Master Thesis

Innovative Region Hamburg

Lena Steinmüller – 850419-P340

Supervisor – Prof. Jan-Evert Nilsson

Tutor – Alina Lidén

Submitted to Blekinge Tekniska Högskola for the Master of European Spatial Planning and Regional Development on the 17/ 05/ 2010

Acknowledgements

I am deeply grateful to Jan-Evert Nilsson and Alina Lidén for the advice and support they gave me to improve my thesis. Their inspiration helped me a lot during the process of developing it.

Abstract

The presented thesis analyses the theoretical concept of Innovative Regions for the study case Hamburg. To provide a basis for the analysis of the study case a closer look on the process of innovation, innovative elements and the appropriateness of the regional level for innovation policy has been taken. For the examination of Hamburg two approaches have been used: First, a deeper look on the Regional Innovation Scoreboard, which is a European approach to benchmark Innovative Regions, has been taken. Second, an investigation of the historical development of the main economic sectors, the main actors and the attractiveness of the region has been made. Concluding Hamburg's strength and its weaknesses as an Innovative Region have been defined. Its strength is, among others, a (national) leading position within the fields of media, aviation, the maritime industry and logistics. In these fields a thick labour market and, especially in media, schools/ universities with a high reputation can attract a high educated labour force. But the receptiveness to new people, companies and ideas is rather low. The European importance of the port grants a steady income for the city, which again provides room for further policy actions. Its weaknesses display the other side of the medal, as the success of the port and some sectors decrease the need for change, which is a source for innovation. Innovation policy in Hamburg does not try to solve this contradiction; instead the main efforts are taken in the already strong sectors, which are also fostered by cluster initiatives. The author suggests that replacing this targeted policy by a more general innovation policy might be a solution. By doing so, it has to be taken into account that innovation itself cannot be fostered by policy. Policy can only influence some framework conditions for innovation, others, such as the 'people climate', must be changed in a bottom up process.

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I Hamburg as an Innovative Region

> "Innovation has become the industrial religion of the late 20th century. Business sees it as the key to increasing profits and market share. Governments automatically reach for it when trying to fix the economy." (Valery, 1999, February 18)

Since the late 20th century, the interest in innovation has not slowed down; on the contrary, the number of policies fostering innovation has increased. One example for a growing political interest in innovation is the Lisbon Agenda. Since 2000, when the first version was signed, it has been revised and its focus has been shifted from dynamics and competitiveness, over focusing on growth and jobs in the relaunched strategy from 2005, to "harnessing the potential of ICT to drive innovation and productivity in Europe" (European Commission, 2010) in the i2010 strategy. Even in its title '*Lisbon Strategy towards Growth and Jobs – Towards a green and innovative economy*' the i2010 strategy stretches the importance of innovation and displays the growing political interest in it. All strategies have in common that they want to use innovation as a tool to achieve economic growth.

The EU is a confederation of different states but not one federal state. It does not have its own territory, thus it has to make a detour by funding measurements that could enhance innovation. For this detour, the regional level is appropriate, as it is on the one hand open to programmes and funds designed by the EU and on the other hand provides a common basis for actors to innovate.

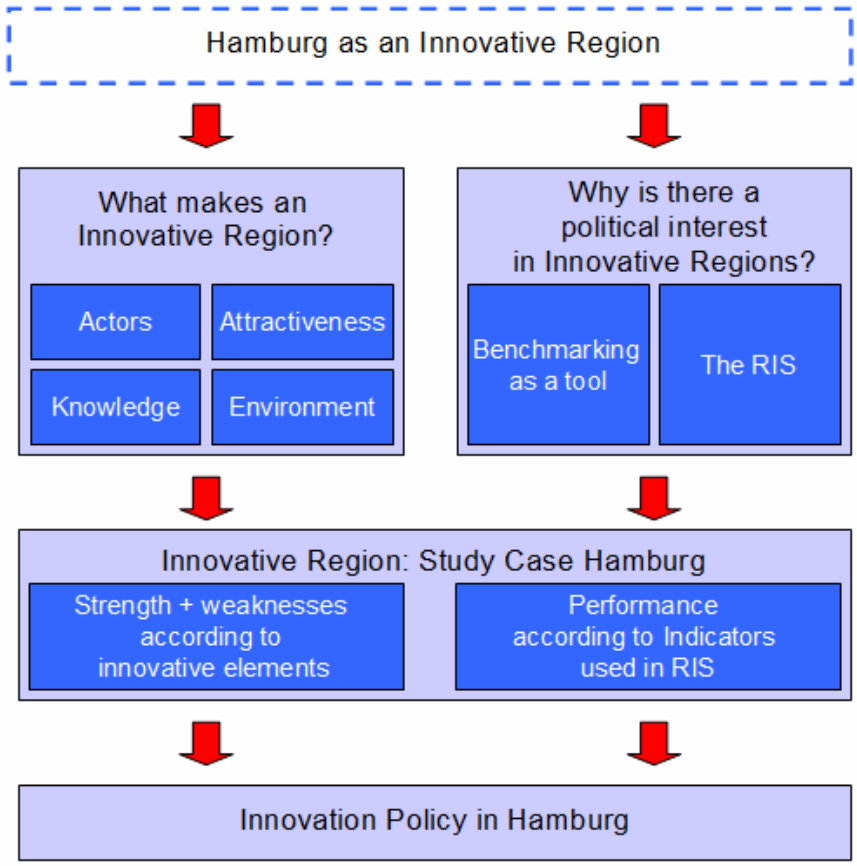
As this common basis and the applied policy differ from region to region, a closer look on one region is necessary. The metropolitan region Hamburg, a region with approximately four million inhabitants that is situated in northern Germany, has been selected as study case for several reasons. Hamburg is ranked on place 53 out of 208 European Regions and therefore within the first quarter on the Regional Innovation Scoreboard (Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2006). This makes it an interesting choice since

there are fewer studies on its innovativeness than this is the case for the top regions, but it is still ranked high enough so that innovative elements can be visible. The metropolitan region is a cooperation of the city Hamburg, which is also a 'Land' (states in Germany) on its own, and its surrounding districts. The Länder have the legislative power to set up different political measures to foster their innovative potential and the overall competitiveness within the region. This process is still evolving.

The purpose of this thesis is to analyse the theoretical concept of Innovative Regions for the study case Hamburg. In this respect the first subordinate objective is to define an Innovative Region, the second to examine innovative elements in Hamburg and the third to analyse the policy measures taken to foster innovation in Hamburg.

The following figure illustrates the structure of the thesis in its main parts.

Figure 1: Thesis structure



The first part is a theoretical approach on Innovative Regions. It defines what innovation is, how it is created and which elements can be found in an Innovative Region.

In the second part the performance of Hamburg according to the Regional Innovation Scoreboard (RIS) is examined as one method to analyze its innovativeness. In order to evaluate the explanatory power of the used indicators, both the political interest in innovation and benchmarking as a tool to enhance innovation are explained.

In the third part the findings out of the theoretical analysis of Innovative Regions (part one) are applied on Hamburg as another method to define its innovativeness. A deeper look at the framework conditions that influence Hamburg's innovative capacity is taken and its strength and weaknesses as an Innovative Region are analyzed. The absence of studies on actors, their networks, the knowledge they use and the environment which is attractive to them, act limiting to this part.

The last part analyzes the policy measures taken to foster Hamburg's innovativeness. These are reconsidered and further research questions as a basis for a better focused innovation policy are given. As a conclusion an evaluation of Hamburg as an Innovative Region is derived and the possibility to plan for innovation is questioned.

II What makes an Innovative Region?

In order to gain a better understanding of Innovative Regions, a closer look on innovation is essential. Various approaches define innovation and the process of innovating. In this chapter an overview on some relevant approaches is given. A definition of innovation in respect to regional innovation and the way it is used in this thesis is derived in the end.

1 What is innovation?

At first a distinction between innovation and invention has to be made. Whereas an invention is a first idea, an innovation applies the invention in practice (Fagerberg, 2005; Pleschak & Sabisch, 1996). Since there is no causal connection between both, one invention can be the base of none or many innovations.

The term innovation is deduced from the Latin word ‘innovatio’, which denotes renewal and change (Microsoft Cooperation, 2004). Thus an innovation must not necessarily be something new; it can rather contain a new adaptation or modification of “old” knowledge. Almost all definitions trace in one way or another back to the one given by Schumpeter (1911/ 1934). He saw innovation as a new combination of existing resources (Fagerberg, 2005). Innovations can in this respect be new products, new methods of production, the opening of new markets, new organization modes or new sources of supply:

- A *product innovation* is the introduction of a new or improved good or service. This includes significant improvements in components and materials, technical specifications, user friendliness, integrated software or other functional characteristics.
- A *process innovation* is a change in the production or delivery method. This can be significant changes in equipment, techniques and software. Process innovations intend to decrease costs of production

or delivery, to increase quality, or to produce or deliver new or significantly improved products.

- A *marketing innovation* can be a changed design, placement, promotion or pricing of a product. It aims to better address the customers' needs, to position a product newly or to open up new markets.
- An *organizational innovation* can be a change in workplace organization, in the company's business practices or in external relations. It aims to reduce costs or to enhance labour productivity (Tiwari, 2008).

An innovation can either be incremental, or radical. A radical innovation is done at one point in time, whereas incremental innovation refers to the slow and long lasting process of further development. New versions of existing products exemplify this kind of innovation. This might be not as important and visible as a radical innovation for the economic development at first sight, but it has actually a great influence. Not only radical innovations, such as the innovation of the automobile, but also series of incremental innovations, like the further development of the automobile industry to mass production, have a big impact on economic development. The "realization of the economic benefits from 'radical' innovations in most cases […] requires a series of incremental innovations and improvements." (Fagerberg, 2005, p.8) But it still has to be kept in mind that the incremental innovation could not be done without the radical innovation as a starting point. Because developing and sustaining a competitive advantage is crucial for firms and regions, both types of innovations are important.

The question can be raised from which point on a region or economy can be characterized as *innovative*. Since all regions develop somehow, elements of incremental innovations are present everywhere. Therefore all regions can call themselves innovative at least in terms of incremental innovation. That is the reason why the definition is so attractive for policy. In order to avoid this all-embracing definition it could be said instead, that an innovative development must somehow contain a radical element. The problem with this

definition is that it can be difficult to see the radical elements in an ongoing innovation process. Especially process innovations, which are often made in mature industries, are mostly invisible for an observer from the outside. Hamburg's industry is mainly based on mature industries, such as aviation and logistics. In these fields incremental innovations are from high importance, thus focussing on radical innovations only would not be applicable for the following observation of innovative elements in Hamburg.

2 The Innovation process

Innovations and inventions are continuous processes without a starting and an ending point. They are permanent improved and adapted (Fagerberg, 2005, p.5). This makes them hard to measure and to define as they can be almost invisible. There are two main approaches trying to explain the process of innovation: The linear model and the innovation system model.

The linear model

Innovation is seen as the outcome of applied sciences in the linear model. "It is 'linear' because there is a well-defined set of stages that innovations are assumed to go through. Research (science) comes first, then development, and finally production and marketing." (Fagerberg, 2005, p.8) Since research is mentioned at first, it seems to be the crucial element within the innovating process. This perspective underlines the importance of R&D activity and focuses on in-house learning processes that develop seemingly independent from other actors (Klaerding, Hachmann & Hassink, 2009).

But as Kline and Rosenberg (1986) point out, this chain of causation only applies to a minority of innovations. According to them

> "Firms normally innovate because they believe there is a commercial need for it, and they commonly start by reviewing and combining existing knowledge. It is only if this does not work (…) that firms consider investing in research (science). In fact, in many settings, the experience of users, not science, is deemed to be the most important

> source of innovation." (Kline & Rosenberg, referred to by Fagerberg, 2005, p.9)

Another critique they offer is that the process of innovating is not linear, but contains many steps backwards, loops and failures. This can be called a circular learning process or a systemic view on innovation and is dominant in current literature.

The innovation system model

According to the innovation system model, the development of innovation is based on new created or newly applied knowledge that is merchandised. This is mostly done in an interactive process by different actors but it can also be a product of the work made by one single person. Again, Schumpeter was one of the pioneers to emphasize the importance of teamwork for the creation of innovations, even though he referred to teamwork within larger organizations (Fagerberg, 2005). Circular learning processes and feedbacks are characteristic for the connection of relevant actors in networks. The actors – e.g. companies from one branch, customers, research centres, organizations, associations and regional government agencies – serve as generators, users or propagators of new knowledge (Klaerding, Hachmann & Hassink, 2009).

