

# CLUSTER GOVERNANCE IN THE MEDICAL CLUSTER OF ROTTERDAM



***ABOUT HOW AND BY WHOM THE MEDICAL CLUSTER OF ROTTERDAM IS ORGANIZED AND GOVERNED IN RESPONSE TO MAIN GLOBAL AND LOCAL CLUSTER DILEMMAS AND CHALLENGES***

**- Master thesis Economic Geography -**

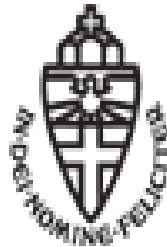
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September 2015

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Master thesis Human Geography

September 2015



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## Preface

In front of you lays my master thesis titled; 'Cluster governance in the medical cluster of Rotterdam'. Finalizing this master thesis represents the completion of my study Human Geography with the specialization of Economic Geography at the Radboud University Nijmegen. I am very happy and proud that I have completed this study and that I can look back to a period of studying geographical topics with great passion and enthusiasm.

In the first phase of the master trajectory of Economic Geography the topic of my thesis was changing and not yet clear. I first focused on several possible topics and wanted to match the topic to (possible) internships. Luckily, Kees Stob offered me a very nice internship for the second semester at Public Result. We discussed the several topics I had in mind and he gave me the freedom to choose the topic of my choice. I was very happy that I could focus on a 'spatial-economic clustering' theme. My supervisor Arnoud Lagendijk and PhD. Miranda Ebbekink helped me to find the right focus within this theme.

The supervision and constructive critique of Arnoud Lagendijk were essential elements to the creation of this thesis. I really want to thank him for challenging me to get the best out of myself to improve this thesis. My second word of thanks goes out to my colleagues at the internship organization Public Result and especially to my supervisor Kees Stob for their support in trying to help me combine the general work for Public Result with the master thesis research.

Third, I would like to thank all of the respondents of my interviews. Without their cooperation this research would not have been possible. I would like to thank them for creating time for me in their busy schedules to answer my questions while this research did not always benefit them directly. I also want to thank them for helping me find and contact other inspiring respondents.

My fourth word of thanks goes out to my friends and family that have offered their patience and supporting words in times where my motivation for this research was low or when things didn't go as planned in my eyes. They always managed to give me new energy and motivation.

My final word of thanks goes out to you, reader of this thesis, for showing your interest in my research.

Roos van der Werf

Nijmegen, September 2015

# Abstract

Factors such as social change and technological development have affected firms' location choices. The process of globalization and technological developments triggered the increase of firms that became footloose. This caused the importance of economic geography and locations seemed to fade and physical distance between places seemed not to matter anymore. This is a misunderstanding, because a flourishing economy tends to attract more economic activities and places start to compete in attracting these activities. Partly caused by these processes, the competitiveness of Dutch cities and regions has been tested extensively in recent years. Not only do neighboring regions compete with each other over firms, knowledge, labour, investments etc., they also have to compete with regions on the European or even on the global level. Globalization seems to steer on an increase of interregional inequality and enhances competition and the specialization of regions. Therefore, certain places flourish more than others and places specialize themselves locally while trying to link up to global production networks (GPN's). One of the most striking examples is of course the cluster of Silicon Valley; the ultimate innovative cluster. The ideas of Michael Porter seem to give rise to the current clustering developments.

All kinds of local policy and entrepreneurial initiatives are all around the world derived from the cluster concept, such as science parks, campuses, industrial districts, learning regions and regional innovation networks. A lot of cities try, on their journey to create a successful cluster, to copy strategies and concepts that were used and successful in other cities. Policy makers seem to think that copying the 'form' automatically steers on the same process. This all costs a lot of time and money and results in mixed results. The economic theory about clusters seems to be solid and clear while the policy theory might sometimes be the opposite. Namely, the concentration of firms, 'clustering', alone does not necessarily lead to a self-enhancing innovative process. It is important that firms do not only compete, but that (tacit) knowledge, which is central for innovation, is shared between firms. This creates the need for the ability of face-to-face meetings to facilitate knowledge and experience exchange. The key feature for the diffusion of knowledge lies within qualitative networks. All of the widespread known cluster advantages, that are easy to mention and recognize, but much harder to create, are only reflected in practice in a well-functioning cluster where all of the mentioned stakeholders work together to collectively respond to opportunities and treats. Hereby guarding a balance between openness and protection and between local and global orientation of the cluster, because the way in which local clusters function and specialize further as a part of larger GPNs also determines a lot about the functioning of clusters. This should be done not by copying concepts from elsewhere, but getting inspired by success stories elsewhere and combining concepts on the basis of the own ambitions of certain clusters or campuses. How this is all is carried out concerns the 'cluster governance' of the cluster.

