was recognised as the "new thing" to do in Arabianranta: nurturing user-driven innovations and test-bedding of solutions, facilitated by the ICT infrastructure and benefiting from the area´s mixed uses and consumers. This

change did not come out of the blue: it was largely influenced by the first successful user-driven "living-lab" experiments in the area, a method pioneered by TaiK (imported from the MIT) and Nokia. Thus, besides coordinating the area´s infrastructural development, ADC gained a new influential role in Arabianranta´s vision, as a "mediator" of such experiments, due to its mobilizing role with the area´s "users" (e.g. lists of contacts and liaison in the area, control over each building´s virtual forums).

Hence, over the last decade, manifold living lab experiments took place in Arabianranta; new related partnerships were created in Helsinki to scale-up living lab experiments in other areas of the city (Forum Virium), and the role of "design" and user-driven innovation became increasingly recognised by the Finnish Innovation Policy, and "exported" to other places (e.g. European network of living labs). Arabianranta gained strong national and international recognition during the decade as an "art and design"-"social innovation" hub, hosting an increasing number of companies, students and residents. The deployment of user-driven innovations and citizen involvement methods, as well as the whole partnership model around a common theme is currently being deployed in the redevelopment of former port areas in Helsinki. Yet, by the end of 2008, the decision of TaiK to leave the area (due to a merger of Universities in Helsinki) left a void in the vision for the area, opening up a new stage whose new actors and problem-solution combination are still unknown (see Table 4).

The evolution of **Biocant**'s governance arena and vision over time is also illustrative of the theoretical argument. Its vision and profile moved from a generalist business-technology park towards a biotechnology hub of national significance (Table 5). Three different rounds and problem-solution combinations could be identified. The first round started in 1999 when a strategic planning consultant convinced the Mayor of Cantanhede of the advantages of a condominium-based "*general business-technology park*" to lure new firms into the Municipality. Enthusiastic with the idea, the Mayor of Cantanhede and other neighbouring Municipalities founded an association (ABAP), envisaging the development and management of a larger network of business parks in the region. In 2002 the Mayor and ABAP applied for EU funding to build the park in Cantanhede, but the tender was

rejected due to the lack of focus and relevant scientific partners. In 2003 the land development process started anyway, but in a slower pace.

A new round started in 2003-2004, with the entry of a new key player in the governance arena. Coimbra´s Centre of Neurosciences and Cell Biology (CNC) was looking at the time for a place to settle their technology transfer labs and nudged the Mayor of Cantanhede to give "his" park a biotechnology focus – "*Biocant-Biotechnology park*". With a clear focus and with CNC as scientific partner, a new funding application was approved in 2004, and the participation of ABAP lost momentum. During 2005-2006, the first two buildings were developed, hosting 6 technology transfer R&D centres from the onset; those were followed over the period by a dozen of biotech start-ups (from national and international entrepreneurs) and a bio-specialized venture capital company.

By the end of 2006, Biocant was proudly recognised as the first truly specialized knowledge location in Portugal. The promising success at early stages – rising concentration and commercialization of bio-services, increasing number of R&D centres and start-ups – raised the ambitions of the park towards a "*National Biotechnology Hub*". This new "problem-solution" combination is still on-going at the time of this writing, and largely emerged as Biocant provoked change in the spatial-economic context of the region, but also at the national level. Biocant´s model influenced the design for the Portuguese regional innovation policy 2007-2013; its managers became founding members of the National Health cluster initiative, calling further attention to the role of biosciences´ commercialization in society at large. Firms´ demand to settle in Biocant kept growing, and new R&D centres were established and headed by leading international scientists; Biocant managers and company´s staff got increasingly involved in the support (e.g. mentoring, investing) of new bio-entrepreneurship initiatives in the region. Start-ups from Porto and Lisbon moved to Biocant, attracted by its growing dynamic, but also due to the lack of EU R&D funding in the Lisbon region (due to new EU regulations). By 2010-2011, the City of Coimbra launched health-related cluster initiatives for the first time, and a new building to host the whole CNC (150 researchers) started to be developed in Biocant, adding to the 28 already established start-ups by the end of 2011 (see Table 5).

In Dublin´s **Digital Hub**, three broad decision-making rounds and visions can be identified plus one still open round (see Table 6). The first round started in June 2000 and was set in motion by the announcement of establishment of the MIT Media Lab Europe (MLE) in Dublin: the "*anchor tenant*". The governance arena for this development was led by the National Government and the MLE itself, envisaging the public-driven development of premises for the MLE and other offices for smaller foreign and indigenous digital media companies. MLE was expected to create ground for the development of new companies through technology transfer and spin-offing. This nationally-driven model evolved during 2003, as an act of the Irish Government established a separated body to deliver the Digital Hub: the Digital Hub Development Agency (DHDA), counting with different national agencies but also with Dublin´s City Manager and a representative of the district´s community association. This made the vision for the Digital Hub more encompassing, including also the development of a functionally mixed neighbourhood (in a partnership with private developers), and explicit objectives of providing digital-ICT training and education for the surrounding community – model of "*anchor tenant in a multifunctional district*".

By the end of 2005, the Digital Hub office premises hosted 50 national and international companies. However, the vision and problem-solution combination changed again as the MLE closed down due to lack of funding (and firm´s complains of "too blue sky" research). Hence, the DHDA vision shifted towards nurturing a more distributed "*ecosystem*" of start-up, SMEs and other organizations, under a carefully designed entry criteria. The National Digital Research Centre (NDRC) was founded in 2006 in the Digital Hub and supported that vision, focusing on fostering the commercialization of academic and applied research. In 2007, the Irish Development Strategy recognised digital media as a spearhead sector, and the Digital Hub (whose number of companies kept growing) as a key player in that strategy.

The global financial crisis of 2008 and its severe impact in the Irish Economy triggered new change in the location´s vision, whose contours are not known yet. The financial and real estate contraction made the whole development stop (new office premises, housing). The demand for office space in the Digital Hubs keeps strong but the current premises are

running at full capacity (roughly 100 firms) and new "digital media locations" spontaneously emerged in the city. At the time of this writing, the DHDA launched new studies and consultation processes to re-think the business model and vision for the Digital Hub under this new context.

The **PIA** in San Sebastian is a more recent development, but its vision and design have been already adapted over two rounds of decision-making. The recent interest of the City of San Sebastian in the audiovisual industry started around 2004, when the City (represented by the Film Commission, and later on also by Fomento, the Economic Development Unit), participated in an EU exchange network on "Cinema Cities". This participation nudged the City to lead regular talks and surveys with the local audiovisual industry and their representatives. As the regional Basque TV decreased the number of outsourced hours (a result of broader trends of TV restructuring in Spain and the world), the local sector and the City converged in the need to provide a supportive services and incentives to help the industry´s diversification and new entrepreneurship promotion. One of these incentives and supports consisted in the development of PIA.

The vision for PIA and associated "problem-solution combination" changed by 2009, when Fomento teamed up with Tecnalia, a Basque R&D centre with interest in the industry and in rendering advanced services to the industry. Tecnalia agreed to locate in PIA with an "antenna", and supported Fomento in defining the "top10" shared labs and equipments to be available in the location. Moreover, they influenced Fomento in considering not a sector-strict audiovisual focus for the park, but combining it with new media and digital services. Moreover, also during this time, PIA enlarged its vision and strategy towards fostering interactions and synergies among tenants (as there was some contestation on spending too much money to develop a "firm´s hotel"). In early 2012 (one year after its formal opening), PIA was running at roughly 50% of the capacity (see Table 7).

Summing up

What can we conclude from the analysed cases? The four analysed cases provide empirical support for ***P2****: a location´s vision and profile evolves over time, in multiple rounds of decision making; that evolution results from the coupling of external-to-the-location*

changes with the progressive co-evolution between the location, its spatial-economic context and the governance arena.

Why is that the case? What other insights can be derived?

- First, the cases show that the development of knowledge locations follows a non linear process, along multiple rounds of decision making. Governance arenas, visions and designs are not once-and-for-all. Changes in a location´s design do not necessarily result from "bad planning", but from a natural evolution process as internal and external-to-the-location change unfolds.
- Second, the cases illustrate a number of external-to-the-location events and forces that provoke change and the need for new problem-solution combinations. On the one hand, such events and forces result from changes in global context or landscape (e.g. severe economic downturns, like in Helsinki or Dublin; global restructuring of an industry, like in the case of audiovisual in San Sebastian). On the other hand, they may result from actor´s own self-organization, such as entries or exits from a location´s governance arena (e.g. the entry of CNC in Biocant or Tecnalia in PIA, the exit of MLE in Dublin).
- Moreover, beyond the non linearity provoked by changes in the global external context, actors´ behaviour shows to be largely adaptative, relying on the emergence of new ideas by current actors (e.g. the promotion of audiovisual-digital media in PIA; development of living labs in Arabianranta supported by TaiK and ADC) and trial-and-error and learning (e.g. the re-composition of the partnership following a lost tender).
- Despite the non-linearity, from a certain moment onwards knowledge locations start to exhibit relevant path dependencies, as decisions taken in one moment of time influence the context that will shape new action in subsequent moments. Hence the reason why our case studies show signs of co-evolution between the development of the location, its spatial-economic context and the governance arena that shapes future decisions and location´s visions (e.g. the recognition of the Digital Hub as a key player in the National Digital Media Strategy, the

emergence of bio-supportive institutions in Coimbra and Portugal shaping Biocant´s new visions).

- A result from the previous (due to the triggering of such path dependencies) is that after the definition of a core concept for a knowledge location it doesn't tend to change radically, but to progressively evolve and adapt. In other works, it is more about adaptation that radical change (e.g. adaptations in the features and realignment of visions, like when MLE left the Digital Hub, or when Tecnalia entered the governance arena of PIA).

Table 4. ***Arabianranta:*** *governance rounds, chronology of events and context*

Round I: "Living and leisure"	
	Actors: *City of Helsinki, Private land owners and developers*
	Problem-solution combination: *Conventional public-private land-urban development plan*
1986	*TaiK (Helsinki School of Art and Design) relocates to the vacant factory of Arabia, in the deprived Arabianranta district*
1987-1990	*Talks between TaiK and the City of Helsinki on whether TaiK´s relocation would be permanent or temporary*
	City´s Planning Department idea for the area consisted in developing a urban park and some real estate, benefiting from the waterfront location
Round II: "Art & Design City"	
	Actors: *City of Helsinki, TaiK; Private owners and developers; industrialists*
	Problem-solution combination: *Public-private partnership for a large urban redevelopment focused on art and design*
1991-1992	*Soviet collapse and deep economic downturn in Finland*
	Urban park idea abandoned for the development of a (job-creating) multi-function urban redevelopment, focused on "art and design"
	Detailed master plan and soil remediation starts
1994-1996	*Art and Design City Helsinki Ltd. (ADC) founded by the City of Helsinki, TaiK and private land owners to coordinate the area´s development.*
	Relocation to Arabianranta of the Helsinki Pop and Jazz conservatory and the Faculty of Culture and Services of the Helsinki Polytechnic
1997	*Helsinki City Council decides to make Arabianranta a pilot for local ICT services; launch the first European fibre optic network in the area.*
1999-2000	*Start of new building construction and progressive location and relocation of new residents and businesses*

2001 *Launch of the digital portal "Helsinki Virtual Village" in Arabianranta; consolidation of the local area fibre network and internet service packages.*

Development of intra and inter building ICT communication platforms.

Round III: "Social Innovation Valley"

Actors: *ADC, City of Helsinki, TaiK, industrialists, residents association*

Problem-solution combination: *Public-private partnership for a large urban redevelopment focused on art and design + hub of "social innovation"*

2001 *"Dot.com" IT bubble in the US; emerging policy concerns on the threats of ICT overspecialization in Helsinki*

2003-2004 *Arabianranta hosts Europe´s first "living labs" (user-driven innovation method brought from the MIT by a TaiK´s professor), with Nokia, TaiK and residents.*

Relocation of the Finland-Swedish University of Applied Sciences and the Prakticum vocational institute.

2005 *New Development Plan for Helsinki Region envisages a "World class place for innovation, ICT and combinations of art, design and technology in businesses"*

During the Finnish EU presidency, the EU network of living labs is founded.

National law incentivizes the merger of Higher Education Institutions.

The City of Helsinki and a number of large companies create Forum Virium – association promoting living lab experiments in the Helsinki region.

2006 - 2007 *More than half of the new housing, university and office space has been developed and progressively taken*

Tekes (National Innovation Agency) recognises design as an important innovation field (after a previous focus on 'hard' technology)

Hundreds of living lab projects have been already run in Arabianranta, by many companies (in domains such as health, mobility, etc)

The area is firstly dubbed by external commentators as a "Social Silicon Valley".

(End 2007: Arabianranta hosts around 5000 residents; 5000 workers; more than 1300 students; national and international companies)

Round IV: Post TaiK (...)

Actors: *ADC; Still open*

Problem-solution combination: *Still open*

2008	*Creation of Aalto University: Merger of the Helsinki Schools of Business, Technology and Art & Design.*
2009	*City of Helsinki applies to be entitled World Design City in 2012, influenced by the past decade´s developments in Arabianranta.*
2010	*Arabus – the incubator of TaiK, leaves Arabianranta to re-locate in Ruohonlahti district (Aalto University start-up centre and "Cable Factory" – hub for creative industries)*
2011	*TaiK is planned to relocate in the coming year to new premises in Otaniemi, campus of the School of Engineering (proximity of large firms).*

Source: Fieldwork

Table 5. ***Biocant:*** *governance rounds, chronology of events and context*

Round I: General Business and Technology Park	
	Actors: *City of Cantanhede; Consultants, Business Parks Association (ABAP)*
	Problem-solution combination: *Municipal-driven, general business-technology park*
1999	*The Strategic Plan for Cantanhede suggested the development of a (generalist) business-technology park to support economic diversification.*
2000-2001	*ABAP (Association for the development of business parks in the region) is formed by Cantanhede and other neighbouring municipalities.*
2002	*The Mayor of Cantanhede applies for EU funding with the regional authority to develop the business-technology park (pure condominium-style). The tender is refused due to the lack of focus and research/university partners.*
2003	*The Mayor of Cantanhede starts the land development process with own resources, yet in a slow pace. The ABAP partnership loses momentum.*
Round II: Biocant - Biotechnology park	
	Actors: *City of Cantanhede; ABAP; Coimbra´s Centre of Neurosciences and Cell Biology (CNC)*
	Problem-solution combination: *Research-driven biotechnology park, supported by the Municipality*
2003-2004	*The University of Coimbra´s Centre of Neurosciences and Cell Biology (CNC) successfully concluded a technology transfer project (XPROT) and shows interest in the development of new labs and infrastructure for research commercialization.* *CNC´s Vice-President nudges the Mayor of Cantanhede to re-orientate his idea towards a fully dedicated biotechnology park. The University of Coimbra uninterested in the development ("ivory tower mindset").* *A new tender for a dedicated biotechnology park (Biocant) is jointly submitted by Cantanhede and CNC for EU funding (now approved).*
2005	*The first building of Biocant is inaugurated, with R&D and technology transfer labs.*

2006	*Six technology transfer units/labs are staffed in Biocant (in partnership with the Universities of Coimbra and Aveiro)*
	The second building of Biocant is inaugurated; the first biotechnology companies move in/start-up in Biocant (from national and international entrepreneurs). Biocant created 60 direct high-qualified jobs in the first year. Creation of Biocant Ventures, public-private venture capital company

Round III: Biocant - National Biotechnology Hub

Actors: *City of Cantanhede; ABAP; Coimbra´s Centre of Neurosciences and Cell Biology (CNC)*

Problem-solution combination: *Research-driven biotechnology park, supported by the Municipality, National Hub*

2007	*Biocant model inspires/influences the design of Portuguese regional innovation policy and funding schemes (2007-2013), highlighting the specificities and role of biotechnology. Biocant managers become founding members of the National Health Cluster initiative.*
2008	*Establishment of two new dedicated technology transfer labs in Biocant, run by former PhD graduates from MIT and Harvard University.*
	University of Coimbra publicly supports and recognises Biocant.
2009	*The third building of Biocant starts to be built; firm´s demand keeps buoyant. Biocant managers support the development of entrepreneurship networks and related initiatives in the region*
2010	*Other Portuguese biotechnology start-ups (from Lisbon and Porto) relocate operations and labs to Biocant. The Portuguese Association of Bio-industries relocates headquarters from Lisbon to Biocant*
2011	*The City of Coimbra launches a number of health-related cluster policies.*
	The new CNC building (150 researchers) in underway in Biocant (relocation from dispersed university buildings in Coimbra)
	Biocant reports a 30% increase in private contract research nationally and internationally, despite the economic downturn
2012	*Biocant hosts 8 technology transfer labs and 28 permanent and affiliated biotechnology companies.*

Source: Fieldwork

Table 6. ***The Digital Hub:*** *governance rounds, chronology of events and context*

Round I: "Anchor tenant"	
	Actors: *National Government & MIT's Media Lab Europe*
	Problem-solution combination: *National support for a digital media location*
June 2000	*Announcement of the establishment of MIT's Media Lab Europe –MLE (partnership Irish Government - MIT), in the former Guinness Brewery Hop store.*
	The National government founded the "Digital Media Development Ltd": the official launch of The Digital Hub (DH) project.
2001-2002	*National Government launches a multi-stakeholder consultation process for the development of the Digital Hub.*
	Start of the master planning for the Digital Hub.
	Start of the (public-funded) buildings and infrastructure development for the MLE and companies.
Round II: "Anchor tenant in a multi-functional district"	
	Actors: *National Government, Irish FDI agency IDA, Enterprise Ireland, Dublin City Council, District's Community Association*
	Problem-solution combination: *Multi-stakeholder partnership for a "new media hub" in a deprived district*
2003-2004	*Act of National Government establishes a separate body to deliver the digital hub – Digital Hub Development Agency (DHDA) (abovementioned actors).*
	Decision to develop the DH as a commercial partnership with private developers, with land lease. Dublin Office of Public Works transfers land to the DHDA.
	Establishment of the CPPP – Community Public Private Partnership: a steering group for the DH involving all the relevant stakeholders.
	Start of the accommodation of companies and organizations.

Round III: "Ecosystem"

Actors: *DHDA; National Government, Irish FDI agency IDA, Enterprise Ireland, Dublin City Council, District´s Community Association*

Problem-solution combination: *Multi-level partnership for a "new media hub" in a deprived district + Innovation ecosystem*

2005 MLE closes down (due to lack of funding, output and limited private involvement)

Development plan for mixed-use in the DH (enterprise, retail, residential, community and learning spaces). Selection of private real estate developers.

(End 2005: The Digital Hub hosts 50 national and foreign companies).

2006 National Digital Research Centre (NDRC) is founded in the Digital Hub, as a partnership between different University R&D centres, with Government support.

Multi-objective development plan for DH was agreed on (defined by the CPPP) – focus on nurturing an innovation ecosystem among co-located firms.

2007 *Irish Development Strategy places Digital Media as key niche sector*

Two selected developers fill in planning permissions at the city hall, but encounter resistance (e.g. heights of the future buildings)

Round IV: Saturation and Post-Crisis (...)

Actors: *DHDA; Still open*

Problem-solution combination: *Still open*

2008-2010 *Global financial crisis and Irish economic downturn; severe contraction of Irish real estate and financial markets and IMF bail-out.*

Development of real estate and new premises in the Digital Hub stops, but demand of new companies remains high.

Wave of new media FDI in Dublin (Google, Facebook, Linkedin; Zynga, etc) in Dublin´s docklands area (newly built and empty office space with low prices).

	Dublin´s Institute of Technology launches a new redevelopment project based on the Digital Hub´s model of urban integration
	(End 2010: The Digital Hub hosts 97 national and foreign companies)
2011	*DHDA launches new studies and consultation processes to re-think the business model of the Digital Hub.*
	(Only 2 of the total 9 acres of the planned site have been developed so far - offices and incubation facilities)

Source: Fieldwork

Table 7. ***PIA:*** *governance rounds, chronology of events and context*

Round I: Building for film and TV producing companies	
	Actors: *Film Commission, City of San Sebastian (Fomento)*
	Problem-solution combination: *Buildings and services to support audiovisual companies*
2003	*The City of San Sebastian creates a Film Commission, a networked structure within the local administration responsible for "shooting management" in the city.*
	Under the Film Commission, the City starts hearings, meetings and industry surveys with the local audiovisual industry.
2004	*The Economic Department of the City is re-established as a municipal-owned company called "Fomento San Sebastian", to intervene in economic development and business support schemes.*
	Fomento joins the Film Commission in the EU INTERREG IIIC network CineSpace, steering further contacts and meetings with the local industry.
	Fomento starts to organize surveys and bi-annual meetings with the local audiovisual industry (TV producers, associations, companies, knowledge institutes, etc).
2005-2007	*Steady decline in the outsourced hours of the Basque TV to external producers.*
	Idea to develop a dedicated building with audiovisual-supportive services: PIA – Audiovisual Innovation Pole (supported by the City of San Sebastian and the National Government)
2008	*The construction of the building starts.*
Round II: Audiovisual – Digital Innovation Pole	
	Actors: *Fomento, Film Commission, Tecnalia*
	Problem-solution combination: *Buildings and services to foster new networks and innovations in audiovisual and digital services*

2009-2010	*Fomento adapts their portfolio of services for local audiovisual firms (training, advising, entrepreneurship subsidies, meetings, etc),*
	An "audiovisual cluster manager" is assigned by the City
	Fomento teams up with Tecnalia – a large Basque R&D centre with competences in media, TV and virtual technologies – to jointly define PIA's business model, services and shared equipments to provide in the location.
	Fomento adjusts the vision of PIA from supporting film and producing companies towards "audiovisual and digital media" ("value chain" approach).
	Fomento starts cooperation and pursues alignments with the Basque audiovisual cluster initiative.
2011	*Formal opening of PIA, with 30% of capacity already taken (20 companies and audiovisual associations and organizations, including Tecnalia)*
	Establishment of PIA's Innovation and Development Unit (with Tecnalia, for innovation diagnosis and support to funding tenders)
	The Basque ICT cluster joins audiovisual discussion forums of Fomento
2012	*PIA organizes monthly meetings – "PIA meetings" (sectoral supports, co-working, information diffusion, brokerage)*
	PIA formalizes an internationalization strategy with the City's film commission and receives delegations of Latin American and British audiovisual associations and parks
	In early 2012, 35 audiovisual-media companies locate in PIA, and others are in the process of installation

Source: Fieldwork

9. OUTCOMES OF KNOWLEDGE LOCATIONS: AGGLOMERATION AND MEDIATING PROCESSES

9.1 Introduction: growth and agglomerating outcomes

Which factors contribute to the growth and agglomeration in a knowledge location?

Which intermediate outcomes and mechanisms are associated it? How do they operate?

The previous chapter paid attention to the role of context in the emergence and development of a knowledge location; it was also analysed how a knowledge location´s vision and profile changes overtime, through co-evolutions between the context, its governance arenas and the development of the location itself. However, we did not analyse yet how knowledge locations grow over time, what drives that growth and which intermediate outcomes and processes are associated with that.

That is the purpose of this chapter. It explores the empirical support for the theoretical hints and propositions put forward in chapter 5, namely the relations (developed over time) between a location´s agglomeration and its *specialization*, its *urban-spatial integration* and its *management* features. Moreover, it explores the causal mechanisms behind the proposed relations, and how do they operate. By doing so, it makes clear how two key mediating processes come to the fore – namely "image formation" and "ecosystem formation" – and how do they contribute to the development of the location over time.