Interaction can occur within one company and between different actors. This enhances the accessibility of knowledge. According to Cook (1997, cited in Klaerding, Hachmann & Hassink, 2009) the central determinants for innovation systems are the flow of information, knowledge and capital investments, constellations of power and informal arrangements between the actors. Following this theory both actors and their relations are the main components of innovation systems. In an ideal system, relevant synergetic effects and interdependences are formed in order to create a surplus to the actor's individual performances.[1] The more companies on average cooperate and compete with other actors, the higher will be the pressure on others to do the same and to develop further innovation to stay competitive. This can

[1] This does not necessarily happen. All humans interact within social systems somehow, but not all create an innovative surplus out of this interaction.

increase not only the innovative capacity of the individual firm, but also of the whole innovative system, e.g. the region the firm belongs to (Fagerberg, 2005).

3 Elements of an Innovative Region

Many elements create and influence the innovative potential of a region. Important are the creation and use of knowledge, the environment for the exchange of knowledge and innovation, actors who can take the initiative to use knowledge to innovate and the attractiveness of a place for these actors.

Creation and use of knowledge

Depending on the way knowledge is generated and used, it can be 'synthetic' or 'analytical'. The former one is often created by inductive processes such as experiments, tests, practical work or computer-based simulations. Often this knowledge is tacit knowledge[2] that has been shaped by the institutional and social context within a region and therefore sticks to this context, to people or routines of organizations. Synthetic knowledge is used for example in shipbuilding and machinery. Innovations are mainly created incremental as improvements of existing processes or products. In those industries the importance of R&D is lower compared to other industries, such as biotechnology or information technology, using analytical knowledge. Therefore an increase of R&D activity within a region that is dominated by industries using synthetic knowledge will probably not directly increase industrial relevant knowledge in this region. Scientific research is more important in fields that are based on analytical knowledge. Codified knowledge, which is recorded knowledge, is dominant in this case. Here the amount of in-house R&D as well as links between universities, research institutes and companies is higher and interactions and networking is more important. In these industries, innovations are more likely to be radical and new processes and products are created. All types of knowledge are involved

[2] Tacit knowledge can hardly be exchanged over long distances. Instead it is best exchanged face-to-face. Also it is seen as central for the absorption of new knowledge for the creation of innovations (Asheim & Gertler, 2005; Klaerding, Hachmann & Hassink, 2009).

in the process of knowledge creation and innovation (Asheim &Gertler, 2005; Klaerding, Hachmann & Hassink, 2009).

A spatial proximity can increase the innovative activity in both cases. But, as Asheim & Gertler (2005) state, the degree of concentration is in industries using analytical knowledge even higher.

Environment for innovation

After actors and their relations, Klaerding, Hachmann & Hassink (2009) see institutional, administrative, political and cultural determining factors as a major component of innovation systems. They influence and regulate the economic actions that strive for the creation of innovation. Therefore Hassink & Ibert (2009, referring to North, 1990) call them the “rules of the game” (author translated: p.161) for the interaction within a limited territory, whereas Asheim & Gertler (2005) phrase this phenomenon as “local codes” (p.294) and the knowledge on them as tacit knowledge. These “codes” can be standards, the way laws and political programmes are carried out, cultural norms, moral conceptions or operational routines. They define the institutional structure when it comes e.g. to the decision of becoming a start-up entrepreneur, the receipt of venture capital or the acceptance of failure. In coordinated market economies, such as Germany, the non-market cooperation and coordination within the business sphere and between public and private actors can be innovation drivers too (Asheim & Gertler, 2005). The cooperation and interaction can be shaped by organization of actors in clusters, chambers, initiatives, networks or associations. Consequently Klaerding, Hachmann & Hassink (2009) state that interactions between actors do not take place in a neutral space, but in territories which have been shaped by historical and socioeconomic processes and institutions. Thus networks are embedded into a specific territorial context, which can be defined on a national or a sub national/ regional scale.

The connections arising from common historical and socioeconomic processes and institutions are more entrenched on a smaller, than on a larger scale. On a regional level relevant actors do not only share values, but also territory and culture. A common base for actions can increase trust and

therefore strengthen the relationship between actors. A faster and easier distribution of knowledge, or more often its appliance directed to the development of innovation, can be a positive effect. Cooperation and competition will facilitate innovation (Lundvall & Borras, 1999).

Actors using knowledge to innovate

Entrepreneurs are actors that take the initiative to use and apply knowledge in a new way in order to change existing means of production to become more appropriate and advantageous (Schumpeter, 1911/ 1934, referred to by Nilsson, 2010). According to Schumpeter's definition they are the ones who innovate, as they apply new combinations of existing resources and put them on the market. They contribute to the economic development by offering new solutions or exploring new segments, which can be cooperation and competition at the same time. They strengthen domestic rivalry, which is crucial for sustaining a competitive advantage and will enhance innovation within an industry (Porter, 1990).

Characteristically entrepreneurs are outside the main stream which allows them to see a problem from a different angle. They can be single persons or units within a company (Fagerberg, 2005). In order to become a successful entrepreneur, not only a good product, but also the contact to the 'right people', a strong dedication to the innovation, sources of capital and the right timing or luck are needed (Nilsson, 2010).

Attractiveness of a place

A place is attractive for entrepreneurs and a well educated work force when it offers an attractive, thick labour market and living conditions (Florida 2002, referred to by Asheim & Gertler, 2005). As Florida found out for the US, "instead of people moving to jobs, (…) companies were moving to or forming in places that had the skilled people." (Florida, 2005, p.xxviii) Therefore he states that "places need a people climate – or creative climate – as well as a business climate" (2005, p.7).

The business climate is influenced by the companies and further actors within a region, laws and regulations on the labour market and by what has been described as the environment for innovation.

The people climate is influenced by the attractiveness of a place to different people. But what makes living conditions attractive in a city varies between different groups, thus a place has to offer something for everyone: This can be e.g. natural amenities, a lively urban centre and nice, family friendly housing areas (Florida, 2005). Attractive living conditions are shaped by soft factors; these can be the image of a city and its urban design, the economic climate, the openness to new investments and quality of life, cultural life and quality of leisure activities (Gebhardt, 2006). Low entrance barriers for people, determined by openness and tolerance, are crucial factors for the acceptance of people who are immigrants to the region.

If a place attracts both knowledge creating actors, such as companies, universities and research institutes, and a high educated workforce and entrepreneurs that make use of this knowledge, it can be innovative. The institutional framework at this place, it’s openness to new ideas and the functioning of networks will further influence its innovative capacity.

4 Innovative Region

Actors and interactions, which are defined as major components of innovation systems, are rooted in the regional level. As the composition of economic actors is essential for the innovative development, the region gains importance in order to shape the innovative capabilities of industries and companies (Asheim & Gertler, 2005).

Depending on the interest, regions can be defined by various measures, such as culture, functions, administrative boundaries, statistical units and history. In order to define the innovative capacity of regions, a functional approach that is based on the intensity of flows towards one or more centres within the region can be appropriate. Administrative borders are important for addressing regional strategies and political promotion. Statistical units, such

as the NUTS 2[3], are used to measure the regional economic activity, the competitiveness and innovative potential on a European level (European Commission, DG Regional Policy, 2009). Anyhow, these do not reflect functional connections, therefore the ability to measure the innovativeness of a region on a European level is only limited.

Based on the description above this thesis defines an Innovative Region as an area, where 'new products' are developed and commercialized regularly in order to gain a competitive advantage. In this respect the process of creating an innovation can be both incremental and radical. Important elements of an Innovative Region are the creation and use of knowledge with the aim to develop innovations, the spread of knowledge within networks and the attractiveness of the place to whom that will innovate: The entrepreneurs, companies and skilled workforce. Because of the importance of networks, the extent of an Innovative Region is defined by functional flows.

This definition has, as argued above, the disadvantage that it defines all regions as innovative somehow. Thus it the task for the analysis of Hamburg is to find its innovative elements and its strength and weaknesses as an Innovative Region.

The focus on the regional level is not undisputable. Its usage contains some advantages for the EU: First, it is open to regional development programmes of the EU (Klaerding, Hachmann & Hassink, 2009). Since a political competence is missing in the field of planning, the EU tries to influence spatial development by the usage of funding. Thus the number of programmes fostering innovation designed and financed by the EU is, compared to those designed by other administrative levels, high (Hassink & Ibert, 2009). But this does not necessarily lead to a higher effectiveness of actions on the regional level. It only shows that the European possibility to make institutional changes, which might be more effective in order to

[3] NUTS (Nomenclature des unités territoriales statistiques) is a statistical unit designed by the EU. NUTS 1 regions are the equivalent of the Länder in Germany, NUTS 2 is the regional level and NUTS 3 is equal to the districts.

enhance innovation, is low. Second, the regional level is statistically documented by Eurostat. This allows a better access to statistical data on the development of regional indicators. Consequently the regional level is seen from a European point of view as particularly appropriate for interactions, for the appreciation of needs and for the creation of policy solutions[4] (European Commission, DG Regional Policy, 2006). The most important argument for a focus on the regional level is, as said by the system of innovation model, that the development, use and propagation of knowledge are done by social interactions. These interactions, which are the basis for innovation, are embedded into a regional context.

The focus on regions has also some disadvantages. It contains an inherent risk of an isolated view on the regional development. This would leave out national and global connections, which are important determinants for the development of innovations. The power of public actors to act and their decision-making ability is depending on national framework conditions. Indeed the Länder are powerful, but that does not necessarily apply to the regions, which have only the authority “to formulate and prioritize the innovation policies.” (North Denmark EU-office, n.d., p.4)

It can be questioned if a regional approach is most valid for the creation of innovation, or if another, non-territorial approach, such as a project related one, would be more appropriate. According to this approach ‘communities of practice’, which are bound together by shared experience, exercise and a joint commitment to a project, are the main driving forces for innovation (Asheim & Gertler, 2005).

In conclusion, for the description of the innovativeness of Hamburg the regional approach seems to be the most promising, since a common basis shapes the innovative capacity of the city and its surrounding region. It has been developed thru the institutional structure, historical and socioeconomic processes. Also the flow of information, knowledge and capital investments, constellations of power and informal arrangements between the actors have been defined as central determinants.

[4] Further information on policies that can be directed to foster the innovativeness of Hamburg on a regional level will be given in chapter V.

III Benchmarking Innovative Regions

Innovation has become an important instrument for EU policy in order to reach the strategic goal set in the Lisbon Agenda (2000): That the EU should become “the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" (Eurostat, 2009d) within the next decade. In a knowledge based economy, existing knowledge is used to create, apply or combine knowledge in a new way in order to create innovation and achieve a competitive advantage.

Numerous attempts have been made to look at the performance of the EU and its member states in relation to the Lisbon goals. The European Innovation Scoreboard (EIS), on the regional level it is called Regional Innovative Scoreboard (RIS), is one of these[5]. It aims to further strengthen the member state’s efforts to implement the Lisbon strategy by measuring and benchmarking the innovative capacity of regions. In the following the used indicators is reflected critical and a closer look on Hamburg’s performance is taken.

1 Why benchmarking Innovative Regions?

The attention drawn to the aims set in the Lisbon Agenda in general and to innovation in particular are rooted in the ongoing competition between the US, Japan and Europe. Gannon (2003) calls them the “contenders for the crown of the leading economic zones” (p. 117-120). He states that each of the countries watches the moves and investments of the others and tries to achieve an advantage. Therefore benchmarking has become an important tool to watch the others steps. Even though the indicators used for benchmarking cannot show the overall performance of the countries, they are

[5] Other efforts are the annual synthesis report made by Eurostat, which provides data on the basis of the structural indicators on the progress made by the EU (Eurostat, 2009) and a list of Lisbon-oriented indicators, which strive to activate and help the European Commission to define targets related to the European Research Area (European Commission, DG for Research,2009).

still used for comparison. Achieving better results has become the goal of the game.

The EU sees benchmarking also as an instrument for an assessment on the progress made on the Lisbon objectives (European Commission, n.d. c). Its two main targets are:

- To increase R&D expenditure up to 3% of the GDP in 2010
- To achieve an employment rate of 70% in 2010

There is no obligation for the member states to conform to these targets. Legally binding policy objectives are missing and thus the EU can mainly influence the member states by providing funding through programmes. None of the goals have been reached by now (2010) and also been met in 2008, before the start of the crisis. Missing actions on the member states level are seen as the cause for lagging behind. In order to increase the pressure for reforms within the states, Sprissler suggests to use rankings with an active „naming, praising and shaming“ (2009). In his opinion, this would enhance the political will for change. But in an EU that is constantly looking for common agreements, an active naming and shaming will hardly be possibly.

Figure 2: Policy convergence capacity

1.	Simple benchmarking and/ or recommendations	Lowest
2.	**Voluntary policy objectives + benchmarking & peer pressure***	
3.	Voluntary policy objectives + benchmarking & peer pressure + structured coordination process	**Policy Convergence**
4.	Legally binding policy objectives (sanctions for non-compliance) + benchmarking & peer pressure + structured coordination process	**Capacity**
5.	Legally binding regulations	Highest

* Peer pressure: The provocation of reactions from national leaders on the progress a country has made

Source: Adapted from: Citi & Rhodes, 2007, p. 469.