Also Many Dutch municipalities involve aspect of Michael Porters' cluster theory or derived ideas and entrepreneurial initiatives in their policies in some way and so does also the municipality of Rotterdam. The development of the medical cluster in Rotterdam has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Hereby, Rotterdam tries to anticipate on the idea of the medical care sector as a growing sector.

In this respect the concrete objective of this research is: to gain in-depth insight into how and by whom knowledge processes and clustering initiatives are organized and governed within the medical cluster in Rotterdam also in relation to how the cluster specializes itself within the worldwide knowledge dynamics of the health sector, in order to contribute to theory about cluster governance and to provide useful information that key players in the cluster might use for their cluster governance structure. Derived from the research objective of the previous paragraph, the main question of this thesis is the following: *How and by whom are knowledge processes and clustering initiatives in the medical cluster of Rotterdam organized and governed in response to main cluster dilemmas and challenges on the global and local level?* Derived sub-questions from this main question are the following:

- *What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?*
- *How are cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?*
- *What is the local role and response of key players and leaders within the local cluster governance network in view of the current challenges in the medical cluster of Rotterdam?*

The research objective and the research question consist of several central concepts, which are, after a literature study, operationalized and linked to each other in the conceptual model. The conceptual model provides a theoretical framework for this thesis. The relevant concepts are 'Economic clusters', 'Global production networks', which practically determine the research object. The concept 'strategic coupling' explains the, for a good cluster governance system required, relation between the previous two concepts. And finally the 'cluster governance' concept consisting out of 'what is being governed' and 'who is governing' in cluster governance. Together these concepts and the relations between them determine the local 'cluster governance system'.

The empirical part of the research strategy consists out of a case study of the medical cluster in the region of Rotterdam. The first part of the case study consists out of an in-depth literature study exploring the global developments and challenges within the health sectors global production network in relation to what this means for the position of the health cluster of Rotterdam in the medical GPN. The second part of the case study will be mainly based on practice and will zoom in locally on the medical cluster in Rotterdam its link to the GPN and its local cluster governance network. The research material for this research for the first part of the research is desk research material and for the remaining part of the research it is going to be mainly derived from persons. Twenty face-to-face semi-structured interviews have been made use of in order to gather the relevant data. After the interviews were conducted the interviews were transcribed, coded and analyzed, with the help of the program Atlas.ti.