Agglomeration outcomes

Before exploring each of the abovementioned relations, we turn to the assessment of the agglomeration outcomes of the analysed knowledge locations (see Table 8). To do so, a total count of the number of tenants was collected in two moments of time: early 2012 and two years after the start of each location´s operations. The number of tenants was then compared with the location´s total size/planned capacity at the time. We considered tenants as firms, R&D units and other knowledge-related organizations in the location, therefore excluding supportive activities such as basic services (e.g. catering), leisure or eventual housing. The assessment of the agglomeration results, tenants and capacity was more

challenging in the case of Arabianranta, due to the total size of the location (a small city district) and its many functions (office, education, housing, etc.). To bring the analysis feasible and comparable with the other analysed cases, as explained in chapter 7, we focused our analysis on the companies located in Arabianranta´s official business premises[29], namely within Arabia building and Portaali Business Park. This is likely to slightly under-represent the number of micro-businesses in non-official premises (e.g. shared rooms, single entrepreneurs working from home), but not to alter the conclusion of the notable agglomeration capacity of the area.

Table 8. *Knowledge locations and agglomeration of knowledge-intensive activity*

Location	Type of premises	Start-up year	Growth first 2 years	Occupation in early 2012 (Nº of tenants**)
Arabianranta	Office; incubator*	2000	40% capacity	Almost full (140+)***
Biocant	Office; laboratorial	2006	60% capacity	Almost full (28)
Digital Hub	Office; incubator	2003	60% capacity	Full (97)
PIA	Office; audiovisual studios	2009	50% capacity	50% capacity (26)

* The incubator relocated to another district in 2009.
**Tenants include firms, R&D units and other organizations related with the activities of the location but exclude basic services such as catering, leisure or eventual housing.
*** "+" means that the number of micro-companies and companies operating in informal premises are potentially under represented.

As previously referred, all the four knowledge locations under study grew considerably. In fact, they were purposely chosen (see chapter 6), among other reasons *because* they

[29] There is no official registry of the total number of "knowledge-intensive" firms in Arabianranta. Firms are spread across different office and business premises (which have different ownership schemes), and therefore there is no official registry of its concrete number. We calculated the number of 140-150 firms based on summing the firms registered in Arabianranta´s official business premises. This method provides an approximated overview, although it is likely to slightly under-represent the number of micro-businesses in the area, for example, single person companies.

showed strong agglomeration results in relation to their respective sizes. Moreover, they not only agglomerated a considerable number of activities but also started to do so from the early beginning – the locations under study managed to fill in already roughly half of their capacity in the first two years of operation (see Table 8).

Subsequently, besides controlling for the size of the location, we considered other factors potentially associated with a location´s growth and agglomeration. First, we considered the price of the office premises (square meters). None of the locations under study offered subsidized rental prices for office space. In all the cases, the rental prices of the location were higher than in other office locations of the urban region, yet comparable or only slightly lower than in premium business locations the respective city centers. It is true that there are a number of basic services included in the rental prices (e.g. safety, water & electricity, internet, etc.); however, it should also be considered that the knowledge locations here studied are in formerly deprived areas (e.g. Arabianranta and Biocant), just outside the city centre (PIA) and even in a rural greenfield location (Biocant). This suggests that tenants in our set of locations are indeed paying a premium to locate there, hence ruling out any "price subsidization" phenomena associated with the agglomeration.

Second, it was observed that the overall dynamism of the host regions could not explain the agglomeration dynamics of the knowledge locations, at least alone. Although Helsinki and Dublin have been fairly dynamic and growing over the last decade, the same is less true for Coimbra and San Sebastian, whose growth has been much more modest. Third, it was also observed that the regional dynamism of the productive-innovation system in which the location´s intends to specialize is also insufficient to explain its agglomeration capacity. It is correct that Helsinki has a century-old, well functioning design-related innovation system, and Dublin has built over time a strong, FDI-driven IT economy. However, Coimbra had until recently an almost inexistent record of bio-industries, despite the city´s research centers; San Sebastian does host a TV-audiovisual production system, yet rather small, mature and largely dependent on declining TV outsourcing. Hence, even if all the locations and their intended specializations have "seeds" in the region, their underlying dynamics and potentials are rather different.

Subsequently, the next sections explore three different potential drivers of growth and agglomeration in each of the knowledge locations: specialization, urban-spatial integration and management features. Each section i) briefly contextualizes the hinted proposition; ii) explains the way constructs and variables where assessed and operationalised; iii) provides a within-case analysis and a iv) sums up with a cross-case comparison, judging for the empirical support of the proposition while exploring the causal mechanisms through which it operates.

9.2 Role of the thematic specialization

The previously analysed literature provided some evidence that locations specialized in a certain thematic field grow more. It has been hinted that this relation has to do with their superior ability to provide and assemble a number of unique resources, such as an identifiable concept, the provision specialized facilities and services and the co-presence of like-minded individuals and organizations with (potentially) complementary pieces of knowledge. Tenants would be willing to benefit from those resources and thus the location would grow more.

Hence:

P3: *The specialization of a knowledge location positively contributes to its growth and agglomeration potential*

How does the relation between specialization and agglomeration operate in the analysed case studies?

We assessed the specialisation of a location through a number of features, such as i) the presence or not of an *identifiable concept*, assessed through interview data with stakeholders within and outside the location, triangulated with secondary data; ii) the presence or not of an *anchor tenant*, i.e. a larger company or other organizations with high visibility and large operations in the area; iii) the endowments of the location concerning *rare facilities and services*, related with its theme (coded as *weak*, *moderated and strong*); and iv) the tenant mix, qualitatively evaluated through the perceived knowledge similarities and complementarities between tenants (firms and organisations in a knowledge location), for which we relied on key informants within the locations

(managers, tenants), complemented by our own evaluation based on the detailed lists of tenants and their fields of activity (qualifying as *diverse*, *moderately related* and *related*). We illustrate the functioning of some dimensions through interview quotes along the text (in brackets); Table 9 presents a synthetic overview of each location´s specialization dimensions.

Arabianranta is generally considered in the popular discourse a very specialized knowledge location in art and design (see chapter 7). However, a closer analysis provides a more nuanced picture. We found evidence that the agglomeration potential of Arabianranta for knowledge activities has been related mainly with the presence of a rather strong and identifiable concept from the outside – "art and design city" – associated with the presence of higher education institutes (like TaiK) and other important Finnish furniture and appliance companies from the onset. This is corroborated by a recent survey (Fontain Park, 2008), which identified the image of the area and the presence of TaiK as the key location factors for companies. The survey also reveals that companies moved to Arabianranta for art and design "trend watching", again, due to the presence of important HEIs and company´s showrooms. Some of our interviewees, both with national and foreign companies in Arabianranta explained that they moved to the location with an eye to "seeing what was happening around and spotting the last trends", like in a "big inspirational bazaar". Likewise, many companies also moved in order to directly showcase and promote them as being "*in* the core of Finnish design" (emphasis added).

Yet, our interviewees also recognised theirs and other companies´ disappointment, since the expected "buzz" and emergence of business and knowledge exchange relations didn´t seem to have (at least significantly) materialized. On the one hand, this seems to be related with the lack of "get together" facilities and collective working spaces, often mentioned as a negative point. Moreover, apart from the novelty of the broadband infrastructure developed in the late 1990s, Arabianranta never provided specific facilities/infrastructures or rare specialized services for their companies, despite the promoted theme of "art and design". On the other hand, and notwithstanding the overall theme of the location, the tenant mix of the buildings and facilities has never been in practice controlled by the general area´s authority (ADC) or by the building´s owners and management team. This

resulted in the agglomeration of a rather diverse set of "knowledge-based" companies in many fields such as IT, design, architecture, media, furniture, among others, primarily relying on rather different knowledge and innovation modes.

Hence, many of the firms in the area established few networks and partnerships inside, although the contrary was expected by many before moving in. Occasional meetings resulting in new networks showed to be limited. Some firms even tried to create meeting platforms (e.g. 'Fountain Fridays') to meet people working in the same building, but that failed due to lack of interest. For many firms in Arabianranta, the key sources of innovation are stable clients and suppliers outside the area. But even for companies within related knowledge fields in Arabianranta, relations and interactions showed to be limited. One example is Iittala Group (the largest company in Arabianranta with about 400 employees, including 30 designers), outsourcing design from specialised design firms – out of those, only 2 small companies locate in Arabianranta. Also for recruiting and finding staff, the relevant area seems to be much larger than Arabianranta. TaiK is a relevant source of new designers and talent, but cooperation and interaction is far from systematic, and primarily based on some joint lecturing and "opening doors for students". Moreover, as one interviewee of a multinational furniture company (with a subsidiary in Arabianranta) explained:

> "For us, it doesn't matter where good designers are, we can find them anyway, and we are not just picking the first student in the area. Moreover, as a multinational with headquarters abroad, it is not easy to match directly local designers and the firm's design departments – there are many filters in this process".

Thus, the link between agglomeration and specialization in Arabianranta doesn't seem to be primarily running through the provision of rare facilities or a high complementarity of knowledge partners and other synergies, but through the easy identification of a concept/image from the outside and the presence of key anchor tenants from the beginning, strengthening the location´s visibility. There is indication that some "learning through observation" and trend watching might be taking place at the area, namely within the design field *strictu sensu* (e.g. furniture and appliances), but it is not widespread in the

area. Moreover, the fact that Arabianranta´s "creative business" incubator left the area in 2010 to locate in the city centre of Helsinki reflects the limited value ascribed to the area for knowledge-related synergies and exchange.

Contrarily, the case of **Biocant** shows a remarkable specialization across all the pointed dimensions. The concept of the park is well identifiable from the outside. This was achieved since the early beginning through a deliberate strategy of hosting 6 "anchor" R&D and technology transfer centres in different but related bio-science fields (Cell Biology, Bioinformatics, Molecular Biotechnology, Genomics, Microbiology and DNA sequencing). Moreover, the pioneering company moving to Biocant in 2005 was the first fast-growing spin-off of the University of Coimbra in the field of Cell Cryopreservation, with a growing R&D staff and well-settled commercial department. This contributed to strengthen the positioning of Biocant as a biotechnology park from the beginning, not only as a prime location to access advanced knowledge and R&D, but also as a location where knowledge is at the service of commercialization and profit.

Biocant was also designed to provide specialized bio-related services to companies. Biocant´s management jointly developed a venture capital company with other private and public partners, as well as a partnership with specialized lawyers in the UK for the registry of intellectual property of their tenants. On the infrastructure side (besides the 6 technology transfer labs), companies count with technical support to establish joint research labs, reducing the costs of their operations. In biotechnology, experimentation, testing and production are run under strict safety and quality regulations; hence, the ability to access (and settle) in Biocant such types of rare facilities has been an attractor for many companies (e.g. blood and cell banks; food compounds and fermentation pilots). Moreover, as the CEO of a small bioinformatics company explained:

> "Since I work for pharmaceutical companies dealing with big data about all the drug development process, they oblige me to have extra safety measures in many respects. Those requirements are fulfilled in Biocant but not if I want to work from home or from a general office. And the same goes for many companies here who came because of the labs and their quality".

The tenant mix is controlled to fit the park´s profile: the company must be active in biotechnology (health or food related). Thus, the ability to gather and mingle with like-minded individuals has been valued by the companies located in Biocant. Naturally, there is no exclusive need to locate in the park to access such individuals or services (the technology transfer labs of Biocant render services nationally and internationally). However, the direct access to related companies and organizations in-place still proved valuable for at least two reasons. First, it helped new international entrepreneurs with limited knowledge of the national policy and institutional context. As put by a former Portuguese expatriate PhD from Baylor College of Medicine (Texas),

> "…locating in Biocant helped us to deep dive in the national context, their institutions and spot what other like-minded companies were doing. Our 'technological' friends were abroad and we felt a bit like outsiders when we returned from the US – locating in Biocant helped to counter this feeling and acquire new contacts in the country".

Second, being surrounded by companies and organizations is perceived as helping to rapidly solve unexpected problems and challenges, which is a strong plus in such a (still) dynamic field as biotechnology. The director of Biocant explains it vividly:

> "Bio-entrepreneurs – and the venture capital invested on them! – value a location within an "ecosystem" of related companies, people and laboratories that can rapidly support them in case something goes wrong or an expected technical problem emerges during an experiment. Moreover, there is a growing tradition of mentoring between older and younger entrepreneurs in the park. (...). Apart from a few University labs, there are very few places in the country with those features".

Hence, the link between specialization and agglomeration in Biocant seems to be running through a combination of all its four features: anchor tenants, identifiable concept, provision of rare services and presence of related technological partners. While the first three features seem to have helped to catalyse early interest and first agglomeration in the location, the presence of related companies and organizations catalysed such agglomeration further, by i) facilitating the formation in place of an attractive ecosystem of

problem solving and mentoring and ii) strengthening the perceived concept and image of Biocant.

In the case of the **Digital Hub**, although the location started *because* of an anchor tenant (the MIT´s Media Lab Europe, MLE – see chapter 7), it closed down less than two years later. Yet, that did not seem to hurt the Digital Hub's agglomeration appeal – it kept attracting a large number of companies and other organizations since then. Since the closure of the MLE, the management of the hub explicitly assumed that the location would focus on nurturing a "disperse" ecosystem of companies, namely SMEs and micro business (which currently make for roughly 80% of the occupation). Despite the start-up of the National Digital Research Centre (NDRC) in the Digital Hub, it is generally not recognised by the tenants and the management as an "anchor tenant". However, with or without an anchor tenant, the concept has proven to be rather stable and identifiable over time, as a "hotspot for new digital media companies and ideas". The Digital Hub has gained strong reputation in Ireland, hosting digital media related expositions and showrooms.

The Digital Hub provides a moderate number of specialized services. The most differentiating service is the provision of digital media showroom opportunities for test bedding of solutions with clients and consumers. Yet, among the most valued features has been the possibility to access company, policy and research networks, e.g. through the national agencies´ representatives, or contacts established through the NDRC and their affiliates (e.g. the Irish Internet Association). Since the location is rather specialized in digital media, the possibility of tapping into networks that "matter" increase. Interviewees refer that the presence of the NDRC bridged them to partnerships with Dublin City Council and research institutes, helping the company to find new business and innovation opportunities (e.g. related with open-data and city apps development)

The Digital Hub strictly controls the tenant mix and hence, many companies settled in the location with an eye to knowledge exchange, potential learning and partnership benefits. A survey conducted in 2008 to the hub´s companies (DHDA, 2007), reported that even if 20% of the companies had no cooperation whatsoever with each other, the others report some kind of interaction and relations, ranging from ad-hoc cooperation for business

strategy to joint ventures and strategic partnerships. There are different outsourcing and client-supplier relationships going on in the hub, as tenants do show complementarities and are "well aware of the nuts-and-bolts of each other´s business fields".

Therefore, despite the absence of an anchor tenant and differentiating facilities/services, the link between specialization and agglomeration in the Digital Hub had been running through the presence of a well-defined and visible concept, as well as through a carefully managed tenant mix, assuring that tenants and other organizations have similar interests and complementary expertise. Over time, this had led to a number of partnerships and synergies among its tenants, both for commercial purposes and for accessing new markets and search directions, reinforcing the location´s concept.

Just like with the Digital Hub, **PIA** does not have a clear anchor tenant. Apart from the Basque TV and a few larger producing companies in the region, the majority of the audiovisual (and media) related companies are small. Hence, the idea behind PIA has always been to provide the services and facilities that those small companies alone could hardly achieve, namely a distinguished set of audiovisual infrastructures and services. Some PIA-services are pure "extensions" of general supports already provided before by the City´s Economic Department to companies (e.g. business plan support, training and legal advice, etc.); others are much more specific, such as audiovisual related coaching, participation in specific audiovisual forums, partner identification, participation in international visits to other audiovisual-focused locations, etc. Moreover, PIA provides access to a number of sophisticated infrastructures at moderated prices, like joint audiovisual studios plateaus, production rooms, etc. (see Chapter 7). This has proven so far to be a highly valued feature for companies locating in PIA.

Generally speaking, the concept of PIA has been considered "identifiable" by stakeholders within and outside the location – an audiovisual-focused location. However, at a more narrow level, and since the location is still relatively recent, its concept is not yet fully stable. On the one hand, due to the large number of services and facilities provided, the location started to be recognised by entrepreneurs in the field as an "audiovisual firm´s hotel"; on the other hand, since PIA´s managers feared that "audiovisual" would be too narrow a theme (basically focused on TV and producers, a declining sub-sector of a

broader “media” theme), it was recently decided to broaden it towards “audiovisual and digital media”, in order to promote complementarities between the two fields and enlarge the location´s reach.

PIA managers do control the tenant mix, now based on a “value chain” criteria – tenant´s business fields must be in principle able to establish client-supplier relations between them. So far, this has led to the agglomeration of TV-related audiovisual companies and producers, but also companies in other, more diverse and “fuzzy” fields such as media, online training, marketing and communication, with different innovation modes and core businesses. Some preliminary examples of synergies and newly established business relations exist (e.g. between a producing company and a provider of make-up services, or between a media company and a provider of on-line training course), but do not seem to be widespread yet.

Hence, so far, the link between specialization and agglomeration in PIA seems to be working primarily through the availability of distinctive and rare infrastructures and services, and expectations of new synergies with related tenants. There are no specific anchor tenants, and the concept of the location is only clear at a broad level, still needing time to mature.

Summing up

Which conclusions can be draw from the analysis of the four cases? In all the cases a link between certain attributes of specialization and the growth and agglomeration dynamics of a location could be identified. Specialization does facilitate the provision and emergence of a number of unique resources, which attract tenants and makes the location grow. However, the case studies show different degrees of specialization, at least when assessed through the four analysed features. Arabianranta´s shows a more limited degree (it runs primarily through the presence of anchor tenants and a promoted concept), Biocant shows the highest degree (anchor tenants, identifiable concept, rare services and controlled tenant mix) and the Digital Hub and PIA are somewhere in-between.

In all the cases, specialization has led to growth and agglomeration, but it did so through different ways, activating one or more mechanisms.

First, specialization ignited the formation of "safe-choice" and /or "place-to-be" effects. In situations of limited information and cognition (e.g. new ventures; firms coming from outside the region), an identifiable concept seems to reduce the perceived risks when making a location decision, namely for more knowledge intensive activities (*safe-choice*); moreover, it signals the presence of distinctive "ambiences" in place, fit to one´s activities (*place-to-be*). These image effects seem to have more exclusively dominated the link specialization-agglomeration in Arabianranta, but have also been largely present in the other cases. Evidence also suggests that those effects, although can be "promoted" in a first stage and supported by the presence of e.g. anchor tenants, are largely reinforced by other features (such as rare services and the effective tenant mix). Recent re-locations away from Arabianranta of emblematic organizations (TaiK, incubator "Arabus") suggest that this agglomeration mechanism might be losing strength.

Second, specialization facilitated the formation of distinct atmospheres and "ecosystems" in the location (e.g. access to rare facilities and services, networks of support for specific problem-solving, access to information, communities of specialized mentoring, brokerage), primarily driven by the presence of like-minded individuals and rare services and infrastructures, as well as anchor tenants. Firms and organizations are willing to join those environments and thus the location grows. The cases also suggest that the development of such ecosystems take some time to unfold (e.g. Biocant, Digital Hub), but would play an important role in the agglomeration dynamics of the location, not only by itself but also by reinforcing the above mentioned image effects over time.

Why didn't strong specializations hamper agglomeration in the analysed case studies, e.g. through spilling out of competitive information among tenants? In the one hand, because analysed activities are mostly in rather dynamic sectors, with significant product differentiation, where multiple solutions co-exist – that is largely the case e.g. with digital media, but also with biotechnology. On the other hand, the core knowledge pieces of such products and solutions are hard to copy, but their development can largely benefit from inspiration and technical support from others facing similar situations.

*Hence, the case studies support the proposition (**P3**) that the specialization of a knowledge location positively contributes to increase its growth and agglomeration potential. This*

relation is mediated by the formation in the location of unique resources, such as 1) the formation of image effects – location as a "safe-choice" and "right-place" for certain types of activities, and 2) the formation over time of specialized atmospheres and ecosystems, facilitated by the presence of rare infrastructures and like-minded individuals, which attract new tenants to the location. Evidence also suggests that i) image effects of specialization can trigger early growth, but cannot support it over time; ii) the formation of specialized ecosystems dynamically re-enforces image effects.

Table 9. *Specialization of the knowledge locations*

Location	Large anchor tenant?	Identifiable concept to the outside?	Provision of rare facilities and services?	Tenant mix: Access to related knowledge partners?
Arabianranta	Yes (TaiK, large firms)	Yes "Art and Design City"	Weak	Diverse working and innovation modes
Biocant	Yes (Biocant R&D labs, cryopreservation company)	Yes "Biotechnology Park"	Strong Technology transfer labs, access to multiple networks, venture capital and patent register	Related working and innovation modes
Digital Hub	No	Yes "Hotspot for digital media"	Moderate Access to multiple networks, showcasing	Related working and innovation modes
PIA	No	Yes, but evolving "Audiovisual firm´s hotel" + "digital media"	Strong Audiovisual studios, plateaus, production rooms, coaching, forums, etc.	(Moderately) related working and innovation modes

Source: fieldwork
Note: "Provision of rare facilities and services": Weak = only basic/general services and infrastructures; Moderate = some specialization-related services and infrastructures, but generally not unique in the region; Strong = highly specialization-related and unique services in the region.
"*Tenant mix: access to related knowledge partners*": Diverse = companies working is many different fields of activity; moderately related = some companies working in similar fields of activity; Related: many/most of the companies working in similar fields of activity.

9.3 Role of the urban-spatial integration

In a context of increased value paid to "quality of life", recent work suggests that the quality of the spatial integration of the location *within* the urban region may contribute to explain its agglomeration potential, through features such as its *accessibility*, presence of *amenities* in the area and *functional mix/diversity* of users in the immediate surroundings. Moreover, it is suggested that knowledge workers and firms in different types of activities ascribe different values and weights to those features and perceive "quality" in different ways, being that workers and industries with more symbolic content tend to privilege denser urban settings and the proximity to urban amenities, vibrancy and liveliness. Thus:

P4: *The perceived quality of the urban-spatial integration of a knowledge location varies by type of activity, and that perceived quality positively contributes to its growth and agglomeration potential.*

How does the relation between urban-spatial integration and agglomeration operates in the analysed case studies?

In line with the theoretical hints, we assessed the urban-spatial integration of a location through three distinct features, i) its *accessibility* within the urban region by combinations of individual and public modes (coded as *good*, *medium* or *poor*); ii) the *urban attributes* of the immediate surroundings and presence or not of *amenities*; iii) *functional mix* and *diversity* of users in the immediate surroundings (coded as *high*, *medium* or *low*). The codes were attributed on the basis of input collected through the interviews with tenants and others diverse stakeholders within and outside the location, and complemented with our own local observations. Table 10 presents synthetic results and qualitative scores per location.

Arabianranta situates in the north-eastern end of Helsinki and is overall considered an "extension" of the city centre. It is thus well connected within Helsinki´s urban fabric. It is well accessible by individual and public transport (tram). Accessibility scores among the most valued features of the area by its users (Fontain Park, 2009). For companies, it is relatively easy to move in and out of the area to the "traditional" city centre. Apart from the natural surroundings (waterfront), workers and residents declare to rank high the area´s

architecture and art-filled streetscapes (Kangasoja and Schulman, 2007). From its inception that developers and land owners are required to invest a minimum of 1-2% of the total development costs in street art. All the previous features contributed to endow Arabianranta with a distinct image of urban quality. The presence of higher education institutions reinforce the previous, contributing to create a "mini-city" feeling, with high diversity of users (see chapter 7), even if it is always referred as lagging behind other areas in Helsinki concerning density, liveliness and vibrancy.