According to Citi & Rhodes (2007) the efficiency of benchmarking as a policy instrument in the EU context is only little (second lowest policy convergence

capacity according to figure 2). In the EIS it is explicitly used as an assessment tool for national performances on the highest political level and an annual review on the national performance and best practices is done (Citi & Rhodes, 2007; European Commission, n.d.). Benchmarking in the EIS/ RIS is mostly ignored by political actors and by public. Otherwise it could have the effect of moral suasion (Citi & Rhodes, 2007).

Altogether, the policy convergence capacity of benchmarking in the framework of the Lisbon Agenda is rather low. This might have an effect on the way the regions try to increase their innovativeness, because the pressure to reach the Lisbon goals is mainly coming from the will of the member states to enhance the employment rate and to receive funding, not from legislation. Since the performance of the countries and regions is highly heterogeneous, a setting of concrete targets for the individual countries/ regions is missing and benchmarking is used here in one of its weakest forms. Yet the “naming and shaming” in a ranking has been given up in the 2009 RIS. Instead of a clear ranking, five groups of regions have been defined according to their innovative performance. Even the worst performing regions cannot be ashamed that much, because they are still among others.

2 Measuring the innovative capacity of a region

Characteristics of an Innovative Region are difficult to define. On the one hand different attempts to measure the innovativeness of countries and regions have been made and their use is popular among the better performing European regions. On the other hand it can be questioned what the main driving forces for an innovative development are and if they are measurable by indicators.

A closer look is taken at the two latest versions (2006 and 2009) of the RIS in comparison with the EIS (2006). They aim to evaluate and compare the innovative performance of the EU member states (NUTS 0 level) respectively the European regions (NUTS 2 level). On the NUTS 0 level 26 indicators are used to measure innovativeness, whereas the evaluation of the regional

performance is only based on an extract of these (Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2006; Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2009).

The indicators are split into input and output indicators. Input can be seen as the framework for economic development that can mainly be provided by public policy. It includes the structural conditions for innovation, such as a high level of education, the creation of knowledge through R&D and the support of entrepreneurs. Output is measured in terms of business activities and labour, their value adds in innovative sectors and by results of innovative activity, mainly technical elements that are patented. As a high share in these fields implies a high competitiveness, it is aimed by innovation policy.

Together input and output are supposed to display how much a country or a region is structured in a way that might enhance innovation. But there are some problems with this approach. It is closely linked to the linear model, which sees innovation as an outcome of R&D[6] activity. This is only true for a minority of innovations, as it has been explained above. Industries dominated by synthetic knowledge are not directly linked to R&D, their way of creating knowledge is mainly based on inductive processes. The ratio of innovation input and output are measured to display the efficiency of innovation policy in the chosen fields, even though there is no theoretical basis for this linear assumption (Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2006).

[6] Not only the number of variables displaying R&D activities, but also their high correlation with other indicators such as patent applications influence the results of the RIS.

Table 1: Innovation Indicators used in the 2006 Regional Innovation Scoreboard and in the updated version of 2009

		INPUT – INNOVATION DRIVERS	
1.1		S&E graduates per 1000 population aged 20-29	EUROSTAT
1.2		Population with tertiary education per 100 population aged 25-64	EUROSTAT, OECD
1.3		Broadband penetration rate (number of broadband lines per 100 population)	EUROSTAT
1.4		Participation in life-long learning per 100 population aged 25-64	EUROSTAT
1.5		Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)	EUROSTAT
		INPUT – KNOWLEDGE CREATION	
2.1		Public R&D expenditures (% of GDP)	EUROSTAT, OECD
2.2		Business R&D expenditures (% of GDP)	EUROSTAT, OECD
2.3		Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditures)	EUROSTAT, OECD
2.4		Share of enterprises receiving public funding for innovation	EUROSTAT (CIS4)
		INPUT – INNOVATION & ENTREPRENEURSHIP	
3.1		SMEs innovating in-house (% of all SMEs)	EUROSTAT (CIS3)[7]
3.2		Innovative SMEs co-operating with others (% of all SMEs)	EUROSTAT (CIS4)
3.3		Innovation expenditures (% of total turnover)	EUROSTAT (CIS4)
3.4		Early-stage venture capital (% of GDP)	EUROSTAT
3.5		ICT expenditures (% of GDP)	EUROSTAT
3.6		SMEs using organisational innovation (% of all SMEs)	EUROSTAT (CIS4)
		OUTPUT – APPLICATIONS	
4.1	**	Employment in high-tech services (% of total workforce)	EUROSTAT
4.2		Exports of high technology products as a share of total exports	EUROSTAT
4.3	*	Sales of new-to-market products (% of total turnover)	EUROSTAT (CIS4)
4.4	*	Sales of new-to-firm products (% of total turnover)	EUROSTAT (CIS4)
4.5		Employment in medium-high and high-tech manufacturing (% of total workforce)	EUROSTAT
		OUTPUT – INTELLECTUAL PROPERTY	
5.1		EPO patents per million population	EUROSTAT
5.2		USPTO patents per million population	EUROSTAT, OECD
5.3		Triadic patent families per million population	EUROSTAT, OECD
5.4		New community trademarks per million population	OHIM[8]
5.5		New community designs per million population	OHIM[7]

Indicators used in the 2006 Regional Innovation Scoreboard

Indicator used in the 2006 RIS but not in the EIS:

Human Resources in Science and Technology – Core (% of population)

Indicators used additionally in the 2009 Regional Innovation Scoreboard

* Only for SMEs

** Not Included in the 2009 RIS

Indicator used in the 2009 RIS but not in the 2006 EIS:

- Non-R&D innovation expenditures of SMEs (as a percentage of turnover)
- SMEs introducing product or process innovations (as a percentage of all SMEs)
- SMEs introducing marketing or organisational innovations (as a percentage of all SMEs)
- Number of all innovating SMEs who replied that their product or process innovation had a highly important effect on reducing labour costs per unit of output as a percentage of all firms or on materials and energy per unit of output as a percentage of all firms
- Employment in knowledge-intensive services (% of workforce)

Source: Adapted from: Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2006, p.7.

The output does not display the economic competitive advantage a region created from an innovation, since one innovation might lead to a whole new industry whereas another one can only be sold on the market to a very small market segment. Thus the effect of innovations on the economic development varies. The output indicator “Applications” tries to solve this problem by looking at the sales of new to market products on a member state level. But due to data unavailability, this is not possible area-wide on a regional level. The focus on the NUTS 2 level remains employment and economic growth, not innovation.

A continuous process, such as the development of innovation, is difficult to measure with variables that display a more or less static picture. If there is a connection between input and output in reality, it will need some time to develop an output from the input. Furthermore the input of individuals and their collaboration in networks form an environment for the creation of innovations, but this is not measurable on a European scale and therefore not included. The same applies to history and chance. Moreover the habit to take patents varies in the different industries; it is high in the pharmaceutical industry and low in the software industry. A headquarter is more likely to send the patent in, so that the place where it was developed cannot be found in the statistics. Also it is not the innovation itself that is patented, but an invention that might be integrated in one or in several innovations of which some might be successfully commercialised. Furthermore patents are taken batch-wise (Rahmayer, 2005), looking at one year only can change the result. Overall the variables are only given for statistical units, not for the functional agglomerations where interactive social processes take place.

The selection of variables evaluating the regional innovativeness is lacking any theoretical basis and there is a high variation of used indicators between the different reports. This hinders a comparison of the innovative performance of regions. It is most likely that in both reports only those indicators contribute to the measurement on a regional level, which are available for most of the NUTS 2 regions. Since a case is only defined as valid in the RIS 2006 when one variable is missing at the most, the comprehensive availability of indicators was probably the most important

criterion for their choice. Possibly for this reason the field of innovation and entrepreneurship, which might even be the most important field of input indicators, has been left aside in the 2006 report. Because the criterion of only one missing value per case has been removed in the 2009 report, the number of used indicators has been increased. How the cases with missing values are calculated is not mentioned in any of the two reports. This can be a problem for a correct interpretation of the Regional Innovation Index, since it changes the result for some regions. Furthermore the information which values are missing is absent.

About the robustness of the index is said the following in the 2009 RIS:

> "As the purpose of this report is not to provide a robust and definite typology of regional innovation performance but rather to catalyse the availability of regional CIS[7] data, we have focused our efforts on the latter." (p. 10)

This shows again that the performance of a region according to the indicator is not that much reliable.

In conclusion it can be said that the implementation of the Lisbon Agenda has partly been done with the set of so called Lisbon-relevant-indicators. Combined with further indicators they try to display the innovative performance of European regions. The RIS makes the innovative performance comparable and thus enhances the competitiveness among the regions. But this has also negative secondary effects: Pushing the indicators might become attractive to a regional government, even though this might not be reasonable to improve innovative activities. This leads in the end to regional development programs that are looking at the "indicative share of Lisbon-relevant categories of expenditure" (European Commission, DG Regional Policy, 2010) like it has been done in Hamburg.

The problem with the indicators used in the RIS is, that they cannot give an impression of the innovativeness of the region, instead they only display how well the countries or regions perform in the chosen areas. A closer look on the leading regions in the 2006 RIS (the 2009 RIS does not contain a

[7] CIS refers to the regional Community Innovation Survey

ranking) shows that especially regions from North-West Europe are favoured by the chosen indicators. Prague is the only exception. Especially Swedish, German and Finnish regions are ranked high. This is not surprising as Sweden and Finland were the only countries that had met the 3% goal (the share of the GDP spent on R&D) set in the Lisbon Agenda and Germany had the fourth highest share of R&D expenditure by 2006 (Eurostat, 2006). From these three countries, the respective capital regions and with Prague and Île de France two further capital regions are included in the top 20.

Table 2: Top 20 regions in the RIS 2006

No	Region	Index	No	Region	Index
1	Stockholm (SE)	0.90	11	Berlin (DE)	0.74
2	Västsverige (SE)	0.83	12	South East (UK)	0.72
3	Oberbayern (DE)	0.79	13	Tübingen (DE)	0.72
4	Etelä-Suomi (FI)	0.78	14	Manner-Suomi (FI)	0.71
5	Karlsruhe (DE)	0.77	15	Praha (CZ)	0.70
6	Stuttgart (DE)	0.77	16	Darmstadt (DE)	0.69
7	Braunschweig (DE)	0.76	17	Eastern (UK)	0.69
8	Sydsverige (SE)	0.76	18	Dresden (DE)	0.69
9	Île de France (FR)	0.75	19	Köln (DE)	0.69
10	Östra Mellansverige (SE)	0.74	20	Noord-Brabant (NL)	0.68

Source: Adapted from: Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2006, p.31.

Also the industrial base of a region has an influence on the ranking. Many regions ranked high, such as Stockholm, Västsverige, Oberbayern, Karlsruhe, Stuttgart, Braunschweig, Île de France, Darmstadt, East and South East of England and Dresden, are home of the automotive industry. Among the high ranked regions are also some, for example Stockholm, Oberbayern and Stuttgart, with clusters in the pharmaceutical industry or in biotechnologies. All these industries have in common that their development is mainly based on analytical knowledge and the share of R&D is comparably high (House of Commons – Business and Enterprise Committee, 2009, p.5).

Overall, the analyses of the RIS shows that the used indicators are structured based on the linear model and draw a strong connection between R&D and innovation. Nevertheless, the usage of the scoreboard allows countries and regions to look at their current innovative performance and their performance

over time, according to the indicators. This is also important when it comes to the evaluation of projects and the usage of structural funds.