In the empirical part of this thesis Chapter 4 then answers the first sub-question: *What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?* Regarding international challenges in the GPN of the medical sector several trends and challenges that are significant for future cluster development can be distinguished. Especially the on-going aging population and the general increase of the world population strongly increase the demand of healthcare. This caused the emergence of the question how society can keep health care affordable while safeguarding the high quality of the health care that is provided because more and more solutions are being found for more and more illnesses and diseases. This is also boosted by the fact that also in the medical sector socio-economic and technical developments have had major consequences on the exchange of knowledge, skills and students on the (academic) medical field. Still the process of developing medicines is a lengthy and expensive one and the valley of death is a challenge for all medicine and medical product development. One way to collect funds in relation to the increasing costs for healthcare it is more and more important and a challenge for researchers and research groups to find partners in the international network of researchers and other cooperating organizations and to work together in consortia. Regarding the position of the medical cluster of Rotterdam in the GPN of the medical sector the development of the medical cluster in Rotterdam, which is a growing sector, has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Also the medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from the municipality of Rotterdam to the municipalities of Leiden and Delft. For that reason Medical Delta is for the medical cluster of Rotterdam an important cluster stakeholder. Other important cluster stakeholders are the local businesses, VNO-NCW Regio Rotterdam, development and acquisition organizations Rotterdam Partners and InnovationQuarter, all hospitals and medical institutions in the region of Rotterdam. Especially the Erasmus academic hospital (Erasmus MC), with the Erasmus University as the mother university and the TTO connected to it plays a central role. Other educational institutes such as the University of Applied Sciences of Rotterdam are also involved in the medical cluster. An important aspect of strategic coupling is that the local cluster stakeholders know the local specialization and position in the global production network, which is called smart specialization. The medical cluster Rotterdam has all kinds of things to offer and responds to many current international GPN challenges, though in respect the concept of strategic coupling not all the stakeholders of the medical cluster of Rotterdam do not know the local specialization and position in the medical GPN, for the reason that there are so many medical fields of focus, and therefore the Medical cluster of Rotterdam does not have a real clear smart specialization.

Chapter 5 answers the second sub-question: *How are cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?* Regarding a clear positioning strategy the medical cluster of Rotterdam is able to contribute to this by a well-functioning collaboration between the acquisition agencies that overcome the pitfall of top-down oriented acquisition by incorporating the local specializations of



firms in the propositions and also overcome the pitfall of an exaggerated local focus by their international orientation. Though, for the reason that the smart specialization of the region is not that clear the positioning isn't clearly being carried out by all of the cluster stakeholders. On the other hand the medical cluster of Rotterdam and especially Medical Delta are aware of the importance of a clear positioning strategy and are successful in profiling the cluster in both the structures of consortia.

For the matter of cluster branding activities it is possible to build a strong brand name, for instance 'Medical Delta', but that is only going to work when the cluster stakeholders feel connected to that brand, which is not the case for all involved parties. For the larger organizations such as the Erasmus MC it would not be contributively to break down this strong brand they've built in order to align it under the name of MD. People will not feel connected to that and be afraid to lose their identity. That will lead to pitfall C.5.v (Figure 5) of empty cluster branding and that is something that the medical cluster Rotterdam is very sensitive for. Especially academics of the Medical Cluster of Rotterdam act as each others' and as firms' ambassadors in international networks in accordance to point C.4 of the conceptual framework. And by letting the individual scientists do what they think is good for the cluster the medical cluster of Rotterdam is providing space for civic entrepreneurs and their strategic intelligence. Regarding the international networks of firms there is the opportunity in the medical cluster of Rotterdam for businesses to make use of each-others international networks, because they are absolutely not using the strategic intelligence of civic entrepreneurs in international networks of firms. Here steps are to be made. Though, with medical Delta as an intermediary in making the connections in these potential networks at least opportunities can be created.

Chapter 6 answers the third and final sub-question: *What is the local role and response of key players and leaders within the local cluster governance network in view of the current challenges in the medical cluster of Rotterdam?* Regarding collaborating initiatives involving the medical institutions in Rotterdam they work together on several projects in an attempt to overcome the challenge of properly guiding the patients true the health care chain and on overcoming institutional barriers between the medical institutions to work more efficient and effective. In the collaboration between medical and knowledge institutions the Erasmus MC plays a central role and is therefore involved in several initiatives and activities regarding collaboration between different involved institutes that focus on bridging the gap between theory and practice. The collaborations above are primarily focused on the exchange of codified and tacit knowledge Though, as far as could be identified with this research institutional entrepreneurship) regarding the overcoming existing institutional barriers between different education programs could be pushed further. When looked at the network as a whole, that also comprises actors such as business, not every cluster actor is naturally 'embedded' in the network of knowledge sharing by frequently visiting each other.