The previous features contributed to agglomerate many companies in the area, namely the ones looking to establish showrooms and settle in places with a distinctive image and urban quality (e.g. in industrial design, ICT, architecture), while still in the physical proximity of other clients, suppliers and relations in Helsinki. These characteristics were strongly valued by the companies (plus students and residents) that settled in the area, namely foreign subsidiaries.

Yet, despite the initial agglomeration boost, the fact that Arabus (Arabianranta´s business incubator for creative business) left the area to settle in the Ruohonlahti district (city centre, close to the "Cable [creative] Factory") reflects a stronger preference of some niches of "art and design" for denser, livelier and "rougher" urban atmospheres. It can be argued that this move is primarily due to the merger of TaiK towards Aalto University (leading to integrated incubation services), but the fact remains that such entrepreneurs did not strongly value the urban-spatial qualities of Arabianranta for their activities. As one representative of Helsinki´s cultural department explains:

> "Both Arabianranta and the Cable Factory are Helsinki´s success stories (...) but they implicitly focus on different types of activities. The Cable Factory in Ruohonlahti is much "rougher" but more lively and adjusted for smaller and younger businesses interested in music, media, design and performing arts. The museums, cafés and shares venues in the area make it easier to establish contacts and see what each other are doing and that´s important for these types of activities. Arabianranta is a more "high-level" business area".

The urban-spatial setting of **Biocant** is completely different. Being located in a rural and quiet area, in the proximity of a few industrial plants, access has to be made almost

exclusively by individual transport. The city of Coimbra is 30 Km away and the neighbouring town of Cantanhede (basic services) is rather small. The area and its surroundings are thus mono-functional, with rather limited diversity of uses.

Biocant is the extreme opposite of a "lively urban location". Yet, these features did not seem to have hampered the agglomeration potential of the location for biotechnology activities. On the contrary, such types of urban-spatial integration seem to fit well the character of those activities. As explained by the founder of a biotech company in Biocant:

> "We all like cafés, restaurants and museums, and most of us live in cities [Coimbra, Porto], but for our business, dealing with precision experiments, we do need a quiet place, far from the buzz and confusion of city life (...) Biocant offers just that".

Important pieces of valuable knowledge for biotechnology entrepreneurs and researchers come from codified scientific articles and patents, not from the "hustle and bustle" of city life. The labs are privileged places for knowledge exploration, acquisition and exchange. Yet, as referred, some lab facilities are not only space intensive but require extra safety measures (e.g. blood and cell banks), calling for calmer surroundings. The director of Biocant explains that

> "...in activities with a strong scientific and R&D compound and combined with pilot production, locations in the core of city centres are unfavourable. It has to do it the calm and safety required to conduct experiments, but also with the biotechnology requirements [labs]. It is not sufficient to just adapt a number of conventional offices".

The **Digital Hub** is well integrated in the western end of Dublin´s city centre, in former premises of Guinness Brewery. It is well accessible by individual and public transport, and close to lively neighbourhoods such as Temple Bar, with a relevant concentration of bars, restaurants and art venues. The Digital Hub managers made strong (financial) efforts to preserve the heritage and identity of the former brewery area, revamping the office premises under their original setting (bricked old walls, etc.). The Digital Hub locates in the middle of the Liberties area, a working-class district with diverse uses but limited amenities.

Beyond the rehabilitation of a deprived neighbourhood, The Digital Hub was developed in such an area bearing in mind that the "average" worker in digital media activities is an urban dweller. On the one hand, such workers tend to privilege the proximity to higher-order amenities that the Digital Hub offers (Dublin´s city centre). On the other hand, the facilities required for SMEs and smaller digital media firms are typically not very demanding or space intensive and can be easily adapted to more conventional offices and shared open spaces. Interviewees do mention these attributes and the identity-image of the premises (the Guinness Brewery is an icon in Dublin) as a plus in their decision to locate in Digital Hub, yet also recognising safety problems during late hours.

The urban-spatial integration profile of **PIA** is somewhere in-between the previous *urban fabric*-oriented Arabianranta and Digital Hub and the *greenfield* Biocant. It locates at the edge of San Sebastian, within the so-called Zuatzu Business Park. It is close to the ring road and highway, being accessible mainly by individual modes and a bus line. It has the (few) basic amenities and diversity of uses of a business park, yet in the edge of a medium-sized city with recognised quality of living (e.g. seaside location).

PIA tenants tend to value the (individual) accessibility to the area; moreover, Zuatzu has a good reputation as a business area. Among many other firms and plants, some audiovisual producers and related activities locate there (since larger plots are need for big shooting premises). Yet, it is unlikely that PIA tenants will "rub shoulders" with other producers in Zuatzu. Premises are settled apart, and there are limited meeting possibilities in area. Still, the demand to locate in PIA has been rather strong. Besides declined company´s applications (unfit to the tenant mix), and based on the number of filled applications under analysis, PIA´s managers expect the occupation rates to rise closer to 80% by the end of 2012 (despite the sharp economic downturn in Spain).

Summing up

The case studies show very distinct urban-spatial integration features, ranging from locations within the city fabric and with a strong urban felling (Arabianranta and the Digital Hub) to greenfield locations in rural surroundings (Biocant) and within business parks at the edge of cities (PIA).

Tenants and activities in those locations do seem to value the features of their urban-spatial integration – hence contributing to the agglomeration dynamics of the location –but they do it in different ways. On the one hand, the activities and tenants of Arabianranta and the Digital Hub place strong value to their location in the urban fabric, in the close proximity of amenities, in places with strong identity and aesthetic components (even if for some segments of Arabianranta such attributes seem insufficient, due to the lack of liveliness, vibrancy and "roughness"). However, the opposite happens with the biotech and science-driven activities of Biocant – its calm and greenfield surroundings are much appropriated for their activities, also for safety reasons. And in the case of PIA, the location at the edge of the city did not seem to constitute a blockage for early agglomeration, due to the proximity to the city and the good image of the business park where PIA was developed. Naturally, accessibility within the urban region is important for every location, but the value ascribed to the characteristics of the immediate surroundings do vary.

Hence, the evidence is supportive of the proposition that the perceived quality of the urban-spatial integration of a knowledge location varies by type of activity, and that perceived quality positively contributes to its growth and agglomeration potential. The link between urban-spatial integration and agglomeration runs through the image connected with location, and more concretely, the fit between the immediate urban-spatial features and the type(s) of activity in which the location intends to focus on.

Table 10. *Urban-spatial integration of the knowledge locations*

Location	Accessibility	Main amenities and attributes	Functional mix in the immediate surroundings – diversity of users
Arabianranta	Good (public and individual modes)	Street art, quality architecture, nature	High (work, residential, student & leisure district)
Biocant	Poor (individual modes, far from larger cities)	Rural, quiet atmosphere	Low (industrial/rural area)
Digital Hub	Good (public and individual modes)	Proximity to lively neighbourhoods; heritage and identity	Medium/high (residential, working class district; walking distance to the city centre)
PIA	Medium (mainly individual modes, City limits)	Basic amenities of a business park; within seaside city	Medium/low (business area in the city End)

Source: Fieldwork
Note: "Accessibility": Poor = almost exclusively individual modes; Medium = mainly individual modes but some public transport; Good = individual and public transport modes.
"*Functional mix in the immediate surroundings*": Low = mono functional location; Medium: two urban functions; High = more than three urban functions.

9.4 Role of the management and entrepreneurial leadership

The literature suggests that the growth of a knowledge location over time has to do with management dimensions, more concretely with the capacity of its managers creating dynamic and innovative environments, a feature called "entrepreneurial leadership". It is suggested that such a capacity goes beyond day-to-day bureaucratic management, and has to do with the capacities of individuals to keep mobilizing resources, projects and networks. Tenants would be willing to join such innovations and environments and thus the location would grow. Thus,

P5: *Entrepreneurial leadership in the management of a knowledge location positively contributes to its growth and agglomeration potential*

How does the relation between institutional entrepreneurship and agglomeration operate in the analysed case studies?

Having an intended specialization or theme is not directly assumed as associated with a sound (or weak) management, or with entrepreneurial leadership. We operationalised the degree of entrepreneurial leadership of a knowledge location through a number of features: i) the composition of the location´s *management entity* and stakeholders involved (single stakeholder or combinations); ii) the characteristics and "style" of the *daily executive team* (e.g. "landlords", university professors, entrepreneurs; bureaucrats); iii) the existence or not of *formalized synergy supportive initiatives* (e.g. CEO meetings, networking sessions, etc.) and; iv) the extent of *informal/unstructured brokering* and network mobilisation (coded as weak, moderated and strong). The codes and assessments were attributed on the basis of input collected through the interviews with managers, tenants and other diverse stakeholders within and outside the location, triangulated with a variety of secondary data sources. Table 11 presents synthetic results and scores per location.

In **Arabianranta**, the direct link between management dimensions and agglomeration showed to be weak. Arabianranta was managed since the beginning by a special purpose vehicle called ADC – Art & Design City Ltd. – composed by all the relevant stakeholders involved in the development of the area (City of Helsinki, lead firms, universities and, later on, the community association). Yet, ADC role has been primarily focused on coordinating

the actions and interests of this diverse group of stakeholders and not on supporting or connecting tenant companies, even if such companies did move to the area due to its image, promoted concept and urban quality – features to which the role of ADC has been pivotal.

Besides ADC, the key role of the daily executive team of the different business locations has been primarily a generalist "landlord" one, with limited involvement in the companies and organizations´ businesses. Arabianranta´s management did not host or promoted formalized/regular synergy supportive initiatives. Likewise, no evidence was found of informal/unstructured brokerage initiatives in the location. Though we cannot rule out that those are not happening in some cases and through some individuals (e.g. through TaiK professors), they are not in the hands (or a major concern) of the whole area´s and office building managers.

Yet, a domain in which Arabianranta´s management has been particularly active, brokering and supporting new innovative environments is the promotion of "living lab" initiatives in the area (see chapter 7). Such living labs largely consisted in mobilizing the users of the area (citizens, universities, companies) to test new solutions (e.g. in retail, mobility, health, communications) proposed by companies and other organizations, not necessarily settled in the area (e.g. Nokia). These projects created a new narrative for the area ("Social Silicon Valley"), with the direct involvement of ADC. However, we could not find a direct relation or causal process between such experiments and the growth and agglomeration of the area, or between such initiatives and enhanced synergies between tenants at the location level.

The management features of **Biocant** are substantially different in many respects. Formally, Biocant is managed by an association called ABAP, created with the intention of building and managing a network of business parks in the region. ABAP is formally composed by representatives of different Municipalities in the region, business associations, universities, among other stakeholders. However, in practice, its role is rather modest. Biocant has been developed and run since the early beginning by the Municipality of Cantanhede and by the Centre for Neurosciences and Cell Biology (CNC) – their key stakeholders – leaving ABAP with a merely administrative/formal role.

While the Municipality is the largest shareholder, the executive day-to-day management of the location has been in the hands of the Vice-director of CNC (Prof. Carlos Faro) and a restricted team. Prof. Faro is a well-known and internationally experienced professor in biosciences, strongly involved with the creation of Biocant as well (see chapter 8). On the one hand, he was involved in the design of the location, namely the rationale and implementation of the "anchor" R&D centres, establishing early connections with the parent R&D centres in the University of Coimbra (and, to a lesser extent, the University of Aveiro). On the other hand, some of the first tenants of Biocant were Prof. Faro´s former students, whom he nudged and "mentored" to re-locate or start-up their ventures in Biocant. Prof. Faro has also been closely involved with the location´s internationalisation, and, likewise, promoted former students and young PhD/star scientists working in the US to head technology transfer labs and start-up ventures in Biocant. This contributed to the early growth of the location and reputation of Biocant as a well connected and dynamic bio-sciences location.

Over time, the proactive management of Biocant gave rise to a number of synergies for knowledge exchange among tenants (see chapter 8). Despite the fact that Biocant provides no formalized/regular synergy-supportive initiatives or meetings, its managers facilitate frequent brokerage and the establishment of new connections among its tenants, as well as to other relevant partners outside the location. This makes the location attractive for new companies and organizations.

There are different examples and mechanisms through which this happens. On the one hand, Prof. Faro is frequently invited to the advisory board of companies in the park; moreover, due to support and a "being there" feeling, many entrepreneurs recognise his role as "mentor" of their initiatives. Since he follows the competences, needs and challenges of companies, there are varied cases of business and technology partnership bridged by Prof. Faro in Biocant (e.g. between R&D labs and companies and between different companies, e.g. a new project for new heart-disease solutions based on stem cells; or joint commercial distribution of health kits).

On the other hand, Biocant´s managers are active in many other platforms and organizations. A number of visits are organized to other bio-locations in the world, in

which Biocant´s managers explore business complementarities for their tenants and investment opportunities. At the national level, Biocant´s managers are active in the so-called Portuguese Health Cluster, connecting their tenants with R&D projects taking place with other companies and institutes. Biocant has also established over the last years a sound cooperative yet informal relation with the University´s of Coimbra business incubator (called IPN). As Prof. Faro refers:

> "We [Biocant] are not an incubator, but we have a very good relation with IPN. They support our firms developing business plans and other typical start-up services that we don't have, while we support their biotech start-ups with our experience and advice. This works very well, and we never signed any paper on that".

It results from the previous that the presence of entrepreneurial leadership in the location, namely at the level of its director, seems to be influencing its growth and agglomeration capacity. The formal management partnership (ABAP) or formalized synergy-supportive initiatives (which are absent) did not play a role on this, but mainly the proactive character of Biocant´s management, the recognition among its peers and the location´s brokerage and network building/reactivating activities. This strengthened the image of the park and supported the development of new synergies and mentoring phenomena in the location, a highly valuated feature by new and current tenants. The recent decision to relocate the headquarters of CNC from Coimbra to Biocant (150 affiliated researchers, nudged by Prof. Faro) is also part of the creation of new environments in the park, conducive to reinforce the agglomeration dynamics in place.

The **Digital Hub** has been managed since the beginning by the DHDA, a special purpose vehicle launched by the Irish National Government, with the participation of National Enterprise and FDI agencies, as well as Dublin´s City Manager and a community representative (from the Liberties District). Besides this institutional model, the Digital Hub has been managed by a smaller daily executive team, composed by full time, highly experienced managers with recognised professional and academic backgrounds in the IT and digital media industry. Those are responsible for the overall implementation and strategy design of the Digital Hub, finance, marketing and communication. Such managers

understand well the digital media business, assuring quality and specialized support for the tenants.

The Digital Hub´s managers explicitly focus on fostering synergies between tenants, as this is perceived as one of the main missions of the location. However, there are no formalized or regular initiatives. As explained by the strategy and communication director:

> "We used to arrange formal networking events and CEO meetings but stopped doing that. It proved too imposing and artificial. If a company needs support to arrange meetings with other companies [e.g. around a certain technology or business theme] we are here to arrange it, but we prefer to keep it a bit less structured and more bottom-up (...) They often know better than us, and we don't like to be too pushy and overwhelm them with initiatives."

Hence, Digital Hub´s management team do act as a broker, but in a less structured way. They bridge and connect initiatives personally, namely facilitating contacts with international players and research in the region that fit tenants´ profiles. Besides such unstructured initiatives, a strong focus is placed on creating "buzz" and "sense of belonging" within the location. This has been done through a number of internal social media tools, shared facilities, diffusion of information of the hub´s activities, showcasing cases of successful cooperation in the Digital Hub.

Moreover, the Digital Hub management does support the development of innovative projects involving the location´s tenants. One example is the so called "Digital Hub learning programme", under which multiple projects and partnerships are established between the Digital Hub and the local community, providing the community (e.g. school kids and youngsters) the opportunity to learn about IT skills and digital media, with the active involvement of Digital Hub´s tenants, joint contests, etc.

Thus, in the Digital Hub, the link between management/institutional entrepreneurship and agglomeration has been running primarily through informal brokerage mechanisms, by experienced managers who support innovative projects that other companies and tenants become willing to adopt, joining the location. There is no sign of relevance for formal meeting initiatives. Yet, in this case, the broad formal partnership did seem to have played

a role (through the involvement of the community representatives, nudging leading projects), but only when activated by proactive managers in the location.

Like in the case of Arabianranta, the relation between management dimensions and the agglomeration of **PIA** has been modest. PIA is a Municipal-driven initiative in the hands of *Fomento San Sebastian*, the Economic Development Unit of the City (legally, it is a 100% Municipal owned company). Hence the development and management of PIA has been run by the City Economic Development project managers, with limited expertise in knowledge-based economic development in general, and in audiovisual in particular. Notwithstanding this, a "cluster manager" for the audiovisual sector has been appointed within a sub-unit called "emergent sectors", with the mission of listening and getting together companies and other audiovisual organizations. Despite the good will and the investment to build and run the location, the involvement has so far been limited, as explained by the assistant project manager for audiovisual in Fomento:

> "We don´t have anybody from our technical staff on a daily basis at the location, only one person to deal with maintenance. (...) Currently, we deal mainly with the administrative part of the location (...) [adding to this] we also analyse the applications of new companies willing to rent premises".

Despite the current limitations, Fomento organizes together with the City´s Film Commission the so-called "PIA meetings", monthly gatherings organized around a concrete theme (e.g. internationalization, new media, etc.), with presentations of experts and the ambition of promoting networking among companies. Moreover, it is expected that new tenants such as Tecnalia (an R&D institute with expertise in media and audiovisual) will steer new interactions in the location, increasing its attractiveness. As said by a Fomento representative involved with PIA:

> "Our role will tend to be taking the back seat and [administratively] managing the location. We expect Tecnalia to act as the broker, connecting companies and helping those finding new business and innovation partners, inside or outside PIA. That has been Tecnalia´s prime interest to settle an antenna in PIA".

Therefore, so far, the management features of PIA have not led to the emergence of entrepreneurial leadership in the location, being its direct management relatively passive; the management of PIA has been positively complemented by the expertise of Tecnalia and the audiovisual networks of the Film Commission, which contributes to the image of the location and some emerging signs of network building; yet, the direct role of Fomento as a manager cannot be directly associated with the location´s agglomeration dynamics so far.

Summing up

The cases show rather distinct management features among them, as well as different indications of entrepreneurial leadership from their management teams. Entrepreneurial leadership – i.e. the capacities and action of the location´s managers to permanently mobilize resources, projects and networks – has shown to be limited in Arabianranta and PIA, and much more consistent in Biocant and the Digital Hub.

Which causal mechanisms have been driving the link between entrepreneurship leadership and agglomeration in the analysed cases? On the one hand, it is associated with capacity of managers for creating/attracting projects and competences to the location (financial resources, entrepreneurs, organizations). Moreover, such managers and their deep knowledge of the activities in the location tend to support the emergence of networking atmospheres and brokerage dynamics within the location (nudging tenants to link their skills) and with it to the "outside world". This supports the formation of "community feeling" in the location, increasing its attractiveness to related businesses and activities. On the other hand, there is an image effect associated. Well-known and recognised managers among its peers (e.g. in the sector or field of activity) become part of the image of the location; moreover the management and presence of competent and dynamic brokers can be seen as a rare service in its own right, attracting new tenants.

The case studies also show that the previous mechanisms and the entrepreneurial leadership of the location can be set in motion also by location´s tenants, and not exclusively by appointed managers. Examples in the case studies are Tecnalia (PIA), NDRC (Digital Hub), TaiK (Arabianranta) and a leading cryopreservation company (Biocant). Such tenants can also act as mentors for smaller companies and brokers within

the location (ecosystem formation) and act as ambassadors of the location (image formation).

Finally, contrarily to what could be expected, the institutional composition of the management entity (few or many stakeholders involved) or the presence (or not) of formalized synergy-supportive initiatives seem to have *per se* a limited (if any) connection with the abovementioned mechanisms. The Digital Hub´s learning initiative (with the community association involvement) shows that the participation of multiple stakeholders can foster new learning atmospheres in the location, but it requires other entrepreneurial leadership dimensions to foster the initiative´s ignition.

The case studies also suggest that this finding is related with the dynamic sectors in which the knowledge locations specialize. Such sectors (e.g. biotechnology, digital media) function under environments of fast change, requiring flexible supports and fast responses that can be better provided by dynamic individuals than by formalized structures. Moreover, too formalized structures may be associated with closed "groups", where it is difficult to plug in.

Hence, the above evidence supports the proposition that entrepreneurial leadership in the management of a knowledge location positively contributes to its growth and agglomeration potential. This relation is mediated by the formation of learning, brokerage atmospheres and community feeling in the location, and by the image associated with the quality (and recognition among peers) of a location´s management. In this sense, entrepreneurial leadership and specialized management attributes of a location become a rare service in its own right.

Table 11. *Management of the knowledge locations*

Location	Management entity/ stakeholders involved	Daily executive team	Formalized synergy supportive initiatives?	informal/unstructured brokering by the managers
Arabianranta	ADC Art&Design City (company owned by the City, firms, HEIs and community association)	Daily managers for the area as a whole plus office space managers ("landlords")	No	Weak
Biocant	ABAP - Association of Regional Business Parks (many formal stakeholders)	Highly experienced biosciences professor - "spider in the web"	No	Strong
Digital Hub	DHDA - Digital Hub Development Agency (Owned by the National Government, with National Agencies, the City and community representatives)	Highly experienced managers form the IT and digital industry	No (not anymore)	Strong
PIA	Fomento San Sebastian (Municipal Economic Department)	City general economic managers (with outsourced expertise of R&D institutes	Yes (PIA meetings)	Weak

Source: Fieldwork
Note: "Informal/unstructured brokering": Weak = no evidence of brokering activity; Medium = some evidence of brokering activity; Strong = frequent and valued (by the tenants) brokering activity.

9.5 Conclusions: intermediate outcomes and mediating processes

In this chapter we provided empirical confirmation for the theoretical propositions brought forward in chapter 5, namely the relations between three key features of a knowledge location and its growth and agglomeration dynamics. By doing so we didn't want to suggest that growth and agglomeration are (or should be seen as) the ultimate or most important result of knowledge locations (see chapter 4). However, by putting growth and agglomeration dynamics central, we could assess and flesh out to which extent are there other relevant outcomes and mediating processes linking a location´s features with their agglomeration results.

Which factors contribute to the growth and agglomeration in a knowledge location?

After controlling for a number of factors that can exert influence in a location´s growth and agglomeration – rental and real estate prices, overall economic dynamism of the host region and of specific sectors – we confirmed the influence of three key features: *specialization* in related activities, proper *urban-spatial integration* and the entrepreneurial leadership of a location´s *management.* As explained, when activated, each of the three dimensions provides tenants with a set of unique resources that can be accessed in the location but not outside it, increasing its attractiveness, and thus the location grows.

It was not our aim to explain which locations grew "more" (all the cases in the set show sizeable agglomeration results), but to identify factors responsible for growth and agglomeration across the cases. In this vein, one important conclusion from the analysed evidence is that there are multiple paths to growth and agglomeration in knowledge locations. We could not identify a single factor that had to be always present (necessary condition). In other words, as foreseen (see chapter 6), the phenomena of growth and agglomeration in knowledge locations exhibits *equifinality*: a similar outcome (growth and agglomeration) can be based on substantially different features or "competences". At a certain point in time, the lack of one or other feature can be compensated by the presence of others. For example, growth and agglomeration in Arabianranta or PIA happened even in the absence of entrepreneurial leadership; and in the Digital Hub in the absence of specialized facilities or infrastructures.