3 Measuring the innovative capacity of Hamburg

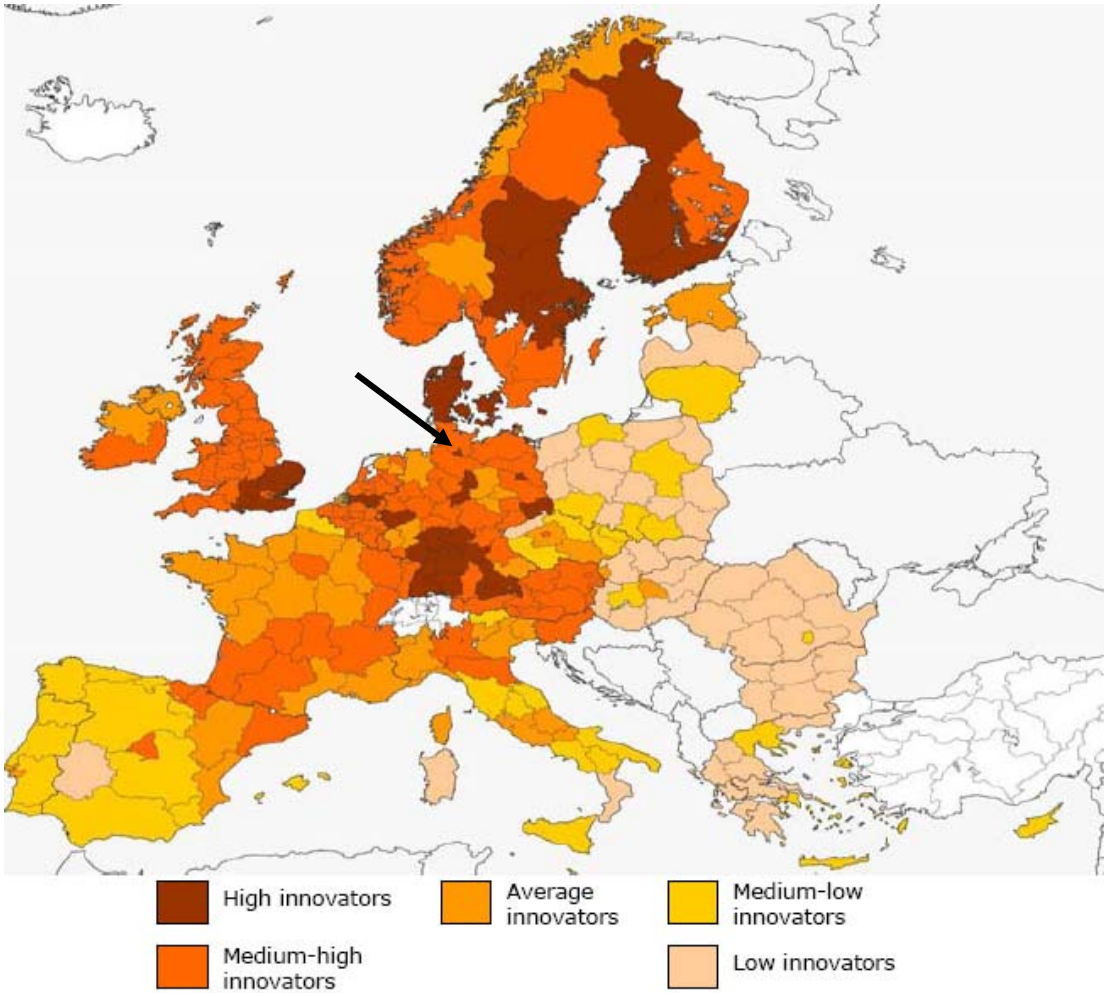
The following description displays Hamburg's performance in the above shown groups of indicators used in the RIS. Since the RIS is officially published in accordance with the EU Commission, one could assume that data availability is not a problem on the regional level. But this is a misapprehension. Since the used data set has not been published officially, it is complicated to analyze the ranking. Depending on the availability, one or two indicators have been chosen from each group. They characterize Hamburg's present performance according to indicators on innovation. If possible, 2007 has been chosen as the basic year, but because of data unavailability, it has not always been possible.

The city Hamburg is with 1.8 million inhabitants the second largest city in Germany. It is the economic and cultural centre of the metropolitan region Hamburg and can be seen as the core of functional connections within the region. Therefore it has a high influence on the development of its surrounding districts.[8] The functional region is in its spatial extension similar to the metropolitan region of Hamburg but the description is done, alike the RIS, based on the city Hamburg, which is a NUTS 1 and NUTS 2 region itself.[9]

[8] The only major hubs of economic initiatives in northern Germany are in Lübeck, Bremen and Bremenhaven, which are not part of the metropolitan region (see also figure 5 and 6). Within the metropolitan region only few economic important places can be found: One is the city of Stade, which is part of the network around Airbus, and another one is the city of Lüneburg, which is the largest university town after Hamburg. Approximately 7.500 students are living in there and their number is decreasing (Landeszeitung für die Lüneburger Heide, 2009).

[9] Two different agencies are responsible for the collection of data within the region: The statistical office Nord (for Hamburg and Schleswig-Holstein) and the statistical office for Lower Saxony, one office for the whole metropolitan region is missing.

Figure 3: Regional innovative performance according to the RIS 2009



Source: Adapted from: Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2009, p.3

Hamburg, which is ranked on position 53 out of 208 in the RIS 2006, is according to the indicators, located in one of the leading innovative countries in Europe (Maastricht Economic Research Institute on Innovation and Technology & Joint Research Centre of the European Commission, 2009, p.3). As almost all regions in Germany are high or medium-high performing, Hamburg is not one of the leading Innovative Regions within the country.

Table 3: Indicators used for the description of Hamburg

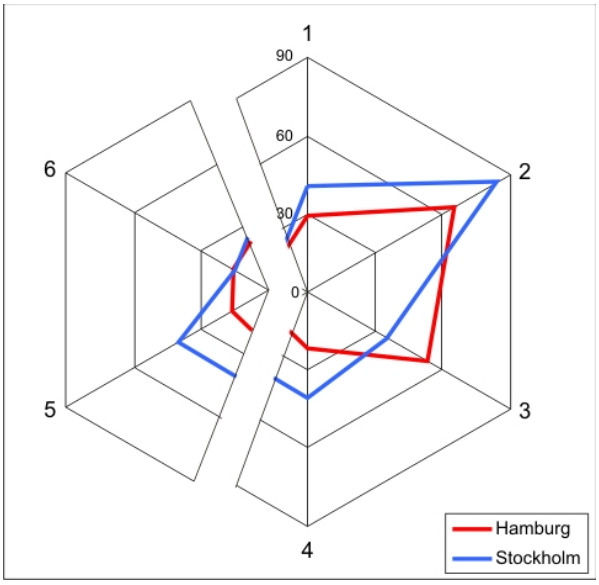
Input	Output
• percentage of labour force with a tertiary education • the share of households with a broadband access • public and business R&D expenditures as a percentage of the GDP	• employees in high tech and medium-high tech manufacturing • labour force working in high-tech services • patent applications to the EPO (European Patent Organisation)
• employment growth rate • GDP growth rate	

Source: Own design.

For reflecting the data a short comparison with Stockholm, the leading innovative region according to the 2006 RIS, has been made in the fields where data was available from one source for both regions. It has to be taken into consideration that some of the regional differences are a result of national differences. Thus a comparison with Oberbayern[10], which is the leading German region according to the RIS, has been added in the text where data was available.

Figure 4: Innovative Performance of Hamburg vs. Stockholm

1 % labour force with a tertiary education (2007)
2 % households with a broadband access (2009)
3 % high tech and medium-high tech manufacturing employment (2007) *10
4 patent applications to the EPO (per 10mio of inhabitants) (highest value 1996-2006)
5* GDP Growth rate (1995-2004) *10
6* Employment Growth rate in Industry and services(2000-2007) *10



* Indicator 5 and 6 are displayed separate, as they are not part of the RIS. Instead they display what is supposed to be the outcome of a high innovation activity.

Source: Own design (Data from Eurostat, 2009; OECD, 2009).

[10] Oberbayern is a Bavarian region that has Munich as its core.

At first sight, it becomes obvious that Stockholm has a better performance in almost all used indicators except *employees in high tech and medium-high tech manufacturing* and in the overall *employment growth rate* (in industry – except construction – and services), where both regions show the same performance.

Input

The field of indicators called *Innovation Drivers* is measured by two variables: The percentage of labour force with a tertiary education and the share of households with a broadband access. The percentage of *labour force with a tertiary education* in Hamburg has increased slightly from 28.6% in 2000 to 29.3% in 2007. This is a little higher than the German average, here it increased from 27.3% (2000) to 27.8% in 2007. In Stockholm it has been stable on a higher level (40.8%). This difference might be caused by different national education systems (OECD, 2009). The share of *households with a broadband access*, which is supposed to be "an important factor in productivity growth and stimulating innovation" (Eurostat, 2009b), has rapidly increased in Germany since 2003. At that time, only 9% of all households had a fast connection in contrast to 65% in 2009. With 67% (2009) Hamburg is slightly above the German average, but compared to Stockholm, which has a penetration rate of 84%, this is still low (Eurostat, 2009a). This shows again the national differences in political focuses, as enhancing broadband penetration has been focused more in the Nordic countries.

Knowledge Creation is measured in the RIS inter alia with public and business R&D expenditures as a percentage of the GDP. There are some problems with this measurement. First, as explained above, it assumes that innovation is mainly a result from R&D activity. Second, some countries have traditionally a higher share of business R&D, others in public R&D. In Germany and Sweden industrial R&D accounts for more than 2/3 of all R&D expenditure (Gannon, 2003). Third, the percentage of R&D expenditure can also be increased by a decreasing GDP (Eurostat, 2007). The EU aspires to increase governmental R&D expenditure up to 1% of the GDP until 2010. This number has not been reached by Germany so far (Gannon, 2003). In

Hamburg *public R&D* expenditures have been increased by 10.6% between 1993 and 2003. This is the lowest increase of all German federal states. For example Bavaria, where Oberbayern is situated, had an increase of 43% in the same time period. In this respect, the gap between Hamburg and the leading Innovative Regions has been growing (OECD, 2009; Hamburgisches Weltwirtschafts Institut & Hypovereinsbank, 2005). Still the share of R&D does not necessarily have an influence on the innovative development of a region, as more R&D relying industries, such as biotechnologies and automotive industries, are situated in Oberbayern than in Hamburg.

Output

The output indicator *Applications* is mainly measured by employment and sales-to market variables. The latter ones are not available on the regional level; therefore a closer look has been taken on the employment situation in Hamburg. 8.9% (2007) of all employees are *working in high-tech sectors* (high-tech manufacturing and high-tech knowledge-intensive services). With this number, Hamburg is at the bottom line of the first fifth of all NUTS 2 regions (Eurostat, 2009b). In the field of *high tech and medium-high tech manufacturing* Germany is the leading nation and with 21% (2001) employees of the total workforce Stuttgart is the leading region in Europe (Eurostat, 2002). This traditional strength might also be an explanation why 'high tech and medium-high tech manufacturing' is the only field, in which Hamburg's performance (5.3% in 2007) is higher than the one of Stockholm (3.5% in 2007), even though it is rather low compared to the German average (10,7% in 2007). On national and regional level the development has been stable since 2000 (OECD, 2009). The percentage of *labour force working in knowledge intensive services* is an indicator that has only been used in the 2009 RIS. With 45.1% Hamburg had after Berlin (49.5%) the highest share of all federal states in Germany in 2007. In comparison to all other EU regions this is the 15th highest share, but the gap to the leading region (in 2007 this was Stockholm with a share of 55.8%) is growing (OECD, 2009).

Patents are seen as an output Lisbon indicator reflecting the *Intellectual Property* of a region, since ideas and innovation are in most cases adequately rewarded by taking patents (Eurostat, 2009c). Since patents are usually taken batch-wise their number ranged within the last ten years (1996 – 2006) between 217,716 patent applications in 2005 and 142,014 patent applications (per million of inhabitants) to the EPO by priority in Hamburg in the year 2006. With this number, Hamburg ranks in the first fifth of all EU regions, but still far behind Stockholm where the number of applications ranged between 217,594 (2006) and 408,632 (1999). One of the leading regions in this field is Oberbayern, where both the highest and the lowest amount are four times higher than in Hamburg. Reasons for these differences are, as explained above, the dominating industries within the regions and the number of headquarters (Eurostat, 2009c; Hamburgisches Weltwirtschafts Institut & Hypovereinsbank, 2005). The highest share of patents in Hamburg has been applied in the ICT sector in 2006 (OECD, 2010).

Innovation is used as an instrument to enhance competitiveness, to ensure economic growth and to create more and better jobs. Therefore the success of actions supporting innovation can also be measured with the employment development and GDP growth. The average innovative performance of Hamburg, according to the used indicators, leads to an average *growth rate of employment* (in services and industry without construction), compared to the best performing cities in Europe such as London and Amsterdam. Still it is equal to the one in Stockholm (Hamburgisches Weltwirtschafts Institut & Hypovereinsbank, 2007). With 1.6% (1995-2004) the *GDP growth rate* has been slightly higher than the German average but still far below the one in Stockholm (4%). The growth took place on a high level both compared to the national and the European average, since the absolute GDP per head has been almost twice as high as the average of the EU 27 and also more than one and a half times as high as the German average (European Commission, 2007, p. 180).

4 Profile of Hamburg

The innovation indicators show a good performance of Hamburg in the chosen fields compared to all European regions; in comparison to the leading regions (of whom some are German) it's rather moderate. According to the RIS there is a threat for Hamburg of being overtaken by other, more dynamic regions. If the indicators are able to forecast the reality – which they usually cannot, since there are many other factors influencing the development of the region – this could reduce Hamburg's political and economic power or decrease its attractiveness to innovative and prosperous companies and people. The 'naming and shaming', an instrument for the implementation of the goals set in the Lisbon Agenda, will not have an influence on the development of Hamburg anymore, as a clear 'naming' has been given up in the RIS 2009.