Therefore intermediary institutes such as InnovationQuarter, Rotterdam Partners, The TTO, the Municipality of Rotterdam, Medical Delta and VNO-NCW Regio Rotterdam try to make more connections by facilitating several network events and projects. The knowledge exchange that is the consequence of these network events is primarily codified and tacit knowledge of the medical sector sometimes linked with entrepreneurial insights. Though, the knowledge that the intermediaries have by knowing that the network events will contribute to the overall strength of the medical cluster falls under the category of strategic intelligent knowledge flows that response to the question 'what are the strategic (policy) actions that start the cluster engine to run?' Within the cluster network there is not a real dominant player ore sole leader. The municipality of Rotterdam lives up to the required role of the government in cluster governance described as 'facilitating' and overcomes the pitfall of governmental activism due to the frequent variation in governmental representatives, which is very undesirable especially with regard to the valued role of trust and personal proximity in cluster governance. MD as an overarching cluster organization is also a very present cluster stakeholder and intermediary and does, both as all other cluster stakeholders, value the notion of distributed leadership. Especially in Rotterdam it is a common culture that people at the strategic level are relatively easily accessible for people from the work floor and value these people's ideas that might contribute to the strength of the medical cluster. By acknowledging this the MD initiative shows that it possesses strategic intelligence regarding cluster governance of the Medical Cluster and in that way the climate for a institutional learning process is provided A challenge of the institutional learning and reaching strategic intelligence is to make actors with different agendas, cultures, motives, interests and obligations to work together, something MD faces as well with the involvement of different municipalities and a wide range other stakeholders. Therefore, regarding institutional entrepreneurship some steps have to be made The intermediaries of the medical cluster should pay attention

to making cluster stakeholders aware of the common interests and cluster identity in order to let them intrinsically carry out this identity and contribute to medical cluster as a whole.

Regarding commendations for further research and practice some general lessons can be drawn from the case study while other elements might only be applicable to this specific case. The importance of the right people and civic entrepreneurs in the cluster governance system is something that could be generalized in respect of theories of cluster governance systems and the same goes for the required facilitating role of the government, because in this case that turned out to be important aspects and the respondents viewed these aspects as not specific for the medical cluster. Also the importance of increasing the visibility of a cluster network can be generalized for the reason that it would contribute to all clusters, because cluster stakeholders can then work more efficient, get the opportunity to engage in networks of sharing both tacit and strategic intelligence knowledge flows and can find both near and far learning partners more easily. However, the respect for bottom-up initiatives, distributed leadership and civic entrepreneurs must not be overestimated, as the theory sometimes tends to do, because in this case some guiding structure and the right balance between strategic organization and bottom-up initiatives in order to make all the cluster stakeholders aware to be part of the overarching cluster and the common interests turned out to be important

For this case, the question about the specialization of Rotterdam was hard to answer, because there are so many strengths in the medical cluster of Rotterdam that it is hard to point out the clear specialization of the cluster. For that reason further research could focus on that and try to bring the cluster members of those sub-sectors together. Further research, could focus on how to overcome institutional barriers between knowledge institutions on the local and global level. Further research could also focus on strategies on how to easier spot the intrinsically motivated civic entrepreneurs and give them more space to use that motivation in order to stimulate the cluster development of the medical cluster. Further research should also focus on how to spread a common cluster identity, which is now for instance not present in the medical cluster of Rotterdam, that all cluster stakeholders can identify with and carry out. That would contribute to theory about cluster governance. Finally, further research could focus on how to properly guide the process of frequent variation of cluster stakeholder representatives (often of the government), which seems to have quite an impact on the strength of the network for the reason that the persons and their personality seemed to be very important. This in relation to the time it takes to build up a strong network is quite challenging.