As previously illustrated on Table 8, besides showing considerable agglomeration results relative to its size, the analysed case studies presented significant growth already during the first two years. The evidence presented in the chapter allowed exploring the different paths to early agglomeration across cases, associated with different features or "strengths" (yet not exclusively):

- ***Specialization-driven***, i.e. primarily associated with the provision of rare/unique resources and facilities, and combinations of related tenants in place (e.g. PIA, Biocant). In such cases, apart from the image associated with the concept, specialization primarily activates the perception of learning and synergy potentials.

- ***Urban-spatial integration driven***, notably relevant in locations that intended to specialize in activities with higher symbolic content (Arabianranta/design, The Digital Hub/digital media). In such cases, agglomeration is activated through the high quality of its urban integration, identity and functional mixes in the immediate surroundings. For other activities (Biocant/biotechnology), the valued urban-spatial integration has totally different features, and showed to be more a supportive factor than a key driver.

- ***Management-driven***, primarily associated with the recognition of the location´s managers and directors, and their capacity to access and mobilize relevant projects and networks for the tenant´s activities (entrepreneurial leadership). The actions of those managers can become directly responsible for attracting and nudging important tenants to the location, or, in other cases, by the early creation of distinctive environments and brokerage among tenants that others want to adopt (e.g. Biocant, The Digital Hub).

Which intermediate outcomes and mechanisms are associated it [growth and agglomeration]? How do they operate?

However, in order to better understand intermediate outcomes and the mediating processes leading to growth and agglomeration, a more dynamic perspective is needed. The analysed cases allowed studying the evolution of knowledge locations over a significant timeframe,

so that such outcomes and processes had enough time to unfold. In other words, the aim was to get into the texture of the development process rather than focusing on its ultimate outcomes *per se*.

The exploration of the evidence from the four analysed knowledge locations allowed the identification of *two key mediating processes* linking the features of a knowledge location with its growth and agglomeration outcomes over time. We called them "image formation" and "ecosystem formation"[30] (see Figure 7).

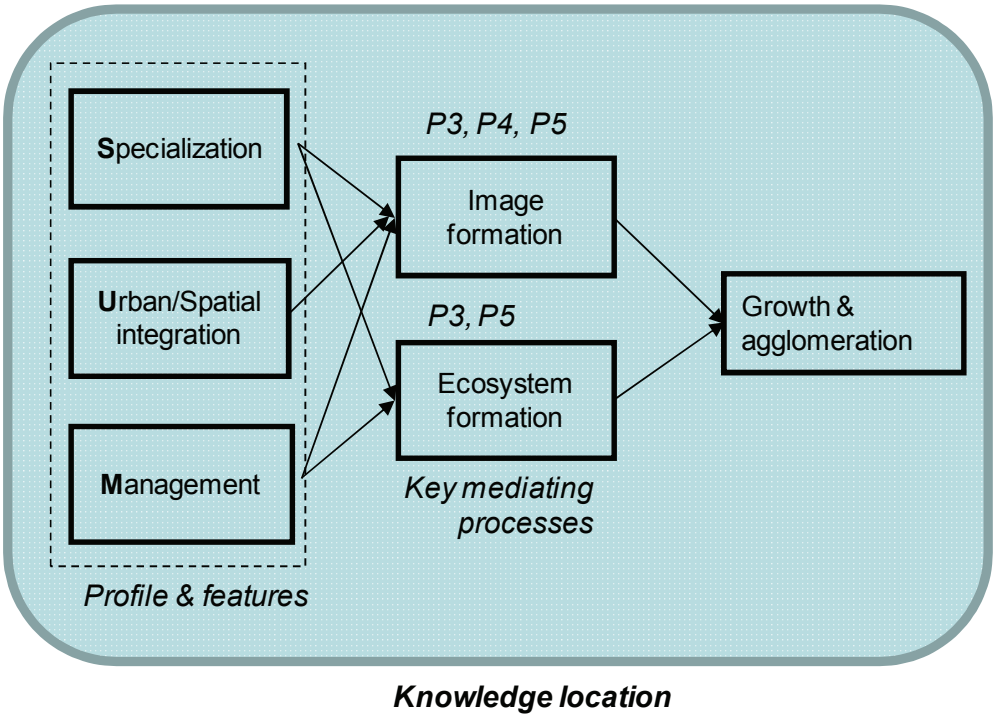
Image formation. Propositions P3, P4 and P5 suggest that knowledge locations grow and agglomerate knowledge activities by forming specific images and identifiable concepts. For example, image formation is associated with a location´s specialization, e.g. due to the presence of rare facilities and a coherent and related mix of tenants, eventually with "anchor" tenants (**P3**). The result is the formation of "safe-choice" and "place-to-be" effects, guiding location decisions in contexts of limited information and cognition. Also the urban-spatial integration of a knowledge location contributes to image formation, through the quality of the fit between its surrounding environments and the working-living requirements of its intended tenants (**P4**). This dimension is particularly relevant for locations specializing in activities with more symbolic content, calling for denser urban settings. Finally, a location´s management, such as the recognition of its managers and their entrepreneurial leadership (and eventually also of important tenants) become a rare and identifiable resource in its own right (**P5**); moreover managers and tenants become ambassadors of the location, contributing to its image formation. Overall, image formation makes locations easier to identify, attracting specialized investments and entrepreneurs from the region, nationally and internationally.

---

[30] Since our empirics focused on situations of positive/strong growth and agglomeration results, the conceptualization of the following mediating processes are mainly based on "positive" scores of the location features associated with those agglomeration results (i.e. focused specialization; fit between a location´s intended profile and its urban-spatial integration; presence of entrepreneurial leadership). However, it is also possible to imagine the theoretical situation of negative scores, leading e.g. to unclear/negative image formation and/or lack of ecosystem formation (as we saw during the case studies).

Ecosystem formation. Moreover, propositions P3 and P5 suggest that knowledge locations grow over time by forming specific ecosystems of interacting elements (e.g. tenant firms, organizations, location managers, etc.), underlined by emerging routines in place and its connections to the "outside world". The formation of such ecosystems is intimately associated with a location´s specialization, namely the capacity of agglomerating a coherent tenant mix in related fields and rare facilities supporting their interaction and exchange (**P3**). This facilitates the emergence of environments for joint learning and experimentation, networks and communities of problem solving and learning through observation of other tenants. Moreover, management dimensions of the location and the action of their managers and leading tenants contribute to "glue the pieces together", fostering new relations within the location (**P5**). The result is the emergence of formal or/and informal mentoring relations in place, as well as brokerage phenomena inter-tenants, and between them and other relevant connections in regional, national and international spaces. This contributes to the emergence of intra-location routines and sense of community, associated with joint fulfilment of needs and the sense that being in the location matters. Overall, ecosystem formation creates in the location a valuable set of external effects that new tenants and organizations would be willing to join.

Figure 7. *Key mediating processes*



The identification of these two mediating process – constituting important outcomes in their own right – provide new lens to analyse the growth and agglomeration in knowledge locations.

First, they stress that growth and agglomeration in knowledge locations is a multi-causation phenomenon, allowing disentangling the roots and different circuits to that outcome (see Figure 7). Arabianranta and PIA are cases in which processes of image formation have been more dominant in the way to agglomeration, while ecosystem formation has been more visibly present in Biocant or the Digital Hub.

Second, the processes of image formation and ecosystem formation can co-exist in the development process of a knowledge location, but not necessarily. Having agglomeration at a certain point in time doesn't necessarily mean the presence of a dynamic ecosystem. The process of image formation can be triggered by all the three different drivers

considered, but the process of ecosystem formation is more selective; in other words, the "substitutability" between the drivers is more limited. On the one hand, we did not find evidence of a link between urban-spatial integration and ecosystem formation. On the other hand, ecosystem formation seems to be particularly associated with some specific components of "specialization" and "management", such as a specialized/related tenant mix, rare facilities, proactive daily management teams and informal yet active brokerage, and much less with formal institutional partnerships and synergy supportive initiatives.

Third, there are different time lags between each of the two mediating processes start to kick-off. While the image formation process start to take shape early on with the development of a knowledge location (linked with the intended concept, early anchor tenants, provided facilities and urban-spatial integration), the emergence and formation of an ecosystem takes more time to unfold. Hence, the early growth of a location can hardly be associated with an ecosystem, but much more with image formation.

Finally, if the process of image formation can trigger growth and agglomeration in a knowledge location, the evidence suggests that maintaining it over time requires ecosystem formation to kick-off as well. For example, the recent exits of important tenants from Arabianranta (TaiK, Arabus) suggest the exhaustion of an image-driven agglomeration model, namely in the absence of a relevant ecosystem formation. Other cases (Biocant, the Digital Hub), illustrate processes in which image formation and ecosystem formation become intertwined over time, reinforcing each other. This suggests that growth and agglomeration of a knowledge location over time has ultimately to do with ecosystem formation dimensions.

10. CONCLUSIONS AND DISCUSSION

This chapter wraps up the contributions of the thesis. Section 10.1 provides a general overview of the main arguments, while Section 10.2 and Section 10.3 answer each and every one of the research questions, bringing back the previously elaborated insights in a summarized way. More concretely, Section 10.2 focuses on the theoretical analyses (features, dynamics and benefits of knowledge locations); Section 10.3 combines the theoretical and empirical contributions to inform an integrated framework to explain the emergence and development of knowledge locations. Section 10.4 concludes with final remarks and research avenues.

10.1 General conclusions

The creation of technology parks, creative factories and other types of knowledge hubs is currently one of the most popular local economic development tools throughout the world. Like most policy tools, they do not provide a fast track to change and prosperity, and their design is not straightforward. However, over generalizing their limitations does not get us much closer to understand how such types of instruments can be improved to the benefit of their local and regional economies.

This thesis called those area-based policy instruments "knowledge locations". It refrained from directly evaluating their different categories of impact (there are already a considerable number of studies on that) to take one step back and empirically understand the texture and dynamics of their functioning. Therefore, the main research question of this thesis was:

How do knowledge locations emerge and develop over time?

This thesis contributes to answering that question by posing two main arguments:

First, it argues that the emergence and development of knowledge locations is better understood in the context of the spatial-economic dynamics of their host regions. On the one hand, emergence results from the coupling of interests and power of individuals and organizations; however, their actions are deeply influenced by the character of the region´s production-innovation dynamics and policy-planning traditions. Thus, it is misleading to

think of knowledge locations as the sole result of the action and free will of visionary (or short-sighted) decision makers. On the other hand, the vision and design for a knowledge location can hardly be once and for all – they evolve over time in multiple rounds of decision making. Again, those changes do not necessarily result from good or bad planning, but from the coupling of 1) external-to-the-location changes and actor´s self-organization with 2) the progressive co-evolution between the location and its spatial-economic context. This means that their design and development can hardly be understood as the predictable result of a linear, well-defined set of actions.

Second, contrary to what is suggested in the literature, it argues the that growth and agglomeration outcomes of a knowledge location do not directly or exclusively rely on the economic or sector-specific dynamism of its host city or region. Those features are certainly important moderators – constraining or fuelling it further – but not necessarily drivers. To explain growth and agglomeration in a knowledge location (its most basic outcome), this thesis puts forward three factors: specialization, urban-spatial integration and management/entrepreneurial leadership. An important conclusion is that there are multiple pathways to growth and agglomeration – no single factor has to be always present to explain it at a certain point in time. Moreover, the three factors proved relevant, but in different ways. They are relevant to the extent that they contribute to the formation of two key mediating processes that explain growth and agglomeration: *image formation* (associated with the identification of a concept) and *ecosystem formation* (associated with exchange and learning among tenants and organizations). Those processes provide two different paths to agglomeration, but they are not mutually exclusive. Their interaction largely influences the development of a location over time.

10.2 Knowledge locations: features, dynamics and benefits

This section reviews and answers the first three research questions of this thesis.

What are knowledge locations, and what are their main features?

Departing from a review of different definitions and manifestations, this thesis defined knowledge locations as *planned area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district*. The aim was putting forward a

definition that is flexible enough to encompass different manifestations of the phenomenon, but bounded enough to bring it operational and of scientific and policy relevance. The more conventional and well-known types of knowledge locations are with no doubt science and technology parks, but others manifestations have been on the rise during the last decade, like creative districts and knowledge factories. The latter are associated with the recognition that innovation is not restricted to the technological domain; they tend to be more "urban" than the former, namely by providing not only office space and firm-supportive services, but also – at least in theory – a more diversified array of living, consumption and leisure possibilities.

A number of "hybrids" between these two types have been emerging and their objectives diversifying in the same proportion of the involved stakeholders (different bureaus within the city administration, universities, cultural organizations, real estate developers, community associations, etc.). However, what still binds knowledge locations together is their "bottom-line" objective of agglomerating knowledge intensive activity in a certain area, with an eye to fostering synergy, innovation pay-offs, and, ultimately, local economic development. Therefore, knowledge locations have been justified under both market-failure arguments (presence of external effects, promotion of collective efficiency and resource sharing) and system-failure arguments (creating new innovation supportive organizations and networks, breaking old routines, supporting new activities to take off).

Yet, other reasons for developing knowledge locations can be identified. On the one hand, knowledge locations become "physical proof" of broader development strategies, and play an important role uniting stakeholders in the definition of common visions for their territories. However, on the other hand, knowledge locations can also become instrumental in the local political discourse, e.g. in legitimizing investments in infrastructure and marketing under the umbrella of local economic development.

How can we explain the growing and revitalized attention for knowledge locations, and why are (some of) them moving back to cities?

To answer this question, this thesis framed the development of knowledge locations within a broader theory of urban and regional dynamics. This theory places the preferences of residents, firms and governments central, as they interact to shape urban development

patterns. In line with this approach, it is possible to understand knowledge locations as a government *provision* designed to accommodate the changing preferences of residents (who are also workers) and firms, looking for welfare potentials in space. Thus, if knowledge locations do result from government action, they are ultimately influenced by other urban actors' *self-organization* dynamics and preferences, which in turn respond to fundamental changes.

This theory explains how the generalized interest in technology parks from the 1980s onwards has been catalysed by three fundamental societal changes: technological revolution; globalisation; and emergence of the informational economy. Likewise, it also explains how recent evolutions in the societal landscape and preferences (technological convergence ICT-audiovisual, talent mobility, intertwined work-life patterns, consolidation of a knowledge economy) have been driving the revitalized interest in knowledge locations. Namely, they provoked qualitative changes and variation in their designs, giving rise to the abovementioned new hybrid "working-living-consuming" concepts.

In the face of such changes and trends, we recognised a general "urban turn" in the development of knowledge locations, but explored the reasons behind an observed persistence of locational diversity within urban regions (locations developed within the city fabric vs. in sub-urban/rural areas). Part of the explanation can be found in the possibilities to access "welfare potentials" from different parts of functional urban regions and the resulting inter-municipal competition to attract firms, jobs and investments (e.g. urban regeneration funds). Yet, the other part of the explanation for the locational diversity, it is argued, can be found in the spatially-heterogeneous living and working preferences of residents and companies. For example, it has been demonstrated that activities that more intensively rely on symbolic content have preference for dense urban settings, hence influencing the observed spatial nuances. We concluded by developing a typology of knowledge locations linking the types of knowledge activity with the differentiated spatial preferences for city vs. greenfield locations.

What kind of effective benefits do knowledge locations provide for firms and urban regions?

As said, the objectives pursued by knowledge locations can be rather diverse, and fraught with contradictions. There is hardly a single measure for "success". In this thesis we primarily focused on the side of the knowledge, innovation and business development objectives. The extant literatures are typically very sceptical in this respect, at least when performance is analysed through comparisons of companies inside and outside a location. In many respects (innovation, sales, R&D investments, financial results, contacts with universities), the performance of firms located in science parks is not better than off-park firms. Hence, one indisputable conclusion from that collection of studies is that the demands and expectations placed on science parks and other locations over the last decades have been largely overestimated and unrealistic.

Despite the bleak results, and when analysed beyond the sum of firm´s performance at a certain point in time, at least two main types of benefits associated with knowledge locations could be identified at the level of city/region. The first has to do with the emergence and "un-locking" of new activities and productive combinations in regions, e.g. as knowledge locations and their managers become supportive of the entry, start-up and development of new actors and organizations – both coming from the region or attracted from other places. The second, related with the first, has to do with their contribution to provoke progressive change in the institutional frameworks that supports innovation in the region (e.g. by providing ample experimentation room, demonstrating the viability of solutions, giving voice to its proponents, forging new cooperation routines and regulations, breaking silos, etc.).

The literatures studying knowledge locations in relation to the dynamics of their host regions are still very scarce. What is known is that the abovementioned effects naturally do not emerge simply because a new knowledge location is planned. The literature suggests that a lot has to do with its capacity to become an urban "actor" on its own right and agglomerating entrepreneurs, firms and organizations, while supporting the development of synergies and learning among them. Thus forging some degree of agglomeration seems to be a first necessary condition for knowledge locations to start exerting influence in the

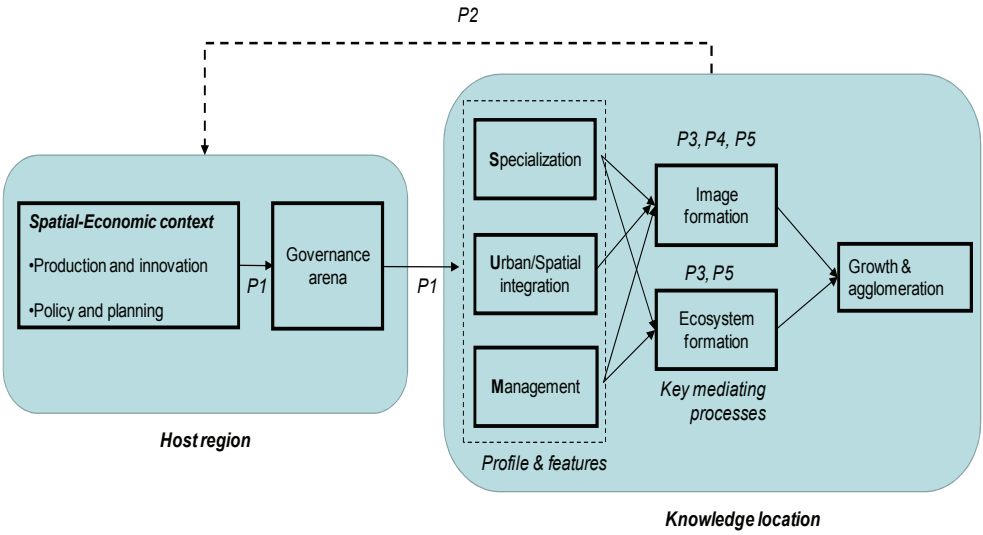
regional institutional setting. But, at the same time, and notwithstanding the effects of pure relocations within the region, growth and agglomeration suggest that "something" is already taking place at the level of the location. Yet, the mechanisms and different pathways behind that growth – when controlled for price levels and the dynamism of the region – are still relatively unexplored.

10.3 Towards a theoretical framework of emergence and development

Based on the previous insights, extent literatures and empirical work, this thesis unfolded a theoretical framework explaining the emergence and development of knowledge locations. This section answers the remaining research questions by elaborating on its underlying propositions and causal mechanisms.

The framework considers two main levels of analysis: *knowledge location* and *host region*, which interact with each other. At the level of the *host region* it considers i) the *spatial-economic context,* formed by two related systems of actors and underlying institutions (*production-innovation system* and *policy-planning system*) and ii) the *governance arena* in which the visions and features of a knowledge location are negotiated. At the level of the knowledge location it considers i) three key features of its design, namely its *specialization*, *urban-spatial integration* and *management features*; ii) its growth and agglomeration outcomes and iii) two mediating mechanisms linking the features with the location´s agglomeration outcomes. Figure 8 presents the final complete visualization of this theoretical framework.

Figure 8. *Theoretical framework (with mediating processes)*



Besides the theoretical hints provided by the literature, the progressive development and testing of this framework made use and explored four different case studies, i.e. *processes of emergence and development of knowledge locations in cities*: Arabianranta (Helsinki), Biocant (Coimbra-Cantanhede), The Digital Hub (Dublin) and PIA (San Sebastian). All the case studies are part of a "new generation" of knowledge locations that intended to specialize in a knowledge domain or sector of activity. This limits the main generalization domain of the underlying theory ("theme/activity-specific locations), even if the analysed cases encompass both science parks and other "urban" versions of knowledge locations.

Moreover, we purposely chose cases with similar results in the dependent variable (growth and agglomeration outcomes) and differentiated – sometimes extreme – results in other dimensions of interest (such as the spatial-economic context, effective specialization of the location, urban-spatial integration and management features). This allowed identifying the presence of multiple paths leading similar outcomes and tracing back the involved mediating processes.

In the next paragraphs we associate the research questions of this thesis with the specific propositions P1 to P5 (as illustrated in Figure 8), as well as with the underlying mechanisms. When appropriated, we derive policy implications from the findings.

How does the emergence of a knowledge location relate to its spatial-economic context?

P1: *The emergence of a knowledge location results from a governance process in which actors from two localized systems strategically engage: production and innovation system and policy and planning system. The location´s design depends on the coupling between actor´s power and influence and the institutional setting of the region.*

Knowledge locations do not emerge and develop in vacuum, but in rather concrete urban and regional contexts, with history and texture. The production-innovation and policy-planning systems (their actors, but also their practices and institutions) determine the emergence and design of a knowledge location. Actors from both systems influence the emergence and negotiate their design, as the multiple resources necessary to make it emerge (e.g. knowledge, funding or the planning authority) are often found in different hands. The initial design of the location is influenced by the different degrees of power exerted by the involved actors (e.g. access to resources, influence, authority, capacity to convince others), which gives rise not necessarily to the "best" location, but to the location that fits the interests of the most influential players better (a concrete specialization, urban-spatial integration and management features). As illustrated, in some cases the distribution of power and resources among actors is more balanced, in others less. Yet, despite the role played by the previously mentioned actors, the four analysed cases do show that the emergent designs of knowledge locations owe a lot to the "texture" of the regional institutional setting underlying both systems (e.g. planning regulations; cooperative culture; previous initiatives of community involvement; policy, sectoral and other regional-specific organizational routines). This illustrates that the notion of *system* (with actors *and* rooted institutions) provides for a more complete explanation for the emergence and design of a knowledge location.

The previous insight helps to explain why "copying" concepts and designs of knowledge locations created elsewhere proved to be so difficult. Even if the types of involved actors are the similar, their influence and power is likely to be very different across places, let alone the coupling of their visions with the distinct features of a region´s production-innovation institutions and planning routines.

However, if the previous installed dynamics have a strong influence in the creation and design of knowledge locations, a challenge for policymakers is to avoid the risk of too much "demand following" designs, which ultimately may lead to the reproduction of old institutions, rent appropriation by powerful players and limited regional change. From a policy perspective, this calls for a balance between designing locations that fit the character of the regional context and, at the same time, have the potential to create change in their regional economies (e.g. by igniting a new complementary activity that makes use of former regional assets and institutions).

How does a knowledge location´s vision and features change over time?