A profile of Hamburg becomes clear in reference to the indicators and in comparison to Stockholm. Hamburg is comparably strong in the field of high tech and medium-high tech manufacturing. The industries behind this indicator are among others logistic and aviation. Especially logistic is less depending on the development of new analytical knowledge in comparison to the automobile and pharmaceutical industry in Stockholm. This is one reason, why the percentage spent on R&D is rather average in Hamburg and it might also lower the need for employees with a tertiary education, which is also low in Hamburg compared to Stockholm. The smaller R&D demand for the creation of innovation is also linked with the lower need of taking patents on these innovations.

The moderate performance of Hamburg on the RIS, compared to leading regions like Stockholm, does not necessarily have to be a sign for a low innovative capital within the region. It might rather be the result of an economic structure, whose innovativeness is not measurable with the linear model, which provides the basis for the RIS.

IV Innovative elements in Hamburg

Both a business climate and a people climate are needed in an innovative region. As it has been explained in chapter II, the main actors, their relationship and the institutional, political and cultural determining factors are main components of innovation systems. Thus a more detailed look on the main historical processes and the relevant actors in Hamburg is taken in the following chapters. These all influence the business climate, whereas the people climate is more depending on the attractiveness of a place. Since humans are “holders and carriers of that [tacit and specialized] knowledge” (Cowan & van de Paal, 2000, p.3) a place with attractive employment opportunities and a high quality of life is more likely to attract a highly skilled workforce. Both business and people climate are influenced by the openness and tolerance of a place towards immigrants and new ideas.

Hamburg is the second largest city in Germany, after Berlin. On an area of 755 km² the population is about 1.8 million people (2008) (Statistisches Amt für Hamburg und Schleswig-Holstein, 2010). The metropolitan region of Hamburg is a monocentric region that is composed by a cooperation of the city with 14 districts from the Länder Schleswig-Holstein and Lower Saxony (Niedersachsen). The collaboration started in 1994 by the use of a regional development concept, positioning and developing the whole region. An enhancement of the regional development concept in the year 2000 defines a long-term cooperation between the districts (Niedersächsisches Ministerium für Ernährung, Landwirtschaft, Verbraucherschutz und Landesentwicklung, n.d.). The Hamburg metropolitan region has a total population of about four million people today (Arbeitsstab der gemeinsamen Landesplanung Hamburg/ Niedersachsen/ Schleswig Holstein, n.d.).

Figure 5: Map of the metropolitan region of Hamburg

Source: Innenministerium des Landes Schleswig-Holstein, 2006

As it has been shown above, Hamburg is neither one of the leading regions on innovation in Europe, nor in Germany. This is probably one of the reasons why advertising the region with the use of innovation is not popular in Hamburg.

1 Main economic sectors

The innovation pattern in Germany is dominated by incremental innovations within mature industries. According to Zopf (2005) the most innovative German sectors are also its main export sectors: mechanical engineering, automotive engineering, chemical industry and electrical engineering. Within

the Hamburg metropolitan region the number of companies belonging to these sectors is not as high as in the leading German regions.

One reason for this is the path dependency of economy. The fields where innovations in Hamburg mainly take place today are constrained by past decisions (North, 1990). The dominating economic branches in Hamburg are organized in clusters,[11] which have been established around industries where a growth in employment and economy is most likely and that are supposed to be innovative in order to become the engine for regional development (Freie und Hansestadt Hamburg, 2010c). Four clusters have been identified and fostered by politics in the city of Hamburg. These are: Logistics, media and ICT[12], life science and aviation (Freie und Hansestadt Hamburg, 2010b).

Hamburg's economy is dominated by the service sector, which employs 75.7% of the working population. Within the service sector, transport and trade have the largest shares (Innovating Regions in Europe, 2009). Both sectors are traditionally rooted in Hamburg, because of the more than 800-year history of its port, which is the second largest in Europe and the eleventh largest worldwide (Port of Hamburg, 2009). Today the city is the wholesale and foreign trade centre of Germany with a strong logistic sector for the distribution of goods – via airplane, ship, train or truck – not only within Germany, but also to Northern and Eastern Europe (Kirsch, 2007). The port has had a strong influence on the economic development of the city. Kern

11 Clusters are defined as the geographical concentration of businesses, suppliers, service companies and supporting institutions, such as universities and research institutes, of one sector. All participants cooperate and compete at the same time (Porter, 1990). Cooperation and competition can, in an ideal model, increase the flow of knowledge and lead to higher dynamics and a higher competitiveness.
The definition used for cluster based policies in Hamburg has a more narrow perspective and favours only the cooperation of companies within one industry. Due to political reasons the geographical concentration is limited to administrative boundaries. Overall, cluster policies in Hamburg are similar to industrial policies. But the strong governmental influence can be seen very critical according to Porter's perception of clusters, which should leave room for new and unplanned development (Rakelmann, 2009).

12 Placing media and IT together in one cluster has been a political decision based on the assumption, that both sectors will grow together in a so called "Medienkonvergenz" (convergence of media) (Freie und Hansestadt Hamburg, 2010n). This is referring to the use of IT technology for media or to the further development of the internet to an interactive web (web 2.0). A concrete explanation is not given, which displays the political arbitrariness in the field of cluster policies.

(1982) called it the economic engine of Hamburg, since 100.000 people were working directly at the port or in port related jobs[13] in the late 1970's, this was 10% of the whole labour force. Also the cargo handling had grown and the impact of foreign trade increased. Because of the high economic importance a specific harbour policy has been developed. The share of people working in port related jobs has even increased to 12.5% today (Petschow, 2009). In order to stay competitive, the harbour and its logistic background needed to develop further. Incremental innovations have made the process of loading goods more effective and today and the according to the Hamburg port authority most modern Container terminal is situated in Hamburg.

In former times, not only goods but also information was 'handled' at the port. Reports from foreign countries were transformed into articles and spread over the country (Kleinsteuber, 1997). Even though this connection does not apply since the development of radio communication, it is one of the reasons why Hamburg became the centre of the German media industry after the Second World War (Führer, 2009). Today information and communication technology is used for the spread of knowledge, and new media, such as online newspapers, are gaining importance (Kleinsteuber, 1997). Almost 1.500 publishing companies, 9.000 companies belonging to the advertising industry of whom some are international award winners and 2.000 companies from the music or film industry are situated in Hamburg. 15 of the 20 highest circulated magazines, like SPIEGEL and Stern, were founded and are printed in the city and the number of companies is still growing. In media innovations are strongly based on the creative use of knowledge. Innovation in this field can be the founding of a new band, marketing campaign, play or TV show. Therefore a good educated and creative workforce is especially necessary in this field. The national dominance of Hamburg in the field of media and the competitive training and education programmes create an inflow of young talented people what creates a rich environment for innovation (Handelskammer Hamburg, 2006b).

[13] These can be found in shipbuilding companies, ship insurance companies, ship financing, logistics, trade, etc. For some of these companies' results the proximity to the harbour only from their historical connection.

New media, telecommunications and the game industry experienced a dynamic growth in recent years (Innovating Regions in Europe, 2009) and today almost 8.000 IT companies are located in Hamburg. Within the IT sector, multimedia is the growth machine and many online marketing agencies are resident. Furthermore, data processing providers, software consulting and development and hardware consulting play, according to the number of resident companies, an important role. International leaders, such as Microsoft, AOL, Adobe Systems Engineering, Google, Facebook and IBM, have branch offices. Important are also some traditional companies that deal with manufacturing of hardware and components. Among these are NXP Semiconductors Germany GmbH (formerly Philips), which produces security chips passports and admission tickets (FIFA World Cup 2006), the European headquarters of Sharp Electronics, a branch office of Hewlett Packard (1961), the Olympus Europa Holding GmbH, the German headquarters for Panasonic Deutschland (since 1962) as well as Philips Deutschland GmbH (since 1946), which is one of the top ten companies in the German electronics industry (Handelskammer Hamburg, 2009). Innovations in the IT industry can provide the ground for further organizational or process innovations in other fields. This is why big resident firms, like Beiersdorf and Lufthansa, have their own IT service suppliers in Hamburg. The proximity to their customers needs can enhance the innovativeness of service suppliers. Therefore it is not surprising that some of them are innovative leaders in their own field. One example for the influence of IT innovations on other industries is e-commerce. Big retailers, such as OTTO, a company established in Hamburg, profit from it. The web-site of OTTO was voted “the most popular web site” for three years in a row.

The history of aviation industry in Hamburg traces back almost 100 years; this is the age of the first airport in Hamburg. The first attempt of building airplanes in the city has been done in the 1930s, when Blohm+Voss, a dockyard, started building floatplanes. The number of companies and competences increased in the 1980s whereas the cluster has been built up by the administration for economy and employment in 2001 with the aim to become a location of Airbus (Kleber, 2009). This initiative won the

‘Spitzencluster Wettbewerb’ (clusters of excellence competition) offered by the federal government of Germany in 2008 (Bundesregierung, n.d.). Today with Airbus, Lufthansa, Lufthansa Technik (these are also the biggest employers in Hamburg), the Hamburg Airport, specialised suppliers and service providers more than 300 companies connected to aviation are working within the region and the number of employees and companies is growing since the middle of the 1990’s. One cause for these growing numbers might be the high number of patent applications[14] that lead to spill-over-effects for the aviation industry in Hamburg (Behörde für Wirtschaft und Arbeit, n.d.; Freie und Hansestadt Hamburg, 2010e,; Handelskammer Hamburg, 2006a). According to Alesina & Givazzi (2006) financial help given by the state can be useful in order to create innovations in this industry in contrast to all others. Since economies of scale are so large, each country/ the EU can only support one producer. Therefore subsidies both for Boeing and for Airbus are the logical consequence. Aviation is a mature industry where mainly incremental innovations are made. In fact Airbus, that is now situated in the Hamburg metropolitan region and in Toulouse, copied Boing and McDonnell Douglas. Therefore Alesina & Givazzi (2006) call it „a case of excellent imitation rather than innovation.“ (p.87) They state that the most innovative components of an airplane are its software and the electronics (Alesina & Givazzi, 2006). These components are also included in the development of cabins, which is dominant in Hamburg. An annual award, the crystal cabin award, is offered for aircraft interior innovation (Hamburgische Gesellschaft für Wirtschaftsförderung, n.d.).

Life Science[15] is, according to the senate of Hamburg, one of the most innovative industries in Northern Germany. Compared to the other main sectors its innovative activity is stronger depending on R&D. There are many national, European or world leading firms within their specialized field of life science situated in Hamburg. This enhances domestic rivalry, which can

[14] The number of patent applications in the field of aircraft, helicopter and gyroplane was the highest in Hamburg in 2004.

[15] Life Sciences in Hamburg have an industrial core and are focused on medical technology, medicare, pharmaceutical industry and bio technology (Handelskammer Hamburg, 2006a).

provide the seeds for further innovation. The success of these companies is based on inventions and their successful development into innovation. In this field, the importance of taking patents on inventions is high and Hamburg companies rank third, after Munich and Berlin, in the number of patents in this field in Germany.

The most patent taking companies are also the ones with the most employees, Beiersdorf, Philips and Olympus. These are outstanding not only because of their size and innovative potential, but also because of their long tradition in Hamburg, which helped to develop the competences in Life Science further within the region. Beiersdorf for example was founded by Paul C. Beiersdorf, an apothecary from Hamburg, in 1880. His first patent was on a plaster that is today known as Hansaplast and became the market leader in 21 countries. After ten years he sold his company to Dr. Oscar Troplowitz, who was an apothecary and an entrepreneur. Under his leadership, innovations such as the Emulgator Eucerit, which is the basis of NIVEA, were developed in Hamburg. He did not only think about the development of new products, but also about the international extension of his business market. The further development (incremental innovation) of well known Beiersdorf products, such as NIVEA and Labello, still provide the basis for the success of this company (Beiersdorf, 2010). Also Röntgenmüller, which is now Philips Medicine Systems, started its business with the innovation of an x-ray tube in 1865 and is still working in this field with 2.500 employees in Hamburg. Today, more than 200 companies and 100.000 employees are working in the life science sector in the metropolitan region of Hamburg. Additionally to the world players, many of the SMEs are leading within their fields.

Not only the companies themselves, but also suppliers are innovative in Hamburg. One example is the Indivumed GmbH, which developed an international unique industry and data base. The definition of new targeted groups of customers, such as foreign patients, mainly from Arabic countries, for specialized clinics, could be seen as a marketing innovation (Handelskammer Hamburg, 2005).