P2*: A location´s vision and profile evolve over time, in multiple rounds of decision making; that evolution results from the coupling of external-to-the-location changes with the progressive co-evolution between the location, its spatial-economic context and the governance arena.*

This proposition is about the feedback loop between the development of knowledge locations and the changing contexts of their host regions. The analysed cases show that the development of knowledge locations follows a non-linear process, over multiple rounds of decision making, with different problem-solution combinations. Changes in a location´s vision and design do not necessarily result from "bad planning". The cases illustrate a number of external-to-the-location events and forces that provoked change and the need for new solutions, such as changes in the global context or landscape (e.g. severe economic downturns; global industry restructuring). Moreover, change may also result from the actor´s own self-organization dynamics, translated e.g. in entries or exits from a location´s governance arena (e.g. the entry of CNC in Biocant or Tecnalia in PIA, the exit of MLE in

Dublin), change of ideas, reaction to new opportunities and eventual learning from trial-and-error out of the participation in the development of the knowledge location.

Despite the non-linearity, from a certain moment onwards knowledge locations start to exhibit relevant path dependencies: decisions taken in one moment of time influence the context that will shape action in subsequent moments. The development of the knowledge location starts to influence the spatial-economic context of its host region, setting on motion co-evolution dynamics between location, context and composition of the governance arena. Examples from the cases are the recognition of the Digital Hub as a key player in the National Digital Media Strategy, reinforcing their role and resources for their tenants; the emergence of new bio-supportive institutions in Coimbra-Portugal shaping Biocant´s new vision and the attraction of new tenants; the development of new cooperation routines in San Sebastian to support further the audiovisual sector. It results from the previous that since the moment the core concept and vision for the knowledge location is set, it does not tend to change radically, but to progressively evolve and adapt.

The former insight poses a significant challenge to policymakers involved in the development of knowledge locations: they have to strike to define a promising vision and recognisable design, while keeping the concept flexible enough to cope with change.

Which factors contribute to the growth and agglomeration in a knowledge location? Which intermediate outcomes and mechanisms are associated it? How do they operate?

P3: *The specialization of a knowledge location positively contributes to its growth and agglomeration potential*

P4: *The perceived quality of the urban-spatial integration of a knowledge location varies by type of activity, and that perceived quality positively contributes to its growth and agglomeration potential.*

P5: *Entrepreneurial leadership in the management of a knowledge location positively contributes to its growth and agglomeration potential*

At this stage we were interested in understanding which variables could policymakers influence to foster growth and agglomeration, and the relations between those variables, growth and agglomeration, and other eventually associated outcomes (such as the creation of synergies and exchange among tenants). By doing this, we got one step closer to understand the loop between the development of knowledge locations and change in their host cities and regions.

The theoretical framework proposes that growth and agglomeration in a knowledge location is positively associated with three dimensions: *specialization* (tenant mix, presence of rare associated services) *urban-spatial integration* (fit to the character of the specialization activities) and presence of *entrepreneurial leadership* (the ability of the location´s managers and individuals to keep mobilizing resources, projects and networks). When present, those provide tenants with a set of unique resources that can be accessed in the location but not outside it, increasing its attractiveness, and thus the location´s growth. Our empirics show that these relations are mediated by two key processes and mechanisms, which constitute intermediate outcomes in their own right: Image formation and Ecosystem formation (see Figure 8).

Image formation. Propositions P3, P4 and P5 suggest that locations grow and agglomerate knowledge activities by forming specific images and identifiable concepts. For example, image formation is associated with a location´s specialization, e.g. due to the presence of rare facilities and a coherent and related mix of tenants, eventually with "anchor" tenants (**P3**). The result is the formation of "safe-choice" and "place-to-be" effects, guiding location decisions in contexts of limited information and cognition. Also the urban-spatial integration of a knowledge location contributes to image formation, through the quality of the fit between its surrounding environments and the working-living requirements of its intended tenants (**P4**). This dimension is particularly relevant for locations specializing in activities with more symbolic content, calling for denser urban settings. Finally, a location´s management, such as the recognition of its managers and their entrepreneurial leadership (and eventually also of important tenants) becomes a rare and identifiable resource in its own right (**P5**); moreover managers and tenants become ambassadors of the location, contributing to its image formation. Overall, image formation makes locations

easier to identify, attracting specialized investments and entrepreneurs from the region, nationally and internationally.

Ecosystem formation. Propositions P3 and P5 suggest that knowledge locations grow over time by forming specific ecosystems of interacting elements (e.g. tenant firms, organizations, location managers, etc.), underlined by emerging routines in place and its connections to the "outside world". The formation of such ecosystems is intimately associated with a location´s specialization, namely the capacity of agglomerating a coherent tenant mix in related fields and rare facilities supporting their interaction and exchange (**P3**). This facilitates the emergence of environments for joint learning and experimentation, networks and communities of problem solving and learning through observation of other tenants. Moreover, management dimensions of the location and the action of their managers and leading tenants contribute to "glue the pieces together", fostering new relations within the location (**P5**). The result is the emergence of formal or/and informal mentoring relations in place, as well as brokerage phenomena inter-tenants, and between them and other relevant connections in regional, national and international spaces (e.g. local and regional policymakers, companies and organizations in other regions). Ecosystem formation is associated with emergence of intra-location routines and sense of community, linked with joint fulfilment of needs and the sense that being in the location matters for the firm´s and organizations´ activities. Overall, ecosystem formation creates in the location a valuable set of external effects that new tenants and organizations would be willing to join.

Summing up: multiple paths and time dynamics

The identification of image and ecosystem formation as mediating processes underlying the framework confirms our expectations that there is "something more" associated with growth and agglomeration that cannot be captured simply by the dynamism of the region (and thus the capacity of the location to grow). There are relevant hidden outcomes. In combination with the three identified features of knowledge locations, the identification of the two different pathways provide important tools for policymakers to evaluate and foresee the development circuits of their knowledge locations, and to more clearly assess what is behind growth (or the lack of it).

One important conclusion from the analysed evidence is that there are multiple paths to growth and agglomeration in knowledge locations: a similar outcome can be based on substantially different features. The analysed evidence shows that different knowledge locations followed substantially different pathways to agglomeration. For example, Arabianranta and PIA are cases in which image formation have so far been more dominant in their way to agglomeration, while ecosystem formation has been more visibly present in Biocant or the Digital Hub.

The framework illustrates that processes of image and ecosystem formation can co-exist in the development process of a knowledge location. However, agglomeration at a certain point in time doesn't necessarily mean the presence of a dynamic ecosystem. The process of image formation can be triggered by all the three different drivers, but the process of ecosystem formation was found to be more selective (see Figure 8). On the one hand, we didn't find evidence of a link between urban-spatial integration and ecosystem formation. On the other hand, ecosystem formation seems to be particularly associated with some specific components of the constructs "specialization" and "management", such as a specialized/related tenant mix, rare facilities, proactive daily management teams and informal yet active brokerage, and much less with formal institutional partnerships and synergy supportive initiatives.

The analysed evidence allows for some extra inferences about the time dimensions and sequences at which the mediating processes seem to unfold. While image formation can start to take shape early on with the development of a knowledge location (promotion of an intended concept, early move of anchor tenants, rare facilities and attractive location), the formation of an ecosystem takes more time to unfold. The early growth of a knowledge location can hardly be associated with the presence of an ecosystem, but much more with image formation.

Moreover, if the process of image formation can trigger early growth and agglomeration in a knowledge location, evidence suggests that maintaining it over time requires ecosystem formation to kick-off as well. Evidence from Arabianranta suggests the exhaustion of an image-driven agglomeration model in the absence of a relevant ecosystem formation. Other cases (Biocant, the Digital Hub), illustrate processes in which image and ecosystem

formation become intertwined over time, reinforcing each other already over a short period of time (rather less than ten years in both cases). This contributes to explain why specialized knowledge locations grow faster, as previously asked by Link and Scott (2006), but also suggests that keeping growth and agglomeration over time has to do with ecosystem formation dimensions.

Finally, the evidence also provides extra insight on the mechanisms through which the loop closes between the knowledge location and the host region (see Figure 8). It is not growth *per se* that influences changes in the spatial-economic context, but the phenomena of image and ecosystem formation and its associated "pressures" towards change. This happens, e.g. by inspiring and influencing the perceptions and behaviours of decision-makers (e.g. the "success" of a new location or activity), new network formation, creation of new organizations, pressure to change regulations and provide increasingly fit policy supports. Hence, the results of image and ecosystem formation dynamics ultimately spill out from the location towards the local and regional economy, provoking change in the spatial-economic context.

10.4 Final remarks and research avenues

This thesis contributed with new theoretical tools and empirical evidence to understand the emergence and development of knowledge locations. As demonstrated, the phenomenon of knowledge locations is better understood when placed within the spatial-economic context of its host cities and regions. Moreover, and almost by definition, understanding the development of knowledge locations requires more dynamic analyses, through which the involved mechanisms and underlying processes can be fleshed out.

This thesis contributed to the study of knowledge locations by providing 1) an integrated framework to understand the relations established between the *knowledge location* and the *host region*; 2) evidence on the relevance of three integrated features that decision-makers can more directly influence when designing knowledge locations: *specialization*, *urban-spatial integration* and *management* features; 3) the identification and conceptualization of two hidden, mediating processes involved in the growth and agglomeration of knowledge locations: *image formation* and *ecosystem formation*. The latter mechanisms can be used to understand the multiple pathways leading to the development of a knowledge location,

their timings and the ultimate effects that spill out to their city and regions´ spatial-economic context.

As previously referred, this thesis intended to contribute to a new reinvigorated agenda on the study of knowledge locations in relation with the dynamics of their host cities and regions. We could think of a number of promising directions to take this agenda further, based on the previous insights and on emerging challenges.

First, the consolidation of the presented theoretical framework could benefit from further testing and complementary research designs. There are still very few comparative studies on knowledge locations. We could think of research designs that focus exclusively on the evolution of very similar location types (e.g. focus on the evolution of different "creative factories" within the same region; or compare the evolution of similar types of "technology parks" in different regions). Other interesting design would be to "freeze" the intended specialization of a location (e.g. media, biotechnology) across a number o cases and make their context vary; more concretely, it would be important to assess specializations in more "mature" versus "dynamic" sectors, relying on different types of knowledge to innovate. Altogether, these experiments could contribute to further fine-tune and extend the generalizability of the proposed theory.

Second, if the design and key features of knowledge locations become path dependent from a certain moment onwards, it would important to identify and theorize on those transition and "locking" moments. This task requires, again, longitudinal and comparative case study methodologies. From a policy perspective, this would provide insight on the challenge of how to simultaneously keep the concept of a location recognisable and flexible to cope with change.

Third, some variables used in this study to operationalise constructs can benefit from more systematic assessment methodologies. One example is the degree of coherence or "relatedness" in the *tenant-mix* of a knowledge location. The assessment of this variable could benefit from recently developed methodologies based on "portfolios of skills", developed in the field of economic geography. Such a methodology could largely support policymakers and location managers, who tend to decide the entry criteria based on value-chain notions.

Fourth, the identified processes of image formation and ecosystem formation open up a number of new research challenges. We do need methodologies to assess them and explore further their formation and development. On the one hand, it would be relevant to have more detailed insight on how to nurture ecosystems in knowledge location – this thesis provided input on that, but more could potentially be learned from management studies and new empirical exploration. On the other hand, it would be interesting to explore if there are different "types" of image and ecosystem formation, and how do those contribute to provoke regional institutional change (gradual transformation? replacement?). Finally, it would also be relevant to better understand the take off and decline of those processes in knowledge locations.

Fifth, the extant literature and evidence from the analysed case studies suggest that knowledge locations are places of strong international connectivity – e.g. through global corporate and academic networks, or through the action of transnational entrepreneurs and expatriate workers. This is a plea to study knowledge locations is relation with other places with which they establish relations, and also to better understand their role accessing external-to-the-region knowledge that can complement eventual missing links in a region´s production and innovation systems.

Finally, as it has been long claimed, new ways to access "success" in knowledge locations are needed. The strong demands placed on innovation and business-related outcomes seem to have eclipsed the study of other potential benefits of knowledge locations. One of those potential benefits has to do with their contributions to urban regeneration and the physical and social improvement of cities. The rising scarcities of (financial and natural) resources are calling for more knowledge on how to improve the contribution of knowledge locations in cities in a more sustained and integrated way.

BIBLIOGRAPHY

Albahari, A., Barge-Gil, A., Canto, S., & Rico, A. (2012). The influence of science and technology parks' characteristics on firms' innovation results. *Paper Presented at the 2012 Annual Conference of the Regional Studies Association,* Delft.

Almeida, P., & Kogut, B. (1999). Localization of knowledge and the mobility of engineers in regional networks. *Management Science, 45*(7), 905-917.

Almirall, E. (2008), Living labs and open innovation: Roles and applicability. *The Electronic Journal for Virtual Organizations and Networks, 10*, 22-46.

Asheim, B. (2009). Guest editorial: Introduction to the creative class in European city regions. *Economic Geography, 85*(4), 355-362.

Asheim, B., Coenen, L., & Vang, J. (2007). Face-to-face, buzz, and knowledge bases: Sociospatial implications for learning, innovation, and innovation policy. *Environment and Planning C: Government & Policy, 25*(5), 655-670.

Asheim, B., & Gertler, M. (2005). The geography of innovation: Regional innovation systems. In J. Fagerberg, D. Mowery & R. Nelson (Eds.), *The oxford handbook of innovation* (pp. 291–317). Oxford: Oxford University Press.

Asheim, B., & Hansen, H. K. (2009). Knowledge bases, talents, and contexts: On the usefulness of the creative class approach in Sweden. *Economic Geography, 85*(4), 425-442.

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing nordic clusters. *Research Policy, 34*(8), 1173-1190.

Audretsch, D. B., & Feldman, M. P. (1996). R&D spillovers and the geography of innovation and production. *The American Economic Review, 86*(3), 630-640.

Bakouros, Y. L., Mardas, D. C., & Varsakelis, N. C. (2002). Science park, a high tech fantasy?: An analysis of the science parks of Greece. *Technovation, 22*(2), 123-128.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography, 28*(1), 31-56.

Bayliss, D. (2007). Dublin's digital hubris: Lessons from an attempt to develop a creative industrial cluster. *European Planning Studies, 15*(9), 1261-1271.

Berg, L. van den (1987). *Urban systems in a dynamic society*. Aldershot: Gower.

Berg, L. van den, & Braun, E. (1999). Urban competitiveness, marketing and the need for organising capacity. *Urban Studies, 36*(5-6), 987-999.

Berg, L. van den, Braun, E., & Meer, J. van der (2007). *National policy responses to urban challenges in Europe.* Aldershot: Ashgate.

Berg, L. van den, Braun, E., & Meer, J. van der (1997). The organising capacity of metropolitan region. *Environment and Planning C: Government and Policy, 15*(3), 253-272.

Berg, L. van den, Braun, E., & Winden, W. van (2001). Growth clusters in European cities: An integral approach. *Urban Studies, 38*(1), 185-205.

Berg, L. van den, Pol, P., Winden, W. van, & Woets, P. (2005). *European cities in the knowledge economy: The cases of Amsterdam, Dortmund, Eindhoven, Helsinki, Manchester, Munich, Munster, Rotterdam and Zaragoza*. Aldershot: Ashgate.

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy, 37*(3), 407-429.

Bigliardi, B., Dormio, A. I., Nosella, A., & Petroni, G. (2006). Assessing science parks' performances: Directions from selected Italian case studies. *Technovation, 26*(4), 489-505.

Biocant. (2012). *Annual report 2011*. Cantanhede: Biocant.

Blum, B. S., & Goldfarb, A. (2006). Does the internet defy the law of gravity? *Journal of International Economics, 70*(2), 384-405.

Boschma, R. (2009). Evolutionary economic geography and its implications for regional innovation policy. *Papers in Evolutionary Economic Geography (PEEG),* University of Utrecht, Department of Geosciences.

Boschma, R., & Frenken, K. (2011). Technological relatedness and regional branching. In H. Bathelt, M. Feldman & D. Kogler (Eds.), *Dynamic geographies of knowledge creation and innovation*. Abingdom: Routledge.

Boschma, R. (2004). Competitiveness of regions from an evolutionary perspective. *Regional Studies, 38*(9), 1001-1014.

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

Boschma, R., Eriksson, R., & Lindgren, U. (2009). How does labour mobility affect the performance of plants? The importance of relatedness and geographical proximity. *Journal of Economic Geography, 9*(2), 169-190.

Boschma, R., & Frenken, K. (2006). Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. *Journal of Economic Geography, 6*(3), 273-302.

Boschma, R., & Knaap, G. A. van der (1999), New High-Tech Industries and Windows of Locational Opportunity: The Role of Labour Markets and Knowledge Institutions during the Industrial Era. *Geografiska Annaler: Series B, Human Geography*, *81*(2), 73-89.

Breschi, S., & Lissoni, F. (2009). Mobility of skilled workers and co-invention networks: An anatomy of localized knowledge flows. *Journal of Economic Geography, 9*(4), 439-468.

Breschi, S., & Lissoni, F. (2001). Localised knowledge spillovers vs. innovative milieux: Knowledge "tacitness" reconsidered. *Papers in Regional Science, 80*(3), 255-273.

Brown, A., O'Connor, J., & Cohen, S. (2000). Local music policies within a global music industry: Cultural quarters in Manchester and Sheffield. *Geoforum, 31*(4), 437-451.

Carlsson, L. (2000). Policy networks as collective action. *Policy Studies Journal, 28*(3), 502-520.

Carvalho, L. (2011). Urban competitiveness, u-city strategies and the development of technological niches in Songdo, South Korea. In M. Bulu (Ed.), *City competitiveness and information science: Technologies for synchronizing urban subsystems*. Hershey PA: Information Science Reference.

Carvalho, L., Mingardo, G., & Van Haaren, J. (2012). Green urban transport policies and cleantech innovations: Evidence from Curitiba, Goteborg and Hamburg. *European Planning Studies, 20*(3), 375-396.

Carvalho, L., Santos, I., & Vale, M. (2012). Living PlanIT and the development of the "urban operating system™": The geographies of an innovation. *Paper Presented at the GREMI -T Meeting, March 2012, Paris,*

Carvalho, L. (2009). Four challenges of a new science and technology park – AvePark in Guimaraes, Portugal. *Urban Research and Practice, 2*(1), 103-108.

Castells, M., & Hall, P. (1994). *Technopoles of the world: The making of 2lst century industrial complexes* London: Routledge.

Chan, K. F., & Lau, T. (2005). Assessing technology incubator programs in the science park: The good, the bad and the ugly. *Technovation, 25*(10), 1215-1228.

Chen, S., & Choi, C. J. (2004). Creating a knowledge-based city: The example of hsinchu science park. *Journal of Knowledge Management, 8*(5), 73-82.

Chesbrough, H. W. (2003). The era of open innovation. *MIT Sloan Management Review, 44*(3), 35-41.

City of Helsinki. (2007). *Arabianranta. rethinking urban living*. Helsinki: City of Helsinki.

Clarysse, B., Wright, M., Lockett, A., van de Velde, E., & Vohora, A. (2005). Spinning out new ventures: A typology of incubation strategies from European research institutions. *Journal of Business Venturing, 20*(2), 183-216.

Cooke, P. (2001). Regional innovation systems, clusters, and the knowledge economy. *Industrial and Corporate Change, 10*(4), 945-974.

Crevoisier, O., & Jeannerat, H. (2009). Territorial knowledge dynamics: From the proximity paradigm to multi-location milieus. *European Planning Studies, 17*(8), 1223-1241.

Cudden, J. (2011). *Dublin economic profile: Overview developed for the project "Cities as engines of sustainable competitiveness"*. Rotterdam: Euricur.

Design Forum Finland. (2004). Finnish design - 125: Classic and contemporary design from Finland. *Presented by Design Forum Finland, Hong Kong Design Centre, 5-21 March, 2004,*

Dettwiler, P., Lindelöf, P., & Löfsten, H. (2006). Utility of location: A comparative survey between small new technology-based firms located on and off science parks--implications for facilities management. *Technovation, 26*(4), 506-517.

DHDA. (2007). *Enterprise survey 2007*. Dublin: Digital Hub Development Agency.

Dicken, P., & Thrift, N. (1992). The organization of production and the production of organization: Why business enterprises matter in the study of geographical industrialization. *Transactions of the Institute of British Geographers, 17*(3), 279-291.

Digital Hub. (2009). The digital hub (by Stephen Brennan). *Presentation Delivered at the Rotterdam Global Urban Summit,* Rotterdam.

Dosi, G. (1997). Opportunities, incentives and the collective patterns of technological change. *The Economic Journal, 107*(444), 1530-1547.

Doz, Y. L., Santos, J., & Williamson, P. (2001). *From global to metanational: How companies win in the knowledge economy*. Boston: Harvard Business School Press.

Drori, I., Honig, B., & Wright, M. (2009). Transnational entrepreneurship: An emergent field of study. *Entrepreneurship Theory and Practice, 33*(5), 1001-1022.

Dunning, J. H. (2009). Location and the multinational enterprise: A neglected factor & quest. *Journal of International Business Studies, 40*(1), 5-19.

Edquist, C. (1997). *Systems of innovation approaches–Their emergence and characteristics*. London: Pinter.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532-550.

Ekstedt, E., Lundin, R., Söderholm, A., & Wirdenius, H. (1999). *Neo-industrial organizing: Renewal by action and knowledge in a project-intensive economy*. London: Routledge.

Eriksson, M., Niitamo, V., & Kulkki, S. (2005). State-of-the-art in utilizing living labs approach to user-centric ICT innovation-a European approach. *CDT, Luleå University of Technology, Sweden.*

Etzkowitz, H. (2006). The new visible hand: An assisted linear model of science and innovation policy. *Science and Public Policy, 33*(5), 310-320.

Evans, G. (2009a). Creative cities, creative spaces and urban policy. *Urban Studies, 46*(5-6), 1003-1040.

Evans, G. (2009b). From cultural quarters to creative clusters–creative spaces in the new city economy. In M. Legner (Ed.), *The sustainability and development of cultural quarters: International perspectives*. Stockholm: Institute of Urban History.

Faro, C. (2008). Biocant park – um estudo de caso em Portugal da promoção da economia do conhecimento pela administração local. In SPI (Ed.), *Economia do conhecimento e administracao local*. Estoril: Principia Editora.

Feldman, M. P. (1994). *The geography of innovation*. Dordrecht: Kluwer Academic Publishers.

Florida, R. (2008). *Who's your city?*. New York: Basic Books.

Florida, R. (2002). *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. New York: Basic Civitas Books.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219-245.

Fomento San Sebastian (2011). City report, paper presented for the INTERREG IVB project "KnowCities". San Sebastian: Fomento San Sebastian.

Fountain Park. (2008). *Arabianranta survey*. Helsinki: Fountain Park.

French, J., & Raven, B. (1959). The bases of social power. In D. Cartwright (Ed.), *Studies of social power*. Ann Arbor, MI.: Institute of Social Research.

Friedman, J. (2005). *The world is flat: A brief history of the globalized world in the 21st century*. London: Allen Lane.

Garnsey, E., & Heffernan, P. (2005). High-technology clustering through spin-out and attraction: The Cambridge case. *Regional Studies, 39*(8), 1127-1144.

Geenhuizen, M. v., & Soetanto, D. (2008). Science parks: What they are and how they need to be evaluated. *Int. J. Foresight and Innovation Policy, 4*(1/2), 90-111.

George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social sciences*. Cambridge, MA: The MIT Press.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12*(1), 78-104.

Gertler, M. (2008). "Buzz without being there? Communities of practice in context". In A. Amin, & J. Roberts (Eds.), *Community, economic creativity and organization*. Oxford: Oxford University Press.

Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography, 3*(1), 75-99.

Glaeser, E. L., Kolko, J., & Saiz, A. (2001). Consumer city. *Journal of Economic Geography, 1*(1), 27-50.