As the port of Hamburg was an important business factor, trading became highly important for the city's economic development. Traders and merchants had and still have a great influence on the cities development, which displays the path dependency of the city's economic development. Their needs influenced the industrial development of the region in a way, that the maritime industry and logistics became important. Since these are all mature industries it is more likely to develop incremental than radical innovations. The influence of the port can also be seen as a weakness concerning Hamburg's innovative basis today, since the need to develop further, create new business and to establish new industries was not as high as in other regions. Also research and engineer technique are not that much needed within these fields. This might be one reason, why research related companies are more likely to be established in other cities. Still, due to spill-over-effects a high number of suppliers have been established within the dominant economic fields. Among the dominating industries Media, IT and Life Sciences are the youngest and probably more innovative industries.

There is a risk for Hamburg of being trapped in the past and therefore not being able adapt to future needs. But the current lack of technical companies does not have to be a competitive disadvantage in the long run, since the low innovative performance today, compared to other German regions, might be a strong push factor to change in the future. As innovations can be developed everywhere and in every field it remains unclear, if Hamburg will be able to profit from the future development or if it will loose ground. What might be a hurdle for the future development of innovations is the political focus on only a few industries that are fostered with cluster initiatives. By focussing on these, the room for new and maybe more promising sectors is strongly limited.

2 Main actors

Main actors that influence the innovative capacity of Hamburg can be, as explained in chapter II, companies, customers, research centres, organizations, associations, chambers and business development agencies.

These actors are able to serve, depending on the context, as generators, propagators or users of knowledge.

Generators of knowledge

Generators of knowledge are mainly companies, universities and research institutes. Companies primarily generate knowledge for their own use as a basis for developing a competitive advantage thru innovation. As explained above, the main industrial sectors in Hamburg are less based on analytical than on synthetic knowledge. The missing direct link between synthetic knowledge and R&D is one reason why the share of business R&D expenditure in the Metropolitan region is lowest of all German metropolitan regions (Tiwari, Buse & Herstatt , 2007) and consequently the performance of Hamburg according to the RIS is low in this field.

In addition to industrial R&D facilities, Hamburg has eight universities, two of these are for music and art, further eight universities of applied sciences, three Max-Planck institutes (institutes that do basic research), five research centres (mainly for medicine and physics) and seven governmental institutes (Bundesministerium für Bildung und Forschung, n.d.). It also has one technology park, which has originally been established by professors of the Technical University Hamburg Harburg for alumni that wanted to establish their own businesses in 1985. Today it provides 25.000m² office space for 100 businesses with more than 550 employees from 20 different fields (HIT-Technopark, 2010).

Altogether 70.000 students and more than 9.000 researchers work in the city (Freie und Hansestadt Hamburg, 2010a). 90.000 students, of whom 11.000 are coming from abroad, live within the whole metropolitan region (Metropolregion Hamburg, 2010c). This high amount of young students and professionals shows a labour force that has, due to its high qualification, a high potential to innovate. Depending on their education especially people from outside the region can provide an important input for innovation, as they are better able to see a problem from a different angle.

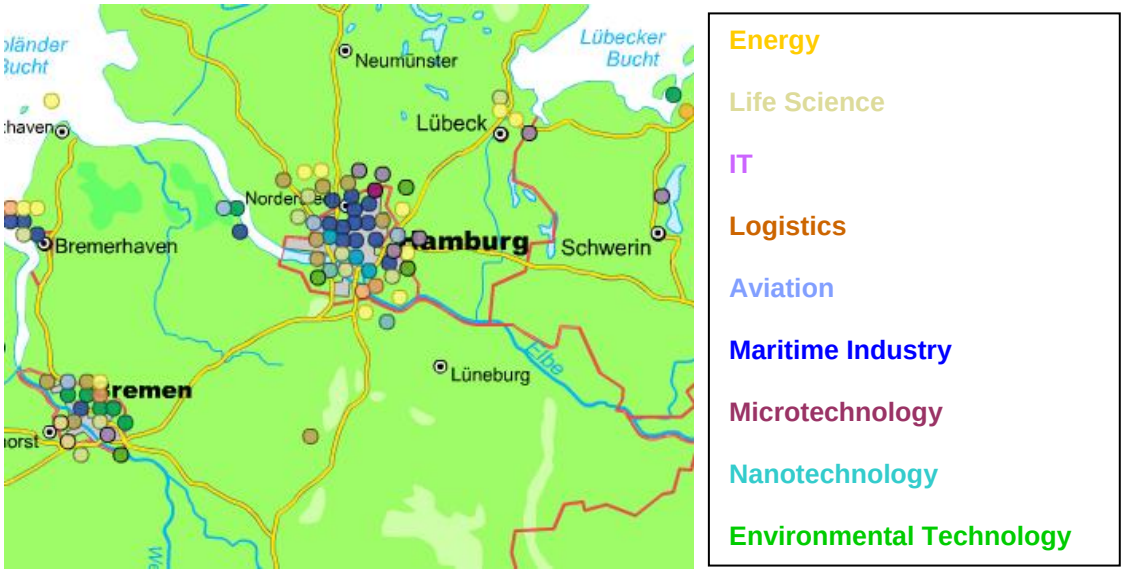
Among the research centres are the Bernhard Nocht Institute, which is specialized “in infectious diseases [and] made international headlines in 2003

by identifying the SARS virus" (Freie und Hansestadt Hamburg, 2010a). The German Electron Synchrotron (DESY), which "conducts basic research with a focus on particle physics, photon science and accelerator development. One of DESY's projects utilizes an X-ray laser, the only one of its kind in Europe, to produce sequences of highresolution radiographs of chemical processes at the atomic level." (Freie und Hansestadt Hamburg, 2010a) Both of these are connected to Life Sciences. The Center for Marine and Atmospheric Sciences (ZMAW), which is a world leader in oceanic, climate and earth system research, is another example (Freie und Hansestadt Hamburg, 2010a). As these institutes are highly specialized the knowledge they create can, if applied properly, provide a basis for not only a national, but a European or international competitive advantage. However because of the path dependency of innovation, the specialization can also be a limit to a further development in another direction.

Connectors

It is most important for the creation of innovation that relevant actors – these can be all actors that can contribute to the development of innovation within a specific field somehow – come together and exchange knowledge. Actors that try to provide a common ground for networking can be called 'connectors'. In Hamburg there are numerous initiatives that act as connectors: Associations, organisations, cluster, chambers and the local business development. The initiatives range from governmental organised clusters, such as the Logistic Initiative Hamburg, scientific related networks (Centre for applied Nanotechnology), technological platforms (Center of Maritime Technologies) and associations in special branches (Association of German ship owners) to self organized clubs, such as the Chaos Computer Club (Verein Deutscher Ingenieure e.V., 2007).

Figure 6: Main economic initiatives in the Hamburg metropolitan area



Source: Verein Deutscher Ingenieure e.V., 2007

Since the membership within initiatives costs a fee, for example between 750€ and 2.500€ per year for a membership in Hamburg@work (Hamburg@work, 2008), not all actors, especially not all SMEs, are organized within them. Therefore they do not represent all actors from one industry and networking only within those initiatives leaves some, maybe important, actors aside. Thus the full innovative capacity within Hamburg cannot be grasped by looking only at organized actors.

Table 4: Relevant Connectors

Associations, Organisations and Initiatives	There are initiatives from nine different branches within the metropolitan region of Hamburg. The maritime industry, energy, aviation, logistics and life science are dominant. Traditionally the trade associations and associations on logistics are strongly represented, as Hamburg is Germany's centre for wholesale and export trade. One could argue that these strongly represented associations have a comparably strong influence on the economic policy in Hamburg, since the sectors they represent are, according to the statistics on sale taxes, most important for Hamburg's economy (Kirsch, 2007; Verein Deutscher Ingenieure e.V., 2007).
Business development Agency	The main duties of the local business development are acquisition of companies, assistance of resident companies, location marketing and cluster management (Hamburgische Gesellschaft für Wirtschaftsförderung, 2010a). It supports networking among actors within one sector with different sector-specific initiatives and clusters: • Hamburg@work (media and IT) • Logistik Initative Hamburg • Luftfahrtstandort Hamburg (aviation) • Foundation for innovation (which focuses on the enhancement of innovative activities mainly made by SMEs). Shareholders are, among others, the chamber of commerce, the city of Hamburg and the Hamburg Marketing GmbH (Hamburgische Gesellschaft für Wirtschaftsförderung, 2010b).
Chambers	All companies have to be a member of a chamber in Germany. They function as a mediator between economy and government and provide assistance for companies. They promote the economic development within a region by various actions and act as service providers for resident and potential new firms as well as entrepreneurs. The chamber of commerce in Hamburg offers a variety of actions such as lobbing for the location, assisting new companies with settling down at the location, providing information for entrepreneurs, helping to organize technology transfer, providing further education, supprting clusters etc. (Handelskammer Hamburg, n.d. a) The organisation in chambers has a long history, e.g. Hamburg's chamber of commerce traces back to an association of traders in 1517 (Handelskammer Hamburg, n.d. b).

Source: Own design.

A main function of connectors is to enable cooperation and technology transfer of universities and research institutes with companies. The importance of this strongly depends on the industry field. Whereas the ties are weak in media industry, as it is less research depending, they are strong in life science and aviation (Handelskammer Hamburg, 2006a). For example Airbus and the Technical University Hamburg Harburg started cooperating in 1990 and since 1995 they corporately operate the technology centre of Finkenwerder, where research and education is done. The fact that AIRBUS

has paid for two foundation professorships at the university so far underlines the interest of strong ties between both actors (TU Hamburg Harburg, 2002).

There are various institutions trying to support technology transfer. For example all universities have one common patent agency that ranks their patens according to their economic potential and helps them selling them to companies. Among others, the Hamburg Innovation GmbH and TuTech help with technology transfer and support start ups. Depending on the source of information and the field a company is working in, different agencies try to support. But this does not seem to be effective, as Tiwari, Buse & Herstatt (2007) report, since one problem many SMEs in Hamburg face is too little technology transfer. For these enterprises the efforts and costs for coordination and finding the partners seems to be too high in respect to their resources. Also a quarter of the interviewed companies had problems finding the information on governmental support they need.

In case that the transfer of knowledge is functioning well all actors can serve to enhance knowledge within Hamburg. This can lead to the creation of innovation. But as some innovative companies from Hamburg put it: “The cooperation of actors within networks is only functioning well when ‘one’ (the company) is part of the circle” (author translated: InnovationsAllianz, 2009a). This shows that a common regional background and the knowledge of local codes can advance the spread of analytical and synthetic knowledge. But it can also be limiting, as it leaves all immigrants – start-ups or branch offices from outside the region – that are usually more innovative, aside.

Users of knowledge

Users of knowledge in order to innovate are entrepreneurs and companies, but as explained above, they are all people. A high education will enhance their receptiveness to knowledge and their ability to use it. Therefore a region that is able to attract a good educated labour force will have a competitive advantage. What makes Hamburg an attractive region will be analyzed in the following chapter.

3 Attractiveness of the region

The labour force is a main driving force for the creation of innovations, since people create, use and apply knowledge. As people either move to jobs or – like Florida explored it – people move to attractive cities and companies will follow, a people climate is needed in an attractive city. This can be found in cities with thick labour market and attractive living conditions.

The fact that after twenty years of decline the population is increasing since 1986 can serve as an indicator for the attractiveness of Hamburg, as only the economic attractive cities are growing in Germany; the others suffer from a decline in population. Within the last decade (2000 – 2008) it has grown due to a positive migration balance by 1.8% (Statistisches Amt für Hamburg und Schleswig Holstein, 2009). A growing amount of young adults (18-44) living in Hamburg is mentionable, as this is the group with the highest innovative potential (Kaiser & Pohlan, 2007).

Labour market

Crucial factors for a thick labour market are attractive employment opportunities in companies, universities and research institutes and the availability of different jobs. With the highest employment rate of all German cities (Freie und Hansestadt Hamburg, 2010q) it can be assumed that Hamburg offers a thick labour market. Working opportunities are most attractive in those fields that offer either a high amount of companies or that have leading companies in specific fields. As described in chapter IV.1, a high number of companies in Hamburg are connected to aviation, logistics, maritime industry, life science, IT and media. Airbus, Lufthansa and Asklepius Kliniken are, in this order, the three largest employees, all of them with more than 10.000 jobholders (Hamburger Abendblatt, 2008, December 27). Moreover, specialized research centres such as the Bernhard Nocht Institute for tropical medicine, the German Electron Synchrotron (DESY) and the Center for Marine and Atmospheric Sciences (ZMAW) provide attractive working conditions for researchers.

Even though the labour force with a tertiary education is, with 30.7% (2008), slightly above the German average (OECD, 2009)[16], this does not show a special attractiveness of Hamburg in this field, as the share of a high educated labour force is above the German average in most major German cities. The share of highly qualified employees is among the in-commuters much higher than among the employees living inside the city (Portrait of the Regions, 2004b). Overall, with 27% (2005) the share of in-commuters is far higher than the share of out-commuters (6.2%, 2005) (Otto & Stiller, 2009). This can give a hint that the living conditions outside the city are more attractive for higher educated and probably wealthier people. In general, companies argue about the shortage of specialists, this is a problem not only in Hamburg but in whole Germany (InnovationsAllianz, 2009).