Godin, B. (2006). The linear model of innovation: The historical construction of an analytical framework. *Science Technology and Human Values, 31*(6), 639-667.

Golder, P. N., & Tellis, G. J. (2004). Growing, growing, gone: Cascades, diffusion, and turning points in the product life cycle. *Marketing Science, 23*(2), 207-218.

Grabher, G. (1993). The weakness of strong ties: The lock-in of regional development in the ruhr area. In G. Grabher (Ed.), *The embedded firm: On the socioeconomics of industrial networks*. London: Routledge.

Grabher, G. (2002). Cool projects, boring institutions: Temporary collaboration in social context. *Regional Studies, 36*(3), 205-214.

Guston, D. (2000). *Between politics and science: assuring the integrity and productivity of research*. Cambridge: Cambridge University Press.

Hansen, H. K., & Niedomysl, T. (2009). Migration of the creative class: Evidence from Sweden. *Journal of Economic Geography, 9*(2), 191-206.

Hansson, F., Husted, K., & Vestergaard, J. (2005). Second generation science parks: From structural holes jockeys to social capital catalysts of the knowledge society. *Technovation, 25*(9), 1039-1049.

Henning, M., Moodysson, J., & Nilsson, M. (2010). *Innovation och regional omvandling. från skånska kluster till nya kombinationer*. Malmö: Region Skåne.

Hippel, E. von (2005). *Democratizing innovation*. Cambridge, MA: MIT Pres.

Hommen, L., Doloreux, D., & Larsson, E. (2006). Emergence and growth of Mjärdevi science park in Linkoping, Sweden. *European Planning Studies, 14*(10), 1331-1361.

Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine, 14*(6), 1-4.

Huggins, R., Johnston, A., & Steffenson, R. (2008). Universities, knowledge networks and regional policy. *Cambridge Journal of Regions, Economy and Society, 1*(2), 321-340.

Hutton, T. A. (2004). The new economy of the inner city. *Cities, 21*(2), 89-108.

IASP - International Association of Science Parks. (2010). Annual statistcs. , Accessed at http://www.iasp.ws/web/guest/statistics [20.12.2011].

IDA. (2012). *End of the year statement (by CEO Barry O´Leary), January 2012*. Dublin: IDA.

Ilmonen, M., & Kunzmann, K. (2007). Culture, creativity and urban regeneration. In C. o. H. U. Facts (Ed.), *Arabianranta. rethinking urban living* (). Helsinki: City of Helsinki.

Jacobs, J. (1969). *The economy of cities*. New York: Vintage.

Jeannerat, H., & Crevoisier, O. (2011). Non-technological innovation and multi-local territorial knowledge dynamics in the Swiss watch industry. *International Journal of Innovation and Regional Development, 3*(1), 26-44.

Jones, B. W., Spigel, B., & Malecki, E. J. (2010). Blog links as pipelines to buzz elsewhere: The case of New York theater blogs. *Environment and Planning B: Planning and Design, 37*(1), 99-111.

Kangasoja, J., & Schulman, H. (2007). Introduction. In City of Helsinki (Ed.), *Arabianranta. rethinking urban living*. Helsinki: City of Helsinki.

Keane, M. (2009). Great adaptations: China's creative clusters and the new social contract. *Continuum, 23*(2), 221-230.

Kelly, R. M., & Palumbo, D. (1992). *Theories of policy making*. London: Routledge.

Kenney, M., & Patton, D. (2006). The co-evolution of technologies and institutions: Sillicon valley as the iconic high-technology cluster. In P. Braunerhjelm, & M. P. Feldman (Eds.), *Cluster genesis: Technology-based industrial development* (). New York: Oxford University Press.

Kincaid, H. V., & Bright, M. (1957). Interviewing the business elite. *The American Journal of Sociology, 63*(3), 304-311.

Klundert, M. v. d., & Winden, W. v. (2008). Creating environments for working in the knowledge-based economy: Experiences from the Netherlands. *Paper Presented at the Colloquium Corporations and Cities*, Brussels, 26-28 May 2008.

Koh, F. C. C., Koh, W. T. H., & Tschang, F. T. (2005). An analytical framework for science parks and technology districts with an application to Singapore. *Journal of Business Venturing, 20*(2), 217-239.

Lai, H. C., & Shyu, J. Z. (2005). A comparison of innovation capacity at science parks across the Taiwan strait: The case of Zhanjiang high-tech park and Hsinchu science-based industrial park. *Technovation, 25*(7), 805-813.

Landry, C. (2000). *The creative city: A toolkit for urban innovators*. London: Earthscan.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, *24*(4) 691-710.

Lee, W. H., & Yang, W. T. (2000). The cradle of Taiwan high technology industry development-Hsinchu science park (HSP). *Technovation, 20*(1), 55-59.

Lever, W. F., & Turok, I. (1999). Competitive cities: Introduction to the review. *Urban Studies, 36*(5-6), 791.

Lindelöf, P., & Löfsten, H. (2003). Science park location and new technology-based firms in Sweden–implications for strategy and performance. *Small Business Economics, 20*(3), 245-258.

Link, A. N., & Scott, J. T. (2006). US university research parks. *Journal of Productivity Analysis, 25*(1), 43-55.

Link, A. N., & Scott, J. T. (2003). The growth of research triangle park. *Small Business Economics, 20*(2), 167-175.

Link, A. N., & Scott, J. T. (2003). US science parks: The diffusion of an innovation and its effects on the academic missions of universities. *International Journal of Industrial Organization, 21*(9), 1323-1356.

Link, A. N., & Scott, J. T. (2007). The economics of university research parks. *Oxford Review of Economic Policy, 23*(4), 661-674.

Löfsten, H., & Lindelöf, P. (2001). Science parks in Sweden–industrial renewal and development? *R&D Management, 31*(3), 309-322.

Löfsten, H., & Lindelöf, P. (2002). Science parks and the growth of new technology-based firms—academic-industry links, innovation and markets. *Research Policy, 31*(6), 859-876.

Luger, M., & Goldstein, H. (1991). *Technology in the garden. research parks & regional economic development*. Chapel Hill: University of North Carolina Press.

Lundvall, B. (1992). *National systems of innovation: Towards a theory of innovation and interactive learning*. London: Pinter.

Macdonald, S. (2012). Milking the myth: High technology and the legacy of the Silicon Valley model, *Paper Presented at the Annual Conference of the Regional Studies Association,* Delft.

MacKinnon, D., Cumbers, A., Pike, A., Birch, K., & McMaster, R. (2009). Evolution in economic geography: Institutions, political economy, and adaptation. *Economic Geography, 85*(2), 129-150.

Mae Phillips, S. A., & Yeung, W. (2003). A place for R&D? the singapore science park. *Urban Studies, 40*(4), 707-732.

Mahroum, S., Huggins, R., Clayton, N., Pain, K., & Taylor, P. (2008). Innovation by adoption. measuring and mapping absorptive capacity in UK nations and regions. *Research Report, NESTA, UK,*

Malecki, E. J. (1997). *Technology and economic development: The dynamics of local, regional, and national competitiveness* Longman, Essex, England.

Martin, R. (2010). Roepke lecture in economic Geography—Rethinking regional path dependence: Beyond lock in to evolution. *Economic Geography, 86*(1), 1-27.

Martin, R., & Sunley, P. (2006). Path dependence and regional economic evolution. *Journal of Economic Geography, 6*(4), 395-437.

Maskell, P., & Malmberg, A. (1999). Localised learning and industrial competitiveness. *Cambridge Journal of Economics, 23*(2), 167-185.

Maskell, P., & Malmberg, A. (2007). Myopia, knowledge development and cluster evolution. *Journal of Economic Geography, 7*(5), 603-618.

Massey, D., Quintas, P., & Wield, D. (1992). *High-tech fantasies. science parks in society, science and space*. London: Routledge.

McAdam, M., & McAdam, R. (2008). High tech start-ups in university science park incubators: The relationship between the start-up's lifecycle progression and use of the incubator's resources. *Technovation, 28*(5), 277-290.

McCann, P. (2008). Globalization and economic geography: The world is curved, not flat. *Cambridge Journal of Regions, Economy and Society, 1*(3), 351-370.

Miao, J. (2012). Stories behind science parks: Resources and networking in optical valley of China, Wuhan. *Paper Presented at the Annual Conference of the Regional Studies Association,* Delft.

Miles, S., & Paddison, R. (2005). Introduction: The rise and rise of culture-led urban regeneration. *Urban Studies, 42*(5), 833-839.

Mingardo, G., Van den Berg, L., & Van Haaren, J. (2009). *Transport, environment and economy at urban level: The need for decoupling*. Rotterdam: Euricur, Erasmus University Rotterdam.

Monck, C., & Peters, K. (2009). Science parks as an instrument of regional competitiveness: Measuring success and impact. *IASP 2009 Conference,*

Monck, C., Porter, B., Quintas, P., Storey, D., & Wynarczyk, P. (1988). *Science parks and the growth of high-technology firms*. London: Croom Helm.

Moodysson, J. (2008). Principles and practices of knowledge creation: On the organization of 'Buzz' and 'Pipelines' in life science communities. *Economic Geography, 84*(4), 449-469.

Moulaert, F., & Sekia, F. (2003). Territorial innovation models: A critical survey. *Regional Studies, 37*(3), 289-302.

Moulaert, F., & Sekia, F. (2003). Territorial innovation models: A critical survey. *Regional Studies, 37*(3), 289-302.

Naisbitt, J. (1984). *Megatrends: Ten new dimensions transforming our lifes*. New York: Warner Books.

Nooteboom, B. (2000). *Learning and innovation in organizations and economies*. Oxford: Oxford University Press.

North, D. (1990). *Institutions, institutional change, and economic performance*. Cambridge: Cambridge University Press.

OECD. (1996). *The knowledge based economy*. Paris: OECD.

Peck, J. (2005). Struggling with the creative class. *International Journal of Urban and Regional Research, 29*(4), 740-770.

Phan, P. H., Siegel, D. S., & Wright, M. (2005). Science parks and incubators: Observations, synthesis and future research. *Journal of Business Venturing, 20*(2), 165-182.

Phelps, N., Miao, J., & Benneworth, P. (2012). Technopoles of the world revisited. *Call for Papers for a Special Session in the 2012 Annual Conference of the Regional Studies Association,*

Phillimore, J. (1999). Beyond the linear view of innovation in science park evaluation an analysis of western Australian technology park. *Technovation, 19*(11), 673-680.

Ponzini, D., & Rossi, U. Becoming a creative city: The entrepreneurial mayor, network politics and the promise of an urban renaissance. *Urban Studies, 47*(5), 1037-1057.

Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology, 30*, 199-220.

Pratt, A. C. (2000). New media, the new economy and new spaces. *Geoforum, 31*(4), 425-436.

Putnam, R. (2000). *Bowling alone. the collapse and revival of american community.* New York: Simon & Schuster.

Queré, M. (2007). Sophia-Antipolis as a reverse science park: From exogenous to endogenous development. In K. Frenken (Ed.), *Applied evolutionary economics and economic geography*. Cheltenham: Edward Elgar.

Quintas, P., & Massey, D. (1992). Academic-industry links and innovation: Questioning the science park model* 1. *Technovation, 12*(3), 161-175.

Rodríguez-Pose, A., & Crescenzi, R. (2008). Mountains in a flat world: Why proximity still matters for the location of economic activity. *Cambridge Journal of Regions, Economy and Society, 1*(3), 371-388.

Romer, P. M. (1986). Increasing returns and long-run growth. *The Journal of Political Economy, 94*(5), 1002-1037.

Saxenian, A. L. (2007). *The new Argonauts: Regional advantage in a global economy*. Cambridge, MA: Harvard University Press.

Saxenian, A. L., & Sabel, C. (2008). Roepke lecture in economic geography. venture capital in the 'Periphery': The new Argonauts, global search, and local institution building. *Economic Geography, 84*(4), 379-394.

Schwerin, J., & Werker, C. (2003). Learning innovation policy based on historical experience. *Structural Change and Economic Dynamics, 14*(4), 385-404.

Scott, A. J. (2000). *The cultural economy of cities*. New York: Sage.

Scott, A. J. (1988). Flexible production systems and regional development: The rise of new industrial spaces in North America and Western Europe. *International Journal of Urban and Regional Research, 12*(2), 171-186.

Scott, A. J. (1996). The craft, fashion, and cultural-products industries of Los Angeles: Competitive dynamics and policy dilemmas in a multisectoral image-producing complex. *Annals of the Association of American Geographers, 86*(2), 306-323.

Scott, A. J. (2006). Creative cities: Conceptual issues and policy questions. *Journal of Urban Affairs, 28*(1), 1-17.

Shearmur, R., & Doloreux, D. (2000). Science parks: Actors or reactors? Canadian science parks in their urban context. *Environment and Planning A, 32*(6), 1065-1082.

Siegel, D. S., Westhead, P., & Wright, M. (2003). Assessing the impact of university science parks on research productivity: Exploratory firm-level evidence from the united kingdom. *International Journal of Industrial Organization, 21*(9), 1357-1369.

Sotarauta, M., & Kautonen, M. (2007). Co-evolution of the Finnish national and local innovation and science arenas: Towards a dynamic understanding of multi-level governance. *Regional Studies, 41*(8), 1085-1098.

Sotarauta, M. (2009). Power and influence tactics in the promotion of regional development: An empirical analysis of the work of Finnish regional development officers. *Geoforum, 40*(5), 895-905.

Spradley, J. (1979). *The ethnographic interview*. New York: Holt, Rinehart and Winston.

Stankiewicz, R. (1998). Science parks and innovation centers. In H. Etzkowitz, A. Webster & P. Healey (Eds.), *Capitalizing knowledge - new intersections of industry and academia*. Albany: State University of New York.

Sternberg, R. (1999). Innovative linkages and proximity: Empirical results from recent surveys of small and medium sized firms in German regions. *Regional Studies, 33*(6), 529-540.

Storey, D. J., & Tether, B. S. (1998). New technology-based firms in the European Union: An introduction. *Research Policy, 26*(9), 933-946.

Storper, M., & Scott, A. J. (2009). Rethinking human capital, creativity and urban growth. *Journal of Economic Geography, 9*(2), 147-167.

Storper, M., & Venables, A. J. (2004). Buzz: Face-to-face contact and the urban economy. *Journal of Economic Geography, 4*(4), 351-370.

Tamasy, C. (2007). Rethinking technology-oriented business incubators: Developing a robust policy instrument for entrepreneurship, innovation, and regional development? *Growth and Change, 38*(3), 460-473.

Tanev, S. (2012). Global from the start: The characteristics of born-global firms in the technology sector. *Technology Innovation Management Review, March 2012*, 5-8.

Teisman, G. (2000). Models for research into decision-Making Processes: On phases, streams and decision-making rounds. *Public Administration, 78*(4), 937-956.

Teisman, G., & Klijn, E. H. (2008). Complexity theory and public management. *Public Management Review, 10*(3), 287-297.

Teisman, G., & Klijn, E. H. (2002). Partnership arrangements: Governmental rhetoric or governance scheme? *Public Administration Review, 62*(2), 197-205.

Teotónio, C. & Albergaria, H. (2011). City report, paper presented for the INTERREG IVB project "KnowCities". Coimbra: University of Coimbra.

Ter Wal, A. L. J. (2008). Cluster emergence and network evolution: A longitudinal analysis of the inventor network in Sophia-Antipolis. *DRUID - 25th Celebration Conference,* Copenhagen, CBS, Denmark.

Todtling, F., & Trippl, M. (2005). One size fits all?: Towards a differentiated regional innovation policy approach. *Research Policy, 34*(8), 1203-1219.

Tuijl, E. van, & Borg, J. van der (2012). Designing the dragon or does the dragon design? An analysis of the impact of creative industries on urban development of Beijing. *International Journal of Chinese Culture and Management, 3*(2), 125-138

Turok, I. (2009). The distinctive city: Pitfalls in the pursuit of differential advantage. *Environment and Planning A, 41*(1), 13-30.

Vale, M., & Carvalho, L. (2012). Knowledge networks and processes of anchoring in Portuguese biotechnology. *Regional Studies, Forthcoming, DOI:10.1080/00343404.2011.644237*

Vale, M., & Carvalho, L. (2009). *Territorial knowledge dynamics in health-oriented biotechnology: Cases from the Centro region*. EURODITE paper - Regional Trajectories to the Knowledge Economy, WP5, University of Lisbon: Lisbon.

Vedovello, C. (1997). Science parks and university-industry interaction: Geographical proximity between the agents as a driving force. *Technovation, 17*(9), 491-531.

Wenting, R. (2008). Spinoff dynamics and the spatial formation of the fashion design industry, 1858-2005. *Journal of Economic Geography, 8*(5), 593-614.

Westhead, P., & Storey, D. (1994). *An assessment of firms located on and off science parks in the UK*. London: HMSO.

Winden, W. van (2010). Knowledge and the European city. *Tijdschrift Voor Economische en Sociale Geografie, 101*(1), 100-106.

Winden, W. van (2011). *Creating knowledge hotspots in the city: A handbook*. European Union: URBACT.

Winden, W. van, Berg, L. van den, Carvalho, L., & Tuijl, E. van (2010). *Manufacturing in the new urban economy*. Abingdon: Routledge.

Winden, W. van, Berg, L. van den, & Pol, P. (2007). European cities in the knowledge economy: Towards a typology. *Urban Studies, 44*(3), 525-549.

Winden, W. van, Carvalho, L., Tuijl, E. van, Haaren, J. van, & Berg, L. van den (2012). *Creating knowledge locations in cities: Innovation and integration challenges*. Abingdon: Routledge.

Wong, K. W., & Bunnell, T. (2006). New economy' discourse and spaces in Singapore: A case study of one-north. *Environment and Planning A, 38*(1), 69-83.

Wright, M., Liu, X., Buck, T., & Filatotchev, I. (2008). Returnee entrepreneurs, science park location choice and performance: An analysis of high technology SMEs in china. *Entrepreneurship Theory and Practice, 32*(1), 131-155.

Yin, R. (1984). *Case study research: Design and methods*. Beverly Hills: Sage.

Zhang, Y. (2005). The science park phenomenon: Development, evolution and typology. *International Journal of Entrepreneurship and Innovation Management, 5*(1), 138-154.

Zhou, Y., Sun, Y., Wie, Y., & Lin, C. (2009). De-centering 'spatial fix'-patterns of territorization and regional technological dynamism of ICT hubs in China. *Journal of Economic Geography, 11*(1), 119-150.

Zhou, Y., & Xin, T. (2003). An innovative region in China: Interaction between multinational corporations and local firms in a high-tech cluster in Beijing. *Economic Geography, 79*(2), 129-152.

INTERVIEWS (2009-2012)

Arabianranta (Helsinki)

Asta Manninen, Director, City of Helsinki, Centre of Urban Facts

Bengt Forsström, manager, Arabus business incubator

Eero Holstilla, senior advisor, former Director of Office of Economic Development (City of Helsinki), former CEO at Culminatum

Elina Joensuu, managing partner, Fountain Park

Ismo Kukkonen, Manager, Varma (Arabianranta pension fund investor)

Janne Kareinen, Chairman, Resident´s Association of Arabianranta

Jarmo Eskelinen, CEO, Forum Virium Helsinki

Juha Suokas, senior statistician, City of Helsinki, Centre of Urban Facts

Kari Halinen, CEO, Art and Design City Helsinki - ADC

Karoliina Kapanen, senior planning officer, Economic and Planning Centre, City of Helsinki

Katja Laine, communication officer, Elisa Communications

Kyösti Oasmaa, urban projects director, Economic and Planning Centre, City of Helsinki

Marja-Leena Rinkineva, director, Office of Economic Development, City of Helsinki

Minna Maarttola, Development Manager, City of Helsinki

Niki Matheson, executive director, Helsinki Festival

Nyrki Tuominen, director of planning, City of Helsinki

Paiju Tyrväinen, head of division, Cultural Office, City of Helsinki

Pekka Timonen, executive director, World Design Capital Helsinki 2012

Reetta Meriläinen, journalist (former Chief Editor of Helsingin Sanomat, the largest newspaper in Finland), resident in Arabianranta

Satu Silvanto, cultural planning officer, Cultural Office, City of Helsinki

Tero Boman, CEO, EFG Toimistokalusteet Oy

Ulla-Kirsti Junttila, urban designer and senior adviser, SITO

Veli-Pekka Niitamo, Helsinki School of Economics, Nokia –Helsinki Living Labs

Veikko Kunnas, cultural director, Cultural Office, City of Helsinki

Ville Meloni, manager, Forum Virium Helsinki

Yrjo Sotamaa, Professor and former Dean, University of Art and Design (UADH) and Aalto University

Biocant (Cantanhede-Coimbra)

Amilcar Falcão, CEO, 4health

André Faustino, founder and R&D director, GenePrediT

André Valente, head of Biocant R&D lab – Biologic Systems

António Teixeira, board member, ABAP and Biocant Ventures

Bruno Sommer Ferreira, CEO, Biotrend

Carlos Duarte, head of Biocant R&D lab – Cell Biology

Carlos Faro, vice-president of CNC and director of Biocant.

Franco Acarpio, director, Hematos

Helena Vieira, director and CEO, APBIO - Portuguese Association of Bio-industries and Bioalvo

Isabel Araújo, CEO, Vinalia

Joana Branco, CEO, GenePrediT

João Pais de Moura, mayor of Cantanhede

Joaquim Cunha, executive director, Health Cluster Portugal

José Luis Oliveira, head of Biocant R&D lab – Bio-informatics

José Manuel Costa, CEO, Biognosis

Lino Ferreira, director of Biocant´s Stem Cell unit; founder of Matera

Nuno Faria, R&D director, Biotempo

Paulo Santos, CEO of Genebox and head of Functional Genomics Lab, Coimbra Hospital

Paulo Santos, executive director, Instituto Pedro Nunes (incubator)

Raul Santos, CEO, Crioestaminal

The Digital Hub – Dublin

Allan Brennan, CEO, Gigabeam

Ben Hurley, CEO, NDRC (National Digital Research Centre)

Brian Mac Craith, Creative Dublin Alliance member; president, Dublin City University

Brian Norton, Creative Dublin Alliance member; president, Dublin Institute of Technology

Colin Broderick, web app developer and spatial planner, Urban Rural.

Declan Wallace, assistant city manager, Dublin City Council.

Eibhlin Curley, assistant chief executive, Dublin City Enterprise Board

Gerry McMahon, Enterprise Ireland

Izaskun Arrieta, international projects officer, Dublin City Council

Jamie Cudden, research manager, International Relations, Dublin City Council.

Jason Roe, developer and IT entrepreneur, founder of JustPark.

John Tierney, city manager, Dublin City Council

Lorna Maxwell, Senior Executive Officer, Creative Dublin Alliance member & project manager Innovation Dublin, Dublin City Council.

Miceal Whelan, communications manager, NovaUCD, Benfield Innovation Park

Michael John Gorman, director, Science Gallery

Michael Stubbs, Creative Dublin Alliance member, assistant city manager, Planning & Economic Development, Dublin City Council.

Michael Martin, network manager, Irish Software Innovation Network.

Noel Crawford, developer relations manager, IBM Innovation Centre

Paul Doherty, CEO, Software Design

Peter Cogan, researcher, Analytics Group, Bell Labs Ireland, Alcatel-Lucent.

Peter J. Finnegan, director, office for international relations and research, Dublin City Council

Pól Mac Aonghusa, senior manager, IBM Research Smart Cities Technology Centre, Ireland.