Living conditions

Studies try to define the attractiveness of a place for living by measuring its quality of life, which is a very broad term, and its informative value can be doubted. Hamburg displays a good performance according to the following ranking: It was ranked on position 24 among 215 metropolises world-wide by Mercer Human Resource Consulting in 2007[17] (Spiegel, 2007). Still, German cities such as Munich are usually ranked better with regard to quality of life, or to the Florida categories talent and technology (Gratzla, 2008; Spiegel, 2007). Whereas Hamburg scores high on income and tolerance, it scores lower on the categories used in the innovative scoreboard, such as labour force with a tertiary education or R&D.

What makes living conditions attractive in a city varies between different groups; therefore an attractive city has to offer something for everyone. Especially those characteristics that are attractive to people in their twenties and thirties are most interesting, as this group will probably try to stay within the region and have the highest impact on its innovative potential. Hamburg offers a vibrant urban centre and nightlife, family friendly neighbourhoods, an

16 For more detailed information look at chapter III.3 – measuring the innovative capacity of Hamburg.

17 The ranking uses economic, social, environment and politic indicators to measure the quality of life (Spiegel, 2007).

appealing urban design, etc. and thus can be seen as an attractive place to live.

Cultural life within the city is affected by the University of Arts, numerous schools for journalists, musicians, actors, creative people living within the city and numerous museums, galleries, theatres, cinemas, musicals, concerts and events. Almost each weekend during spring and summer at least one major sports event, a festival or an ethnical market is offered (Freie und Hansestadt Hamburg, 2010k). But this is not that unusual for a city of this size.

The city tried to use and further develop its cultural potential with a concept called ‘Talentstadt’ (city of talents). This concept was based on the idea that a Creative Class is attracted by a tolerant city (Oehmke, 2010). But the concept was given up and the Senat decided on a new general principal called ‘growing city’. The fast changes of general principles show the difficulties of city planners to ‘create’ an image over time for Hamburg, rather than using the image of a wealthy harbour city that has evolved by itself, since people in Hamburg have the highest average income in Germany. Artist within the city protested against the try to make use of them for promotion. They wrote a manifest stating “Stop messing around! Hamburg is treated like a brand, which we [the artists] are supposed to inspire with aura, atmosphere and recreational value! We opt out.” (author translated: Die Zeit, 2009, November 5, p.1). This protest, which started in August 2009, lead to a change in urban management in the short run: The Senate offered the artist to officially use some old, empty buildings, called Gängeviertel, in the city centre, which the artist squatted anyways (Stock, 2009, September 3). But in the long run it will probably not change so much; the buildings in the Gängeviertel are now (2010) empty again.

Apart from cultural and sport amenities, it is also the natural amenities of Hamburg that increase its attractiveness. Water is an omnipresent element within the city and its proximity both to the Baltic and the North Sea, which also influences its climate, open up for leisure time activities. Because of its

effort for environment and climate protection the city has been awarded as the European green capital for 2011 (Freie und Hansestadt Hamburg, 2010l).

Urban design in Hamburg is characterized by a mixture of traditional and new architecture, water and parks. Especially when it comes to modern architecture, the city tries to build a new landmark with the currently built Elbphillharmonie, a concert hall designed by the world-wide known architects Herzog & de Meuron. It is situated within a whole new designed and still under construction neighbourhood called 'Hafen City', which is build in an fallow lying part of the docklands. The project will increase the size of the city centre by 40% and thus is one of the biggest and most prominent city centre development projects in Europe today (Hafen City Hamburg, 2010).

People climate

In order to have a good people climate, low entrance barriers for new inhabitants are crucial. The inflow of people, especially in the age between 18 and 44, helps to preserve a creative milieu, as the newcomers can play, depending on their education and experience, a role as agents for change and transmitters of new knowledge. The ability to make use of this new knowledge is depending on the openness to new ideas of the actors in a city. From a historical point of view Hamburg should have an open minded society, as there has always been an inflow of foreign people. In respect of its historical development, the city promotes itself as the gateway to the world – open to different cultures and lifestyles. Another indicator for its openness is its ranking, together with Berlin, as the most tolerant[18] city in Germany (Gratzla, 2008) and its gay major. All of these factors can indicate a higher acceptance of new residents and new ideas compared to other German cities. Still, they are only indicators that don't display the reality: The Hamburg market is not especially broad-minded to innovation, instead it is self referring (Selbstreferentialität) and "an actor needs to be part of the

[18] As criteria to measure tolerance the percentage of foreign students and international schools and the stage of development in the art and homosexual scene are used. Furthermore, a good election result for rightist extremists has a negative impact on the tolerance factor (Gratzla, 2008).

network in order to become a part of it" (author translated: InnovationsAllianz, 2009a).

Hamburg is not a "plug-and-play community" (Florida, 2002) in a sense "that somebody can move into and put together a life – or at least a facsimile of a life – in a week." But this is less a problem of the city, but of whole Germany, if not Europe, where families, neighbours and partners have known each other for decades and built up a more closed society than this is the case in the US for instance.

4 Strength and weaknesses

According to the definition, an Innovative Region is a region, where 'new products' are developed and commercialized regularly in order to gain a competitive advantage. To some extent this is done in Hamburg, as in every other region. Therefore Hamburg is an Innovative Region. As an innovative region it has both strength and weaknesses; finding these is the main task of this chapter. In order to do so a look on the industrial fields and the main companies, the actors as connectors, generators and users of knowledge as well as the attractiveness of the region and its climate has been taken.

Industrial fields and innovative companies

Strengths of Hamburg are its (national) leading position within the fields of media, aviation, the maritime industry and logistics. Within these fields, the region is especially attractive and some of the leading companies are resident. Especially in media, here the reputation of schools is especially high, IT and life science the variety of innovative companies is high. The European importance of the port grants a steady income for the city, which again provides latitude for further policy actions.

The dominance of the port can also be seen as weakness, as argued above, since it decreases the need for change and thus innovation. Besides, the sectors with the highest share of employees in Hamburg, trade and transportation, are successful in terms of value adding, but not in terms of innovation. The policy applied to strengthen Hamburg as an Innovative

region further is mainly based on clusters. But this is a preserving policy that does not leave room for new and maybe more promising developments. Also it does not address all companies within one field, but only those that are organised. Overall, the number of leading companies that are considered to be technical innovative is lower than in other German regions.

Actors as connectors, generators and users of knowledge

A high amount of students and researchers (70.000 students and 9.000 researchers within the city) can be seen as strength, since these compose a high potential to develop or make use of new knowledge for the development of innovation. The fact that more than ten percent of these are foreign, could add to the innovative potential of the city, if their knowledge can be used in an appropriate way. The opportunity to do so is provided by numerous connectors.

Even though the total number of students is high, the number of research institutes is rather low compared to Berlin and Munich. Also the reputation in technical fields of Hamburg's universities is lower than in southern Germany.

Attractiveness of the region and its climate

On the one hand it can be said that Hamburg is an attractive place to live for young adults, because it offers a thick labour market. It is a wealthy city with a high quality of life and presents different cultural, sport and natural amenities. Its population is growing and the inflow of people helps to preserve a creative milieu.

On the other hand it only offers a thick labour market within the dominant sectors, of which some, such as wholesale and foreign trade, are not innovative. A shortage of specialists lowers its attractiveness to companies and closed networks – which are only supportive when an actor is part of the circle – plus a not particularly broad-minded market decrease both the business and the people climate. Policy attempts like promoting the image of a 'city of talents' fail to heed the real problems.

Not detected elements of innovation

There are some limits to this text. It can only describe innovative elements in Hamburg without being able to make a qualified analysis of their influence on innovation. Therefore it analyzes the framework conditions that influence Hamburg's innovative capacity. The companies and research institutes could create new knowledge and use it to innovate but a qualitative answer if they do so cannot be given without a deeper research. According to the benchmarks, it can be said that the habit of taking patents, which are usually technical elements of innovations, is rather low in Hamburg. But this is also a result of the dominating industries within the city. In order to analyze the creation and use of knowledge better, a closer look into the companies, their working processes and their use of human capital would be necessary. Moreover the people climate – that has been defined as the attractiveness of a place to immigrants and its receptiveness to new ideas, which have a high influence on the innovative capacity of a place – can only be analyzed from the outside, as a qualified look at the connections of people and their receptiveness to new ideas requires a deeper social research. Still it can be said that those companies, which are part of the InnovationsAllianz, sense the networks as closed circles.

V Innovation policy for Hamburg

Innovation policies need to be dedicated to a specific territory, as innovation does not take place in a neutral space, but in one that has been shaped by historical and socioeconomic processes and institutions. Therefore pure imitation of policies that are well functioning in other places is not desirable (Klaerding, Hachmann & Hassink, 2009).

From a broad perspective, all policies that influence the framework conditions for innovation somehow can be called innovation policy. Indirect policy measures can be found in almost all policies (education, finance, etc.). A more narrow perspective, which focuses on the innovation process in favour of the linear model, is often used in German literature. It defines industry, research and technology measures that mainly aim to develop new or significant improved goods or processes as innovation policy (Schmalholz, 2005; Straubhaar, 2007/2008). Hamburg does not have an explicit innovation policy and therefore no official definition of it; instead numerous efforts are taken on different administrative levels in order to enhance its innovative capacity. **In this thesis, innovation policy will be defined as all public and semi public actions aiming at supporting development of new or improved products and their commercialization in order to develop a competitive advantage. These can be industry, research and technology as well as other methods.**

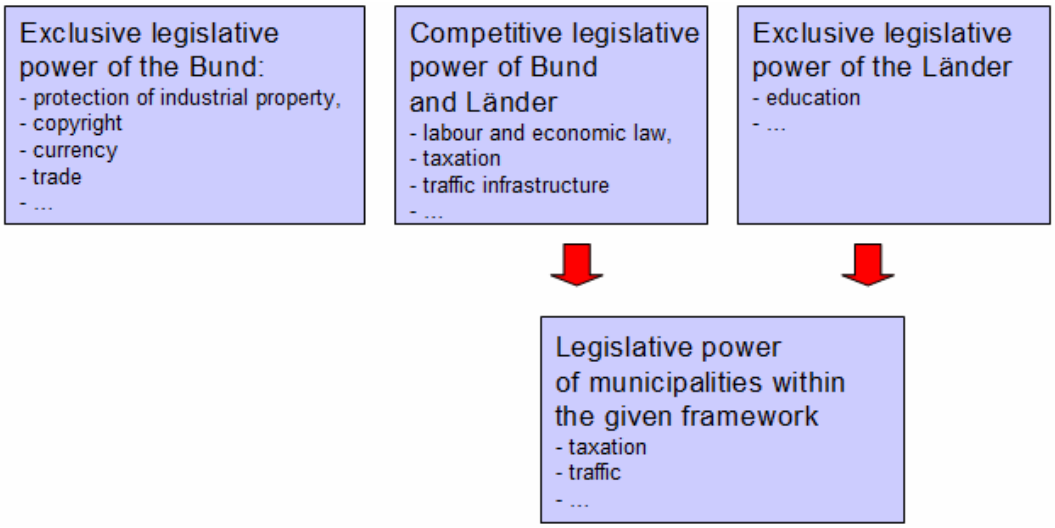
1 Administrative framework

The city of Hamburg is a state (Land) on its own as well as a city. Both the city council and the parliament of the Land are represented by one agency, the senate.

The Länder are equipped with formal power in Germany, due to Germany's federal structure. They are fully in charge of some policy fields, in others they can act if the federal government has not enacted any rules and regulations according to the framework given by the federal parliament. Since there is no

explicit innovation policy on the federal level, different sector's duties are split according to their legal authority between the federal state, the Länder and the municipalities/ districts. The federal state is exclusively in charge for the protection of industrial property, copyright and within the EU framework for currency and trade. The main regulations on labour and economic law, taxation and traffic infrastructure are divided between the federal state and the Länder. The latter ones, taxation and traffic, are also partly regulated by the municipalities and districts. The Länder have an exclusive competence for education (Grundgesetz, 1949, §§70-75).

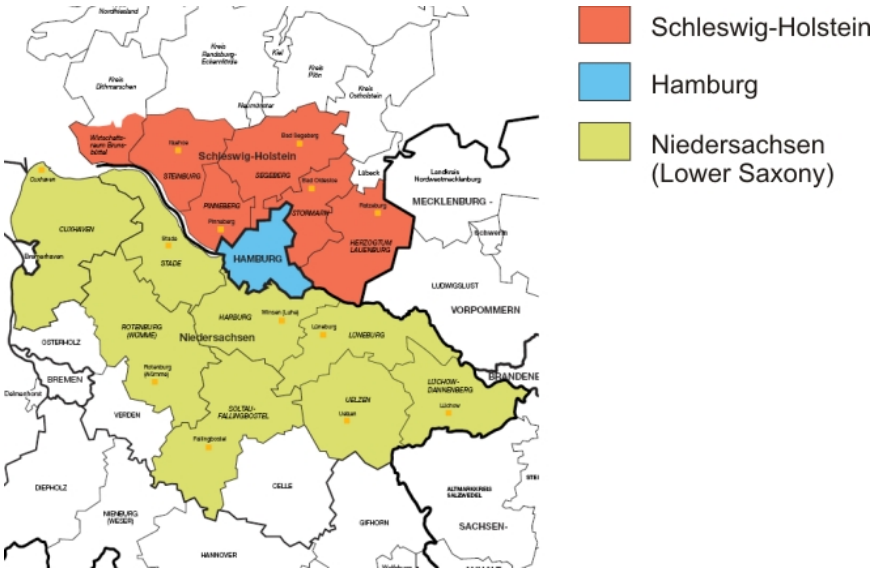
Figure 7: Division of legislative power for innovation policy



Source: Own design.

Among the regional governmental agencies it is especially the agency for economy and labour that is responsible for economic development in Hamburg. Besides the main regulations on labour and economic law they also provide policies directed to the main branches that can be found within the Land (Freie und Hansestadt Hamburg, 2010p). Therefore it can be said that the agency shapes the regional framework conditions for economic development. The sector policies of further agencies, such as the agencies for science and research, planning, finance, sports and media, culture and education, influence the development of the city and with it also its attractiveness to companies and people.

Figure 8: Länder involved in the metropolitan region Hamburg



Source: Arbeitsstab der gemeinsamen Landesplanung Hamburg/ Niedersachsen/ Schleswig Holstein, n.d., p. 7.

The innovative capacity of the metropolitan region of Hamburg is influenced by the former mentioned regulations. Regarding the sector's duties remaining on the Länder level, a harmonized policy between the three participating Länder would support the development of the region as a whole. But since the parliaments of the Länder do not want to give away part of their sovereignty, this is not happening.

The metropolitan region is guided by regional conferences among the cooperating municipalities and Länder. Within these conferences is decide on the main goals for cooperation. In respect to this paper, the aim to encourage the international competitiveness by working on specific projects in economic development is important to mention, since Innovation can be seen as an instrument to reach it. In comparison to the administrative power of the Länder, the power of the metropolitan region is limited to the commitment of the participating Länder and districts and the use of funding (Metropolregion Hamburg, 2010a, Metropolregion Hamburg, 2010b).

2 Addressees and measures

The main aim of Hamburg's innovation policy should be to find actions that create a business and a people climate, in a sense that Hamburg is further developed as a region, where innovations are used to build up a competitive advantage. Important elements of Hamburg as an Innovative Region are the creation of knowledge, its use with the aim to develop innovations, the spread of knowledge within networks and the attractiveness of the place to whom that will innovate: The entrepreneurs, companies and skilled workforce. The measures taken today are not indisputable. Therefore it has to be asked if they take actions and address the actors in the best way.

Since Hamburg does not have an official innovation policy, an overall framework for these actions is missing. Today, the 'InnovationsAllianz' – a consortium of different actors from economy, research, initiatives, chambers and governmental agencies – aims to develop an innovation strategy for Hamburg. In its workshops the InnovationsAllianz defined three main addressees – entrepreneurs, innovative firms and universities and research institutes – and eight main operational fields, including important areas such as network building and the enhancement of motivation for becoming an entrepreneur. The problem with these operational fields is that they are, so far, only defined in theory, without being transformed into practical actions. This will be done in summer 2010 (InnovationsAllianz Hamburg, 2009a). Moreover, the actions taken in order to enhance innovation are mainly embedded into the development of already strong sectors, which are fostered by cluster initiatives.

The following measures are taken to enhance innovation in Hamburg today. They are financed by local, national and European programmes and take into account the major problems for innovating SMEs in Hamburg:

- Financing problems (Hausbanken[19] act risk averse and therefore only make low amounts of venture capital available, information on

[19] The German capital market is closely tied to the companies 'Hausbank' (a bank to which the company has a close connection and where it regularly does its transactions). In comparison to the Anglo-Saxon venture capital market Zopf calls

additional funding or support programmes is not easy enough accessible)

- A lack of qualified employees with work experience (labour force with a tertiary education is only medium high)
- Administrative barriers
- Management problems within the companies with project management and transfer of technology (especially coordination problems, conflicts in interest, missing access to research partners) (Tiwari, Buse & Herstatt , 2007)

the German one underdeveloped. Therefore the development of incremental innovations preponderates and new technologies are integrated into existing processes or products. The room for radical innovations however is rather limited by the institutional structure. (Sieberts, 2005; Zopf, 2005).

Table 5: Addressees and measures of innovation policy in Hamburg

Start-ups and companies	Networking	Universities and research institutes
• Programmes for start-ups/ business assistance programmes: Consultancy on the strength and weaknesses of innovation; if the project is accepted, programmes help with funding, networking (looking for partners and customers), consultancy on marketing and distribution issues (Innovationsstiftung, TuTech) • Providing venture capital or assistance for finding sources of funding (Innovationsstiftung, TuTech) • Providing general assistance to the sector (Cluster, initiatives, chambers, business development) • Technology Park, Business Incubator, Media centres (shared office space and infrastructure for appropriate rent, space to meet cooperation partner, support with finding sources for funding) (Gamecity-Port, Internet-Factory, etc.) • Competitions and awards (chrystal cabin award for innovations in airplane innovation, Hamburg innotech award for start-ups) • support for young creatives (musicians, etc.) by different agencies and competitions for young artists • Business development, especially in cluster related industries • Actors (Innovationsstiftung, TuTech, etc.) provide close proximity and uncomplicated access	• Central points of contact (Cluster, initiatives) • Organization, support of and participation in events (Cluster, initiatives, chambers) • Organizing trade shows (Cluster, Initiatives) • Transfer of know-how and technology (arranging contacts and assistance) (Cluster, initiatives, chambers) • Public relations work (Cluster, initiatives) • Information on life (work, study, living, etc.) in Hamburg (for immigrants from other regions) and a special assistance for governmental agencies for high qualified foreigners (Welcome centre)	• Qualification of labour force complementary with industrial needs (universities, schools, vocational training) • Providing further education • Public R&D expenditure (Land, federal state) • Mission oriented research (TuTech) • Support for patenting inventions (patent application agency of the universities) • Selling of patents/ database on existing patents (patent application agency of the universities)

Source: Own design.

According to the definition of innovation policy the main addresses of Hamburg's policy should be entrepreneurs, companies, a skilled workforce and institutions that develop and spread knowledge.

As displayed in table 5, the main focus is set on SMEs and entrepreneurs, and assistance for big companies, which are in charge of many innovations,

is underrepresented. A special attention to the skilled workforce is missing within innovation policy. Instead this group is addressed by different and not innovation focused strategies such as the ‘city of talents’ or the ‘growing city’.

The way the actors are addressed could be seen problematic since supply measures are arranged in an unclear way. One centralized information point, one agency or one Homepage would increase the accessibility of information and a higher transparency of processes and allocations of tasks could help to increase their use. As many SMEs have no or almost no free human resources to do research on innovation support, an easy access to supply would be helpful and enhance the possibility of firms to use it.

Since clusters and initiatives play an important role for carrying out policy approaches in practice, the sectors that profit the most are also the ones that are already dominant. This is on the one hand comprehensible, since clusters were established for industries, where a growth in employment and economy is most likely and that are supposed to be innovative (chapter IV.2). On the other hand it reduces development opportunities for new and small, but maybe more innovative industries. Thus a more general innovation policy might be a solution, as the economic effect of an innovation becomes only visible with a time delay.

The creation and use of knowledge with the aim to develop innovations, the spread of knowledge within networks and the attractiveness of the place to whom that will innovate are the most important elements for Hamburg to foster its innovativeness.

The presented actions focus on the process of innovating from the perspective of the linear model, research is seen as a main input for innovation and patents or their usage as a central output. Therefore technology transfer seems to be a main measure to enhance innovation. But as explained before, this only applies for a small share of innovations. In mature industries such as aviation, maritime industry and logistics many innovations are done by large firms that review and combine existing knowledge and if this does not work, they use research. But research can also be done in-house, which makes technology transfer less attractive to

them (Kline & Rosenberg, referred to by Fagerberg, 2005, p.9). Innovation in Hamburg is not only done in R&D related sectors, but also in media for example, where the inflow of good educated people and an open atmosphere are most important.

Knowledge on how to manage innovation and how to develop innovation systems within a company is missing in many SMEs (Tiwari, Buse & Herstatt, 2007). Therefore not only a good education within a specific field, but also on innovation management could help SMEs to make use of their knowledge and ideas.

In order to develop a target-oriented innovation policy further information would be needed:

- The effect of innovation transfer has not been measured and a study on spill-over-effects has not been done in Hamburg (Tappeiner, 2010). This information could help to find the companies which have a high impact on economic development due to spill over effects.
- A better understanding on the knowledge transfer within networks, which ties between actors are strong and which are weak. This could be used for the spread of knowledge and information and for the influence on group dynamics. It would also make it easier to find new partners for start-ups or new to the region firms. But as networks are bound to single persons, their functioning is also tied to these and they have a high rate of transformation. This can be a hurdle for making use of the knowledge on networks.
- As innovation is a path dependent development a deeper research on main actors of innovation in Hamburg – this could be companies, politicians, researchers, entrepreneurs, etc. – would be useful to better understand the underlying dynamics that influence the institutional framework.

3 Can innovation be planned for?

As A. L. Saxenian phrased it “It is not the ingredients, but the recipe” (1994). This shows that it is not enough only to have the ‘right’ actors and the ‘right’ measures within a city. Instead, the business and people climate within Hamburg influence its innovativeness. Even though the InnovationsAllianz describes the importance of an entrepreneur spirit, the institutional changes that would be required to develop such a spirit cannot be done by policy. Instead, this has to be a bottom up process. As explained above Hamburg’s actors are not more open to foreigners and new ideas than other actors in other German cities. Also failure is not accepted, even though it is likely to happen when innovating. In order to develop a climate for innovation the focus in Hamburg is set on showing success stories and best practices. But this can neither provide possible entrepreneurs with a strong dedication to their innovation, which will enable them to have the courage to take risks, nor can it decrease the anxiety of failure.

If an important part of the environment for innovation can only be influenced by long term bottom up processes, the question to which extent innovation can be influenced by policy comes up. This lets the initial used citation appear in a different light: “Innovation has become the industrial religion of the late 20th century. (…) Governments automatically reach for it when trying to fix the economy.” (Valery, 1999, February 18) Even though governments use innovation policy as a tool to fix the economy that does not imply this is an effective way. One of the problems with policy is that it is limited to administrative boundaries. But because of the importance of networks, the spatial extent of Hamburg as an Innovative Region should be defined by functional flows. Therefore the policy actions should not be limited by administrative borders as this is the case with many actions provided by governmental institutions or chambers such as the TuTech or the Cluster Hamburg@work. And it also applies to the European efforts that are dedicated to the NUTS 2 region, which equals the Land. For the metropolitan region there is no such thing as an innovation strategy and its development is unlikely because of the split competences between the three involved

Länder. Still appendages for the cooperation of actors from different Länder can be found e.g. with the cluster initiatives for life science, aviation, and logistics. For these the intensity of flows should be further strengthened. Another problem with innovation policies is that innovation happens by chance and is constrained by past decisions – it cannot be planned. Benchmarking and fostering the performance of Hamburg in those indicators that are used in the RIS will probably not help to further develop its innovative potential.

Despite all these problems this thesis does not want to argue to abandon all innovation policies. Even though they contain some problems and may not be suitable best to enhance innovation, they can still play an important role to improve business development. And this is a goal of innovation policy.

The purpose of this thesis is to find innovative elements within Hamburg. In the past, some major entrepreneurs, such as Beiersdorf, and some framework conditions, such as the importance of the harbour, have had a strong influence on the development of Hamburg as an Innovative Region. The dominant sectors life science, logistics and media all started from there. But these elements, in particular the importance of the harbour and trade, are limits to future developments. As they made Hamburg become a rich city in the past and still provide an important ground for its wealth today, the need for change in Hamburg rather is low. Still change is what provides a ground for innovation. The main determinants for future development are unknown today. Therefore it is most important for the development of Hamburg to be open to all directions, which also includes to decrease the focus on clusters and to foster innovative development as a whole.

Even though there are some limits for defining and analyzing innovative elements of the Hamburg region, this thesis can still be used as a starting point for further research on Innovative Regions and on the study case Hamburg.

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Interviewpartner

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