Stephen Brennan, director of marketing and strategy, Digital Hub Development Agency

Teresa Dillon, curator of "Hack-the-city" app contest, Inventorium (National Digital Research Centre).

PIA (San Sebastian)

Alejandro García Alonso, professor and director of computation sciences, University of the Basque Country

Eduardo Miera, project leader, Economic Development Bureau - Fomento

Enara Goikoetxea, managing director, Moztu (production company)

Euken Sése, director, Economic Development Bureau - Fomento

Ignacio Rotaeche, director, Ibaia – Egeda, Independent Producers Association

Iñaki Gomez, managing director, Irusoin (production company)

Iñaki Imaz, director, Cine FX (special effects company)

Loli Ezquerro, managing director, Sintesys Training centre (3D),

Maite Ayestaran, cluster manager, Municipality of San Sebastian, Economic Development Department - Fomento

Nora Mendoza, project leader “Emerging Sectors”, PIA project Municipality of San Sebastian, Economic Development Bureau - Fomento

Oscar Astier, managing director, Arista and TAK (communication and e-learning company)

Rafael Martín, managing director, Sintesys Training centre

Ramón Delgado, Media Unit Director Tecnalia (R&D center)

Ruth Jorde Quintana, PIA manager, Economic Development Bureau - Fomento

Vicente Mozo, production director, San Sebastian International Film Festival

Xabier Arizkorreta, sub director EiTB - Regional TV

SUMMARY

This thesis studies the development of knowledge locations: area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district (e.g. technology parks, creative "factories"). It relates the reinvigorated interest (and qualitative change) in knowledge locations with a number of societal evolutions, and develops a theoretical framework to explain their emergence and development. This framework contributes to better ground the study of knowledge locations within the spatial-economic context and dynamics of its host cities and regions.

This study also explores the relation between a knowledge location´s features – Specialization, Urban-spatial integration and Management – and their agglomeration outcomes. It shows that there are multiple pathways to growth and agglomeration: no single factor has to be always present to explain it at a certain moment in time. Moreover, the three factors proved relevant but in different ways, and namely to the extent that they contribute to image formation (associated with the identification of a concept) and ecosystem formation (associated with exchange and learning among tenants). Those processes provide two different paths to agglomeration. Their interaction influences the development of a knowledge location over time and, ultimately, the relation between the location and change in its spatial-economic context. The abovementioned phenomena are explored with the support of four European case studies of "themed" knowledge locations, focusing on audiovisual, biotechnology, design and digital media, respectively.

NEDERLANDSE SAMENVATTING (SUMMARY IN DUTCH)

Dit proefschrift onderzoekt de ontwikkeling van kennislocaties: gebiedsgerichte initiatieven met het doel om kennisintensieve activiteiten te concentreren in een bepaald gebied of stadsdistrict (zoals technologieparken of creatieve fabrieken). Het gaat in op de hernieuwde interesse voor (en kwalitatieve veranderingen van) kennislocaties, ontstaan door een aantal sociale evoluties en ontwikkelt een theoretisch raamwerk om het ontstaan en de ontwikkeling van kennislocaties te verklaren. Het raamwerk draagt bij aan een betere onderbouwing van het onderzoek naar kennislocaties binnen de ruimtelijk-economische context en de dynamiek van de vestigingssteden en -regios.

De studie verkent ook de relatie tussen de kenmerken van een kennis locatie – de factoren Specialisatie, Stedelijk-ruimtelijke integratie en Management – en de agglomeratie uitkomsten. Het toont aan dat er talloze paden naar groei en concentratie zijn: geen enkele factor hoeft altijd aanwezig te zijn om dit op een bepaald moment te verklaren. Bovendien is het bewezen dat de drie factoren relevant zijn, maar op verschillende manieren, namelijk in de mate dat ze bijdragen aan imago vorming (geassocieerd met de identificatie van een concept) en de ontwikkeling van eco-systemen (geassocieerd met kennis deling tussen en lering van huurders). Deze processen bieden twee verschillende agglomeratiepaden. Hun interactie beïnvloedt de ontwikkeling van een kennislocatie in de loop der tijd, en uiteindelijk de relatie tussen de locatie en de ruimtelijk-economische context. De hierboven genoemde fenomenen zijn verkend met behulp van vier Europese case studies over kennislocaties met een gericht thema, te weten: audio-visueel, bio-technologie, design en digitale media.

RESUMO EM PORTUGUÊS (SUMMARY IN PORTUGUESE)

Esta dissertação foca-se no estudo de zonas ou localizações planeadas para o acolhimento de atividades intensivas em conhecimento e "criatividade" – como por exemplo parques de ciência & tecnologia, "fábricas" e outros "lugares criativos" planeados. O trabalho relaciona o interesse recente (bem como as evoluções qualitativas observadas) neste tipo de localizações com um número de tendências e evoluções na sociedade contemporânea. Subsequentemente desenvolve um quadro teórico para estudar e compreender o modo como estes espaços emergem e se desenvolvem, permitindo enquadrar o seu desenvolvimento no contexto da história socioeconómica e dinâmicas recentes das suas cidades e regiões de acolhimento.

O estudo procede explorando a relação entre três fatores/dimensões deste tipo de localizações – especialização, integração urbano-espacial e gestão – e a sua capacidade de aglomeração de atividade. É demonstrada a existência de vários caminhos para este resultado: não existe um fator único que tenha que estar sempre necessariamente presente. Nomeadamente, os três fatores apontados são relevantes na medida em que contribuem para ativar processos de formação de imagem (associado à identificação de um conceito) e de formação de ecossistema (associado ao desenvolvimento de sinergias de troca e aprendizagem entre as atividades acolhidas). Estes dois processos aqui explorados consubstanciam dois caminhos diferentes para a aglomeração. A sua interação influencia o desenvolvimento da localização de acolhimento ao longo do tempo e, ultimamente, a relação entre esta e a mudança provocada no contexto socioeconómico da cidade e região de acolhimento. Os fenómenos e processos acima referidos são explorados e analisados com o apoio de quatro estudos de caso de localizações "especializadas" (em temas como audiovisual, biotecnologia, design e tecnologias digitais), em contexto Europeu.

ABOUT THE AUTHOR

Luís Carvalho (1979) was born and raised in Porto, Portugal. In 2002 he completed his undergraduate education with a *Licenciatura* (5-year degree) in Economics at the University of Porto. His main studying interests have long been in the fields of economic development, growth and change, urban and regional economics and policy. After concluding his degree, Luís worked for the Studies and Planning Unit at the Municipality of Porto. Later on and until 2007, he joined Quaternaire Portugal as a consultant on strategic planning for cities and regions and policy evaluation studies (namely EU cohesion policy and structural funding). During 2004-05, Luís lived in Rotterdam for the first time and completed a master´s degree in Urban Management at the Erasmus University Rotterdam (*cum laude*). He started his doctoral studies at the same University in September 2007.

Luis is currently at RHV b.v. – Urban, Port and Transport Economics – a research and education company at Erasmus University Rotterdam. He is also associated with the EURICUR (European Institute for Comparative Urban Research) since 2007. His main research interests are in the fields of urban-regional development strategies, territorial economy and the geography of knowledge and innovation. Luis regularly lectures and coordinates educational modules in his fields of expertise. During the last years, he has been involved in various international studies in European, Latin American and Asian cities, on topics such as "the role of manufacturing in the new urban economy", "regional trajectories to the knowledge economy", "creating knowledge locations in cities" and "anchoring temporary events in the urban economy". Among others, his research was internationally published in two books of the Routledge Series "Cities and Regions" and in journals such as *European Planning Studies* and *Regional Studies*.

ERASMUS RESEARCH INSTITUTE OF MANAGEMENT (ERIM)

ERIM PH.D. SERIES

RESEARCH IN MANAGEMENT

The ERIM PhD Series contains PhD dissertations in the field of Research in Management defended at Erasmus University Rotterdam and supervised by senior researchers affiliated to the Erasmus Research Institute of Management (ERIM). All dissertations in the ERIM PhD Series are available in full text through the ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM is the joint research institute of the Rotterdam School of Management (RSM) and the Erasmus School of Economics at the Erasmus University Rotterdam (EUR).

DISSERTATIONS LAST FIVE YEARS

Acciaro, M., *Bundling Strategies in Global Supply Chains.* Promoter(s): Prof.dr. H.E. Haralambides, EPS-2010-197-LIS, http://hdl.handle.net/1765/19742

Agatz, N.A.H., *Demand Management in E-Fulfillment*. Promoter(s): Prof.dr.ir. J.A.E.E. van Nunen, EPS-2009-163-LIS, http://hdl.handle.net/1765/15425

Alexiev, A., *Exploratory Innovation: The Role of Organizational and Top Management Team Social Capital.* Promoter(s): Prof.dr. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-208-STR, http://hdl.handle.net/1765/20632

Asperen, E. van, *Essays on Port, Container, and Bulk Chemical Logistics Optimization***.** PR**o**moter(s): Prof.dr.ir. R. Dekker, EPS-2009-181-LIS, http://hdl.handle.net/1765/17626

Assem, M.J. van den, *Deal or No Deal? Decision Making under Risk in a Large-Stake TV Game Show and Related Experiments,* Promoter(s): Prof.dr. J. Spronk, EPS-2008-138-F&A, http://hdl.handle.net/1765/13566

Benning, T.M., *A Consumer Perspective on Flexibility in Health Care: Priority Access Pricing and Customized Care*, Promoter(s): Prof.dr.ir. B.G.C. Dellaert, EPS-2011-241-MKT, http://hdl.handle.net/1765/23670

Betancourt, N.E., *Typical Atypicality: Formal and Informal Institutional Conformity, Deviance, and Dynamics*, Promoter(s): Prof.dr. B. Krug, EPS-2012-262-ORG, http://hdl.handle.net/1765/32345

Bezemer, P.J., *Diffusion of Corporate Governance Beliefs: Board Independence and the Emergence of a Shareholder Value Orientation in the Netherlands.* Promoter(s): Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2009-192-STR, http://hdl.handle.net/1765/18458

Binken, J.L.G., *System Markets: Indirect Network Effects in Action, or Inaction,* Promoter(s): Prof.dr. S. Stremersch, EPS-2010-213-MKT, http://hdl.handle.net/1765/21186

Blitz, D.C., *Benchmarking Benchmarks,* Promoter(s): Prof.dr. A.G.Z. Kemna & Prof.dr. W.F.C. Verschoor, EPS-2011-225-F&A, http://hdl.handle.net/1765/22624

Boer-Sorbán, K., *Agent-Based Simulation of Financial Markets: A modular, Continuous-Time Approach,* Promoter(s): Prof.dr. A. de Bruin, EPS-2008-119-LIS, http://hdl.handle.net/1765/10870

Boon, C.T., *HRM and Fit: Survival of the Fittest!?,* Promoter(s): Prof.dr. J. Paauwe & Prof.dr. D.N. den Hartog, EPS-2008-129-ORG, http://hdl.handle.net/1765/12606

Borst, W.A.M., *Understanding Crowdsourcing: Effects of Motivation and Rewards on Participation and Performance in Voluntary Online Activities,* Promoter(s): Prof.dr.ir. J.C.M. van den Ende & Prof.dr.ir. H.W.G.M. van Heck, EPS-2010-221-LIS, http://hdl.handle.net/1765/ 21914

Braun, E., *City Marketing: Towards an Integrated Approach,* Promoter(s): Prof.dr. L. van den Berg, EPS-2008-142-MKT, http://hdl.handle.net/1765/13694

Brumme, W.-H., *Manufacturing Capability Switching in the High-Tech Electronics Technology Life Cycle,* Promoter(s): Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. L.N. Van Wassenhove, EPS-2008-126-LIS, http://hdl.handle.net/1765/12103

Budiono, D.P., *The Analysis of Mutual Fund Performance: Evidence from U.S. Equity Mutual Funds,* Promoter(s): Prof.dr. M.J.C.M. Verbeek, EPS-2010-185-F&A, http://hdl.handle.net/1765/18126

Burger, M.J., *Structure and Cooptition in Urban Networks*, Promoter(s): Prof.dr. G.A. van der Knaap & Prof.dr. H.R. Commandeur, EPS-2011-243-ORG, http://hdl.handle.net/1765/26178

Burgers, J.H., *Managing Corporate Venturing: Multilevel Studies on Project Autonomy, Integration, Knowledge Relatedness, and Phases in the New Business Development Process,* Promoter(s): Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2008-136-STR, http://hdl.handle.net/1765/13484

Camacho, N.M., *Health and Marketing; Essays on Physician and Patient Decision-making*, Promoter(s): Prof.dr. S. Stremersch, EPS-2011-237-MKT, http://hdl.handle.net/1765/23604

Carvalho de Mesquita Ferreira, L., *Attention Mosaics: Studies of Organizational Attention*, Promoter(s): Prof.dr. P.M.A.R. Heugens & Prof.dr. J. van Oosterhout, EPS-2010-205-ORG, http://hdl.handle.net/1765/19882

Chen, C.-M., *Evaluation and Design of Supply Chain Operations Using DEA*, Promoter(s): Prof.dr. J.A.E.E. van Nunen, EPS-2009-172-LIS, http://hdl.handle.net/1765/16181

Chen, H., *Individual Mobile Communication Services and Tariffs*, Promoter(s): Prof.dr. L.F.J.M. Pau, EPS-2008-123-LIS, http://hdl.handle.net/1765/11141

Defilippi Angeldonis, E.F., *Access Regulation for Naturally Monopolistic Port Terminals: Lessons from Regulated Network Industries,* Promoter(s): Prof.dr. H.E. Haralambides, EPS-2010-204-LIS, http://hdl.handle.net/1765/19881

Deichmann, D., *Idea Management: Perspectives from Leadership, Learning, and Network Theory*, Promoter(s): Prof.dr.ir. J.C.M. van den Ende, EPS-2012-255-ORG, http://hdl.handle.net/1765/ 31174

Derwall, J.M.M., *The Economic Virtues of SRI and CSR*, Promoter(s): Prof.dr. C.G. Koedijk, EPS-2007-101-F&A, http://hdl.handle.net/1765/8986

Desmet, P.T.M., *In Money we Trust? Trust Repair and the Psychology of Financial Compensations*, Promoter(s): Prof.dr. D. De Cremer & Prof.dr. E. van Dijk, EPS-2011-232-ORG, http://hdl.handle.net/1765/23268

Diepen, M. van, *Dynamics and Competition in Charitable Giving*, Promoter(s): Prof.dr. Ph.H.B.F. Franses, EPS-2009-159-MKT, http://hdl.handle.net/1765/14526

Dietvorst, R.C., *Neural Mechanisms Underlying Social Intelligence and Their Relationship with the Performance of Sales Managers,* Promoter(s): Prof.dr. W.J.M.I. Verbeke, EPS-2010-215-MKT, http://hdl.handle.net/1765/21188

Dietz, H.M.S., *Managing (Sales)People towards Performance: HR Strategy, Leadership & Teamwork*, Promoter(s): Prof.dr. G.W.J. Hendrikse, EPS-2009-168-ORG, http://hdl.handle.net/1765/16081

Doorn, S. van, *Managing Entrepreneurial Orientation*, Promoter(s): Prof.dr. J.J.P. Jansen, Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2012-258-STR, http://hdl.handle.net/1765/32166

Douwens-Zonneveld, M.G., *Animal Spirits and Extreme Confidence: No Guts, No Glory*, Promoter(s): Prof.dr. W.F.C. Verschoor, EPS-2012-257-F&A, http://hdl.handle.net/1765/31914

Duca, E., *The Impact of Investor Demand on Security Offerings*, Promoter(s): Prof.dr. A. de Jong, EPS-2011-240-F&A, http://hdl.handle.net/1765/26041

Eck, N.J. van, *Methodological Advances in Bibliometric Mapping of Science*, Promoter(s): Prof.dr.ir. R. Dekker, EPS-2011-247-LIS, http://hdl.handle.net/1765/26509

Eijk, A.R. van der, *Behind Networks: Knowledge Transfer, Favor Exchange and Performance*, Promoter(s): Prof.dr. S.L. van de Velde & Prof.dr.drs. W.A. Dolfsma, EPS-2009-161-LIS, http://hdl.handle.net/1765/14613

Elstak, M.N., *Flipping the Identity Coin: The Comparative Effect of Perceived, Projected and Desired Organizational Identity on Organizational Identification and Desired Behavior*, Promoter(s): Prof.dr. C.B.M. van Riel, EPS-2008-117-ORG, http://hdl.handle.net/1765/10723

Erken, H.P.G., *Productivity, R&D and Entrepreneurship*, Promoter(s): Prof.dr. A.R. Thurik, EPS-2008-147-ORG, http://hdl.handle.net/1765/14004

Essen, M. van, *An Institution-Based View of Ownership*, Promoter(s): Prof.dr. J. van Oosterhout & Prof.dr. G.M.H. Mertens, EPS-2011-226-ORG, http://hdl.handle.net/1765/22643

Feng, L., *Motivation, Coordination and Cognition in Cooperatives,* Promoter(s): Prof.dr. G.W.J. Hendrikse, EPS-2010-220-ORG, http://hdl.handle.net/1765/21680

Gertsen, H.F.M., *Riding a Tiger without Being Eaten: How Companies and Analysts Tame Financial Restatements and Influence Corporate Reputation*, Promoter(s): Prof.dr. C.B.M. van Riel, EPS-2009-171-ORG, http://hdl.handle.net/1765/16098

Gharehgozli, A.H., *Developing New Methods for Efficient Container Stacking Operations*, Promoter(s): Prof.dr.ir. M.B.M. de Koster, EPS-2012-269-LIS, http://hdl.handle.net/1765/1

Gijsbers, G.W., *Agricultural Innovation in Asia: Drivers, Paradigms and Performance,* Promoter(s): Prof.dr. R.J.M. van Tulder, EPS-2009-156-ORG, http://hdl.handle.net/1765/14524

Gils, S. van, *Morality in Interactions: On the Display of Moral Behavior by Leaders and Employees*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2012-270-ORG, http://hdl.handle.net/1765/1

Ginkel-Bieshaar, M.N.G. van, *The Impact of Abstract versus Concrete Product Communications on Consumer Decision-making Processes*, Promoter(s): Prof.dr.ir. B.G.C. Dellaert, EPS-2012-256-MKT, http://hdl.handle.net/1765/31913

Gkougkousi, X., *Empirical Studies in Financial Accounting*, Promoter(s): Prof.dr. G.M.H. Mertens & Prof.dr. E. Peek, EPS-2012-264-F&A, http://hdl.handle.net/1765/37170

Gong, Y., *Stochastic Modelling and Analysis of Warehouse Operations*, Promoter(s): Prof.dr. M.B.M. de Koster & Prof.dr. S.L. van de Velde, EPS-2009-180-LIS, http://hdl.handle.net/1765/16724

Greeven, M.J., *Innovation in an Uncertain Institutional Environment: Private Software Entrepreneurs in Hangzhou, China*, Promoter(s): Prof.dr. B. Krug, EPS-2009-164-ORG, http://hdl.handle.net/1765/15426

Guenster, N.K., *Investment Strategies Based on Social Responsibility and Bubbles*, Promoter(s): Prof.dr. C.G. Koedijk, EPS-2008-175-F&A, http://hdl.handle.net/1765/16209

Hakimi, N.A, *Leader Empowering Behaviour: The Leader's Perspective: Understanding the Motivation behind Leader Empowering Behaviour*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2010-184-ORG, http://hdl.handle.net/1765/17701

Halderen, M.D. van, *Organizational Identity Expressiveness and Perception Management: Principles for Expressing the Organizational Identity in Order to Manage the Perceptions and Behavioral Reactions of External Stakeholders*, Promoter(s): Prof.dr. S.B.M. van Riel, EPS-2008-122-ORG, http://hdl.handle.net/1765/10872

Hensmans, M., *A Republican Settlement Theory of the Firm: Applied to Retail Banks in England and the Netherlands (1830-2007)*, Promoter(s): Prof.dr. A. Jolink & Prof.dr. S.J. Magala, EPS-2010-193-ORG, http://hdl.handle.net/1765/19494

Hernandez Mireles, C., *Marketing Modeling for New Products,* Promoter(s): Prof.dr. P.H. Franses, EPS-2010-202-MKT, http://hdl.handle.net/1765/19878

Hessels, S.J.A., *International Entrepreneurship: Value Creation Across National Borders*, Promoter(s): Prof.dr. A.R. Thurik, EPS-2008-144-ORG, http://hdl.handle.net/1765/13942

Heyden, M.L.M., *Essays on Upper Echelons & Strategic Renewal: A Multilevel Contingency Approach*, Promoter(s): Prof.dr. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2012-259-STR, http://hdl.handle.net/1765/32167

Hoedemaekers, C.M.W., *Performance, Pinned down: A Lacanian Analysis of Subjectivity at Work*, Promoter(s): Prof.dr. S. Magala & Prof.dr. D.H. den Hartog, EPS-2008-121-ORG, http://hdl.handle.net/1765/10871

Hoever, I.J., *Diversity and Creativity: In Search of Synergy*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2012-267-ORG, http://hdl.handle.net/1765/37392

Hoogendoorn, B., *Social Entrepreneurship in the Modern Economy: Warm Glow, Cold Feet*, Promoter(s): Prof.dr. H.P.G. Pennings & Prof.dr. A.R. Thurik, EPS-2011-246-STR, http://hdl.handle.net/1765/26447

Hoogervorst, N., *On The Psychology of Displaying Ethical Leadership: A Behavioral Ethics Approach*, Promoter(s): Prof.dr. D. De Cremer & Dr. M. van Dijke, EPS-2011-244-ORG, http://hdl.handle.net/1765/26228

Huang, X., *An Analysis of Occupational Pension Provision: From Evaluation to Redesign,* Promoter(s): Prof.dr. M.J.C.M. Verbeek & Prof.dr. R.J. Mahieu, EPS-2010-196-F&A, http://hdl.handle.net/1765/19674

Hytönen, K.A. *Context Effects in Valuation, Judgment and Choice*, Promoter(s): Prof.dr.ir. A. Smidts, EPS-2011-252-MKT, http://hdl.handle.net/1765/30668

Jalil, M.N., *Customer Information Driven After Sales Service Management: Lessons from Spare Parts Logistics,* Promoter(s): Prof.dr. L.G. Kroon, EPS-2011-222-LIS, http://hdl.handle.net/1765/22156

Jaspers, F.P.H., *Organizing Systemic Innovation*, Promoter(s): Prof.dr.ir. J.C.M. van den Ende, EPS-2009-160-ORG, http://hdl.handle.net/1765/14974

Jennen, M.G.J., *Empirical Essays on Office Market Dynamics*, Promoter(s): Prof.dr. C.G. Koedijk & Prof.dr. D. Brounen, EPS-2008-140-F&A, http://hdl.handle.net/1765/13692

Jiang, T., *Capital Structure Determinants and Governance Structure Variety in Franchising*, Promoter(s): Prof.dr. G. Hendrikse & Prof.dr. A. de Jong, EPS-2009-158-F&A, http://hdl.handle.net/1765/14975

Jiao, T., *Essays in Financial Accounting*, Promoter(s): Prof.dr. G.M.H. Mertens, EPS-2009-176-F&A, http://hdl.handle.net/1765/16097

Kaa, G. van, *Standard Battles for Complex Systems: Empirical Research on the Home Network,* Promoter(s): Prof.dr.ir. J. van den Ende & Prof.dr.ir. H.W.G.M. van Heck, EPS-2009-166-ORG, http://hdl.handle.net/1765/16011

Kagie, M., *Advances in Online Shopping Interfaces: Product Catalog Maps and Recommender Systems,* Promoter(s): Prof.dr. P.J.F. Groenen, EPS-2010-195-MKT, http://hdl.handle.net/1765/19532

Kappe, E.R., *The Effectiveness of Pharmaceutical Marketing*, Promoter(s): Prof.dr. S. Stremersch, EPS-2011-239-MKT, http://hdl.handle.net/1765/23610

Karreman, B., *Financial Services and Emerging Markets,* Promoter(s): Prof.dr. G.A. van der Knaap & Prof.dr. H.P.G. Pennings, EPS-2011-223-ORG, http://hdl.handle.net/1765/22280

Klein, M.H., *Poverty Alleviation through Sustainable Strategic Business Models: Essays on Poverty Alleviation as a Business Strategy,* Promoter(s): Prof.dr. H.R. Commandeur, EPS-2008-135-STR, http://hdl.handle.net/1765/13482

Krauth, E.I., *Real-Time Planning Support: A Task-Technology Fit Perspective,* Promoter(s): Prof.dr. S.L. van de Velde & Prof.dr. J. van Hillegersberg, EPS-2008-155-LIS, http://hdl.handle.net/1765/14521

Kwee, Z., *Investigating Three Key Principles of Sustained Strategic Renewal: A Longitudinal Study of Long-Lived Firms,* Promoter(s): Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2009-174-STR, http://hdl.handle.net/1765/16207

Lam, K.Y., *Reliability and Rankings*, Promoter(s): Prof.dr. P.H.B.F. Franses, EPS-2011-230-MKT, http://hdl.handle.net/1765/22977

Lander, M.W., *Profits or Professionalism? On Designing Professional Service Firms*, Promoter(s): Prof.dr. J. van Oosterhout & Prof.dr. P.P.M.A.R. Heugens, EPS-2012-253-ORG, http://hdl.handle.net/1765/30682

Langhe, B. de, *Contingencies: Learning Numerical and Emotional Associations in an Uncertain World*, Promoter(s): Prof.dr.ir. B. Wierenga & Prof.dr. S.M.J. van Osselaer, EPS-2011-236-MKT, http://hdl.handle.net/1765/23504

Larco Martinelli, J.A., *Incorporating Worker-Specific Factors in Operations Management Models,* Promoter(s): Prof.dr.ir. J. Dul & Prof.dr. M.B.M. de Koster, EPS-2010-217-LIS, http://hdl.handle.net/1765/21527

Li, T., *Informedness and Customer-Centric Revenue Management,* Promoter(s): Prof.dr. P.H.M. Vervest & Prof.dr.ir. H.W.G.M. van Heck, EPS-2009-146-LIS, http://hdl.handle.net/1765/14525

Liere, D.W. van, *Network Horizon and the Dynamics of Network Positions: A Multi-Method Multi-Level Longitudinal Study of Interfirm Networks,* Promoter(s): Prof.dr. P.H.M. Vervest, EPS-2007-105-LIS, http://hdl.handle.net/1765/10181

Lovric, M., *Behavioral Finance and Agent-Based Artificial Markets*, Promoter(s): Prof.dr. J. Spronk & Prof.dr.ir. U. Kaymak, EPS-2011-229-F&A, http://hdl.handle.net/1765/ 22814

Maas, A.A., van der, *Strategy Implementation in a Small Island Context: An Integrative Framework,* Promoter(s): Prof.dr. H.G. van Dissel, EPS-2008-127-LIS, http://hdl.handle.net/1765/12278

Maas, K.E.G., *Corporate Social Performance: From Output Measurement to Impact Measurement,* Promoter(s): Prof.dr. H.R. Commandeur, EPS-2009-182-STR, http://hdl.handle.net/1765/17627

Markwat, T.D., *Extreme Dependence in Asset Markets Around the Globe*, Promoter(s): Prof.dr. D.J.C. van Dijk, EPS-2011-227-F&A, http://hdl.handle.net/1765/22744

Mees, H., *Changing Fortunes: How China's Boom Caused the Financial Crisis*, Promoter(s): Prof.dr. Ph.H.B.F. Franses, EPS-2012-266-MKT, http://hdl.handle.net/1765/34930

Meuer, J., *Configurations of Inter-Firm Relations in Management Innovation: A Study in China's Biopharmaceutical Industry*, Promoter(s): Prof.dr. B. Krug, EPS-2011-228-ORG, http://hdl.handle.net/1765/22745

Mihalache, O.R., *Stimulating Firm Innovativeness: Probing the Interrelations between Managerial and Organizational Determinants*, Promoter(s): Prof.dr. J.J.P. Jansen, Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2012-260-S&E, http://hdl.handle.net/1765/32343

Moitra, D., *Globalization of R&D: Leveraging Offshoring for Innovative Capability and Organizational Flexibility,* Promoter(s): Prof.dr. K. Kumar, EPS-2008-150-LIS, http://hdl.handle.net/1765/14081

Moonen, J.M., *Multi-Agent Systems for Transportation Planning and Coordination*, Promoter(s): Prof.dr. J. van Hillegersberg & Prof.dr. S.L. van de Velde, EPS-2009-177-LIS, http://hdl.handle.net/1765/16208

Nalbantov G.I., *Essays on Some Recent Penalization Methods with Applications in Finance and Marketing*, Promoter(s): Prof. dr P.J.F. Groenen, EPS-2008-132-F&A, http://hdl.handle.net/1765/13319

Nederveen Pieterse, A., *Goal Orientation in Teams: The Role of Diversity*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2009-162-ORG, http://hdl.handle.net/1765/15240

Nguyen, T.T., *Capital Structure, Strategic Competition, and Governance*, Promoter(s): Prof.dr. A. de Jong, EPS-2008-148-F&A, http://hdl.handle.net/1765/14005

Nielsen, L.K., *Rolling Stock Rescheduling in Passenger Railways: Applications in Short-term Planning and in Disruption Management*, Promoter(s): Prof.dr. L.G. Kroon, EPS-2011-224-LIS, http://hdl.handle.net/1765/22444

Niesten, E.M.M.I., *Regulation, Governance and Adaptation: Governance Transformations in the Dutch and French Liberalizing Electricity Industries*, Promoter(s): Prof.dr. A. Jolink & Prof.dr. J.P.M. Groenewegen, EPS-2009-170-ORG, http://hdl.handle.net/1765/16096

Nieuwenboer, N.A. den, *Seeing the Shadow of the Self*, Promoter(s): Prof.dr. S.P. Kaptein, EPS-2008-151-ORG, http://hdl.handle.net/1765/14223

Nijdam, M.H., *Leader Firms: The Value of Companies for the Competitiveness of the Rotterdam Seaport Cluster,* Promoter(s): Prof.dr. R.J.M. van Tulder, EPS-2010-216-ORG, http://hdl.handle.net/1765/21405

Noordegraaf-Eelens, L.H.J., *Contested Communication: A Critical Analysis of Central Bank Speech,* Promoter(s): Prof.dr. Ph.H.B.F. Franses, EPS-2010-209-MKT, http://hdl.handle.net/1765/21061

Nuijten, A.L.P., *Deaf Effect for Risk Warnings: A Causal Examination applied to Information Systems Projects*, Promoter(s): Prof.dr. G. van der Pijl & Prof.dr. H. Commandeur & Prof.dr. M. Keil, EPS-2012-263-S&E, http://hdl.handle.net/1765/34928

Nuijten, I., *Servant Leadership: Paradox or Diamond in the Rough? A Multidimensional Measure and Empirical Evidence*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2009-183-ORG, http://hdl.handle.net/1765/21405

Oosterhout, M., van, *Business Agility and Information Technology in Service Organizations,* Promoter(s): Prof,dr.ir. H.W.G.M. van Heck, EPS-2010-198-LIS, http://hdl.handle.net/1765/19805

Oostrum, J.M., van, *Applying Mathematical Models to Surgical Patient Planning*, Promoter(s): Prof.dr. A.P.M. Wagelmans, EPS-2009-179-LIS, http://hdl.handle.net/1765/16728

Osadchiy, S.E., *The Dynamics of Formal Organization: Essays on Bureaucracy and Formal Rules*, Promoter(s): Prof.dr. P.P.M.A.R. Heugens, EPS-2011-231-ORG, http://hdl.handle.net/1765/23250

Otgaar, A.H.J., *Industrial Tourism: Where the Public Meets the Private,* Promoter(s): Prof.dr. L. van den Berg, EPS-2010-219-ORG, http://hdl.handle.net/1765/21585

Ozdemir, M.N., *Project-level Governance, Monetary Incentives and Performance in Strategic R&D Alliances*, Promoter(s): Prof.dr.ir. J.C.M. van den Ende, EPS-2011-235-LIS, http://hdl.handle.net/1765/23550

Peers, Y., *Econometric Advances in Diffusion Models*, Promoter(s): Prof.dr. Ph.H.B.F. Franses, EPS-2011-251-MKT, http://hdl.handle.net/1765/ 30586

Pince, C., *Advances in Inventory Management: Dynamic Models,* Promoter(s): Prof.dr.ir. R. Dekker,
EPS-2010-199-LIS, http://hdl.handle.net/1765/19867

Porras Prado, M., *The Long and Short Side of Real Estate, Real Estate Stocks, and Equity*, Promoter(s): Prof.dr. M.J.C.M. Verbeek, EPS-2012-254-F&A, http://hdl.handle.net/1765/30848

Potthoff, D., *Railway Crew Rescheduling: Novel Approaches and Extensions,* Promoter(s): Prof.dr. A.P.M. Wagelmans & Prof.dr. L.G. Kroon, EPS-2010-210-LIS, http://hdl.handle.net/1765/21084

Poruthiyil, P.V., *Steering Through: How Organizations Negotiate Permanent Uncertainty and Unresolvable Choices*, Promoter(s): Prof.dr. P.P.M.A.R. Heugens & Prof.dr. S. Magala, EPS-2011-245-ORG, http://hdl.handle.net/1765/26392

Pourakbar, M. *End-of-Life Inventory Decisions of Service Parts*, Promoter(s): Prof.dr.ir. R. Dekker, EPS-2011-249-LIS, http://hdl.handle.net/1765/30584

Prins, R., *Modeling Consumer Adoption and Usage of Value-Added Mobile Services*, Promoter(s): Prof.dr. Ph.H.B.F. Franses & Prof.dr. P.C. Verhoef, EPS-2008-128-MKT, http://hdl.handle.net/1765/12461

Quak, H.J., *Sustainability of Urban Freight Transport: Retail Distribution and Local Regulation in Cities*, Promoter(s): Prof.dr. M.B.M. de Koster, EPS-2008-124-LIS, http://hdl.handle.net/1765/11990

Quariguasi Frota Neto, J., *Eco-efficient Supply Chains for Electrical and Electronic Products*, Promoter(s): Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. H.W.G.M. van Heck, EPS-2008-152-LIS, http://hdl.handle.net/1765/14785

Radkevitch, U.L, *Online Reverse Auction for Procurement of Services*, Promoter(s): Prof.dr.ir. H.W.G.M. van Heck, EPS-2008-137-LIS, http://hdl.handle.net/1765/13497

Rijsenbilt, J.A., *CEO Narcissism; Measurement and Impact*, Promoter(s): Prof.dr. A.G.Z. Kemna & Prof.dr. H.R. Commandeur, EPS-2011-238-STR, http://hdl.handle.net/1765/ 23554

Roelofsen, E.M., *The Role of Analyst Conference Calls in Capital Markets*, Promoter(s): Prof.dr. G.M.H. Mertens & Prof.dr. L.G. van der Tas RA, EPS-2010-190-F&A, http://hdl.handle.net/1765/18013

Rook, L., *Imitation in Creative Task Performance*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2008-125-ORG, http://hdl.handle.net/1765/11555

Rosmalen, J. van, *Segmentation and Dimension Reduction: Exploratory and Model-Based Approaches*, Promoter(s): Prof.dr. P.J.F. Groenen, EPS-2009-165-MKT, http://hdl.handle.net/1765/15536

Roza, M.W., *The Relationship between Offshoring Strategies and Firm Performance: Impact of Innovation, Absorptive Capacity and Firm Size,* Promoter(s): Prof.dr. H.W. Volberda & Prof.dr.ing. F.A.J. van den Bosch, EPS-2011-214-STR, http://hdl.handle.net/1765/22155

Rus, D., *The Dark Side of Leadership: Exploring the Psychology of Leader Self-serving Behavior*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2009-178-ORG, http://hdl.handle.net/1765/16726

Samii, R., *Leveraging Logistics Partnerships: Lessons from Humanitarian Organizations,* Promoter(s): Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. L.N. Van Wassenhove, EPS-2008-153-LIS, http://hdl.handle.net/1765/14519

Schaik, D. van, *M&A in Japan: An Analysis of Merger Waves and Hostile Takeovers,* Promoter(s): Prof.dr. J. Spronk & Prof.dr. J.P.M. Groenewegen, EPS-2008-141-F&A, http://hdl.handle.net/1765/13693

Schauten, M.B.J., *Valuation, Capital Structure Decisions and the Cost of Capital,* Promoter(s): Prof.dr. J. Spronk & Prof.dr. D. van Dijk, EPS-2008-134-F&A, http://hdl.handle.net/1765/13480

Schellekens, G.A.C., *Language Abstraction in Word of Mouth,* Promoter(s): Prof.dr.ir. A. Smidts, EPS-2010-218-MKT, ISBN: 978-90-5892-252-6, http://hdl.handle.net/1765/21580

Sotgiu, F., *Not All Promotions are Made Equal: From the Effects of a Price War to Cross-chain Cannibalization,* Promoter(s): Prof.dr. M.G. Dekimpe & Prof.dr.ir. B. Wierenga, EPS-2010-203-MKT, http://hdl.handle.net/1765/19714

Srour, F.J., *Dissecting Drayage: An Examination of Structure, Information, and Control in Drayage Operations*, Promoter(s): Prof.dr. S.L. van de Velde, EPS-2010-186-LIS, http://hdl.handle.net/1765/18231

Stam, D.A., *Managing Dreams and Ambitions: A Psychological Analysis of Vision Communication*, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2008-149-ORG, http://hdl.handle.net/1765/14080

Stienstra, M., *Strategic Renewal in Regulatory Environments: How Inter- and Intra-organisational Institutional Forces Influence European Energy Incumbent Firms,* Promoter(s): Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2008-145-STR, http://hdl.handle.net/1765/13943

Sweldens, S.T.L.R., *Evaluative Conditioning 2.0: Direct versus Associative Transfer of Affect to Brands,* Promoter(s): Prof.dr. S.M.J. van Osselaer, EPS-2009-167-MKT, http://hdl.handle.net/1765/16012

Szkudlarek, B.A*., Spinning the Web of Reentry: [Re]connecting reentry training theory and practice*, Promoter(s): Prof.dr. S.J. Magala, EPS-2008-143-ORG, http://hdl.handle.net/1765/13695

Teixeira de Vasconcelos, M., *Agency Costs, Firm Value, and Corporate Investment*, Promoter(s): Prof.dr. P.G.J. Roosenboom, EPS-2012-265-F&A, http://hdl.handle.net/1765/37265

Tempelaar, M.P., *Organizing for Ambidexterity: Studies on the Pursuit of Exploration and Exploitation through Differentiation, Integration, Contextual and Individual Attributes,* Promoter(s): Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-191-STR, http://hdl.handle.net/1765/18457

Tiwari, V., Transition Process and Performance in IT Outsourcing: Evidence from a Field Study and Laboratory Experiments, Promoter(s): Prof.dr.ir. H.W.G.M. van Heck & Prof.dr. P.H.M. Vervest, EPS-2010-201-LIS, http://hdl.handle.net/1765/19868

Tröster, C., Nationality Heterogeneity and Interpersonal Relationships at Work, Promoter(s): Prof.dr. D.L. van Knippenberg, EPS-2011-233-ORG, http://hdl.handle.net/1765/23298

Tsekouras, D., No Pain No Gain: The Beneficial Role of Consumer Effort in Decision Making, Promoter(s): Prof.dr.ir. B.G.C. Dellaert, EPS-2012-268-MKT, http://hdl.handle.net/1765/1

Tuk, M.A., Is Friendship Silent When Money Talks? How Consumers Respond to Word-of-Mouth Marketing, Promoter(s): Prof.dr.ir. A. Smidts & Prof.dr. D.H.J. Wigboldus, EPS-2008-130-MKT, http://hdl.handle.net/1765/12702

Tzioti, S., *Let Me Give You a Piece of Advice: Empirical Papers about Advice Taking in Marketing,* Promoter(s): Prof.dr. S.M.J. van Osselaer & Prof.dr.ir. B. Wierenga, EPS-2010-211-MKT, hdl.handle.net/1765/21149

Vaccaro, I.G., *Management Innovation: Studies on the Role of Internal Change Agents,* Promoter(s): Prof.dr. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-212-STR, hdl.handle.net/1765/21150

Verheijen, H.J.J., *Vendor-Buyer Coordination in Supply Chains,* Promoter(s): Prof.dr.ir. J.A.E.E. van Nunen, EPS-2010-194-LIS, http://hdl.handle.net/1765/19594

Verwijmeren, P., *Empirical Essays on Debt, Equity, and Convertible Securities*, Promoter(s): Prof.dr. A. de Jong & Prof.dr. M.J.C.M. Verbeek, EPS-2009-154-F&A, http://hdl.handle.net/1765/14312

Vlam, A.J., *Customer First? The Relationship between Advisors and Consumers of Financial Products*, Promoter(s): Prof.dr. Ph.H.B.F. Franses, EPS-2011-250-MKT, http://hdl.handle.net/1765/30585

Waard, E.J. de, *Engaging Environmental Turbulence: Organizational Determinants for Repetitive Quick and Adequate Responses*, Promoter(s): Prof.dr. H.W. Volberda & Prof.dr. J. Soeters, EPS-2010-189-STR, http://hdl.handle.net/1765/18012

Wall, R.S., *Netscape: Cities and Global Corporate Networks,* Promoter(s): Prof.dr. G.A. van der Knaap, EPS-2009-169-ORG, http://hdl.handle.net/1765/16013

Waltman, L., *Computational and Game-Theoretic Approaches for Modeling Bounded Rationality*, Promoter(s): Prof.dr.ir. R. Dekker & Prof.dr.ir. U. Kaymak, EPS-2011-248-LIS, http://hdl.handle.net/1765/26564

Wang, Y., *Information Content of Mutual Fund Portfolio Disclosure*, Promoter(s): Prof.dr. M.J.C.M. Verbeek, EPS-2011-242-F&A, http://hdl.handle.net/1765/26066

Weerdt, N.P. van der, *Organizational Flexibility for Hypercompetitive Markets: Empirical Evidence of the Composition and Context Specificity of Dynamic Capabilities and Organization Design Parameters,* Promoter(s): Prof.dr. H.W. Volberda, EPS-2009-173-STR, http://hdl.handle.net/1765/16182

Wubben, M.J.J., *Social Functions of Emotions in Social Dilemmas*, Promoter(s): Prof.dr. D. De Cremer & Prof.dr. E. van Dijk, EPS-2009-187-ORG, http://hdl.handle.net/1765/18228

Xu, Y., *Empirical Essays on the Stock Returns, Risk Management, and Liquidity Creation of Banks*, Promoter(s): Prof.dr. M.J.C.M. Verbeek, EPS-2010-188-F&A, http://hdl.handle.net/1765/18125

Yang, J., *Towards the Restructuring and Co-ordination Mechanisms for the Architecture of Chinese Transport Logistics*, Promoter(s): Prof.dr. H.E. Harlambides, EPS-2009-157-LIS, http://hdl.handle.net/1765/14527

Yu, M., *Enhancing Warehouse Performance by Efficient Order Picking*, Promoter(s): Prof.dr. M.B.M. de Koster, EPS-2008-139-LIS, http://hdl.handle.net/1765/13691

Zhang, D., *Essays in Executive Compensation*, Promoter(s): Prof.dr. I. Dittmann, EPS-2012-261-F&A, http://hdl.handle.net/1765/32344

Zhang, X., *Scheduling with Time Lags,* Promoter(s): Prof.dr. S.L. van de Velde, EPS-2010-206-LIS,
http://hdl.handle.net/1765/19928

Zhou, H., *Knowledge, Entrepreneurship and Performance: Evidence from Country-level and Firm-level Studies,* Promoter(s): Prof.dr. A.R. Thurik & Prof.dr. L.M. Uhlaner, EPS-2010-207-ORG, http://hdl.handle.net/1765/20634

Zwan, P.W. van der, *The Entrepreneurial Process: An International Analysis of Entry and Exit*, Promoter(s): Prof.dr. A.R. Thurik & Prof.dr. P.J.F. Groenen, EPS-2011-234-ORG, http://hdl.handle.net/1765/23422

Zwart, G.J. de, *Empirical Studies on Financial Markets: Private Equity, Corporate Bonds and Emerging Markets*, Promoter(s): Prof.dr. M.J.C.M. Verbeek & Prof.dr. D.J.C. van Dijk, EPS-2008-131-F&A, http://hdl.handle.net/1765/12703

Erasmus Research Institute of Management - ERiM

KNOWLEDGE LOCATIONS IN CITIES
EMERGENCE AND DEVELOPMENT DYNAMICS

This thesis studies the development of knowledge locations: area-based initiatives aimed at agglomerating knowledge-intensive activities in a designated area or city district (e.g. technology parks, creative "factories"). It relates the reinvigorated interest (and qualitative change) in knowledge locations with a number of societal evolutions, and develops a theoretical framework to explain their emergence and development. This framework contributes to better ground the study of knowledge locations within the spatial-economic context and dynamics of its host cities and regions.

This study also explores the relation between a knowledge location's features – Specialization, Urban-spatial integration and Management – and their agglomeration outcomes. It shows that there are multiple pathways to growth and agglomeration: no single factor has to be always present to explain it at a certain moment in time. Moreover, the three factors proved relevant but in different ways, and namely to the extent that they contribute to image formation (associated with the identification of a concept) and ecosystem formation (associated with exchange and learning among tenants). Those processes provide two different paths to agglomeration. Their interaction influences the development of a knowledge location over time and, ultimately, the relation between the location and change in its spatial-economic context. The abovementioned phenomena are explored with the support of four European case studies of "themed" knowledge locations, focusing on audiovisual, biotechnology, design and digital media, respectively.

ERiM

The Erasmus Research Institute of Management (ERIM) is the Research School (Onderzoekschool) in the field of management of the Erasmus University Rotterdam. The founding participants of ERIM are the Rotterdam School of Management (RSM), and the Erasmus School of Economics (ESE). ERIM was founded in 1999 and is officially accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW). The research undertaken by ERIM is focused on the management of the firm in its environment, its intra- and interfirm relations, and its business processes in their interdependent connections.

The objective of ERIM is to carry out first rate research in management, and to offer an advanced doctoral programme in Research in Management. Within ERIM, over three hundred senior researchers and PhD candidates are active in the different research programmes. From a variety of academic backgrounds and expertises, the ERIM community is united in striving for excellence and working at the forefront of creating new business knowledge.

Design & layout: B&T Ontwerp en advies (www.b-en-t.nl) Print: Haveka (www.haveka.nl)

ERIM PhD Series
Research in Management

Erasmus Research Institute of Management - ERiM
Rotterdam School of Management (RSM)
Erasmus School of Economics (ESE)
Erasmus University Rotterdam (EUR)
P.O. Box 1738, 3000 DR Rotterdam,
The Netherlands

Tel. +31 10 408 11 82
Fax +31 10 408 96 40
E-mail info@erim.eur.nl
Internet www.erim.eur.nl