The importance of the balance between top-down approaches, individual and common interests and the importance of trust and personal proximity that followed from this research might lead to alternative ways to follow for the cluster stakeholders of the medical I cluster of Rotterdam. The visibility of the cluster network is not so good and my recommendation for praxis is that the intermediaries, that all try to make the connections that are not being made in the network, come together more often and talk about their activities. This for the reason that many initiatives happen alongside each other which is not efficient and leading to a coherent whole. Intermediaries should make cluster members aware of the fact that they are part of a larger whole and should show the cluster members what benefits there are if they would commit to that larger whole, while respecting the own identities of all cluster members; a challenging task. In addition, the medical cluster of Rotterdam does not have a clear (medical) theme of focus. Perhaps, more choices have to be made about which specializations the cluster of Rotterdam should focus on or at least should put in the spotlights. What's more is that it became clear that it is very challenging and both promising to link academics to entrepreneurs in the cluster. Cluster stakeholders in the medical cluster of Rotterdam are already aware of this, but should go on spreading awareness about this and trying to guide these matchmakings with great care and with regard of personal connections and trust.

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# 1. INTRODUCTION

## 1.1. Background

*What is the most striking feature of the geography of economic activity? The short answer is surely concentration (...) production is remarkably concentrated in space.'*  
(Audretsch & Feldman, 2003, p.1)

Factors such as social change and technological development have affected firms' location choices (Schiller, 2001). The process of globalization and technological developments, such as the Internet, triggered the increase of firms that became footloose (Dicken, 2010). This caused that the importance of economic geography and locations seemed to fade and physical distance between places seemed not to matter anymore (Atzema, van Rietbergen, Lambooy & Van Hoof, 2012). According to Atzema et al. (2012) this is a misunderstanding, because a flourishing economy tends to attract more economic activities and places start to compete in attracting these activities.

Partly caused by these processes, the competitiveness of Dutch cities and regions has been tested extensively in recent years. Not only do neighboring regions compete with each other over firms, knowledge, labour, investments etc., they also have to compete with regions on the European or even on the global level. According to Atzema & Boschma (2005) globalization seems to steer on an increase of interregional inequality and enhances competition and the specialization of regions. Therefore, certain places flourish more than others and places specialize themselves locally while trying to link up to global production networks (Dicken, 2010). One of the most striking examples is of course the cluster of Silicon Valley; the ultimate innovative cluster. Apparently, geography and distance do seem to matter to some extent.

The ideas of Michael Porter seem to give rise to the current clustering developments. His book *The Competitive Advantages of Nations* (1990) caused that the cluster theory gained notoriety around the globe and is widely involved in policies. The idea that the physically clustered firms within specialized sectors are a source for innovation and regional economic growth is central for the theory. The physical proximity of related firms provides advantages to the participating actors in the form of agglomeration benefits on the one hand and the ability to exchange learning processes, knowledge and the stimulation of competition on the other hand (Weterings, van Oort, Raspe, & Verburg, 2007; Porter, 1998).

All kinds of local policy and entrepreneurial initiatives are derived from the cluster concept, such as science parks, industrial districts, learning regions and regional innovation networks (Kooij, Lagendijk, Moonen & Peeters, 2012). Where some of these concepts were hypes, others are still very alive. From the 1980s onward the interest in innovation increased intensely. Innovation is regarded as essential for economic growth within the first world economies. Along with the increased attention for innovation, also a renewed interest occurred in the issue of the geographically concentrated diffusion of innovation in only a minority of urban regions (Simmie, 2002). The fact that innovation occurs in concentrated regions can be declared by the fact that geographical concentration of rivaling companies stimulates competitiveness and innovative happenings and economic growth (Baptista, 2000).

Though, according to Simmie (2002) the concentration of firms alone does not necessarily lead to a self-enhancing innovative process. It is important that firms do not only compete, but that

(tacit) knowledge, which is central for innovation, is shared between firms. This creates the need for the ability of face-to-face meetings to facilitate knowledge and experience exchange (Desrochers, 1999). The key feature for the diffusion of knowledge lies within qualitative networks. Networks provide a key role in the successfulness of clusters of a high technological nature. Important here is to what extent local enterprises are embedded in a very dense network of knowledge allocation and sharing between agents or actors, in order to diffuse knowledge what may lead to innovative ideas (Dutrénit & Vera-Cruz, 2003).

All these clustering and network initiatives are interesting and sound promising. But these ideas must be organized, facilitated, and put to practice under good guidance. Key figures and cluster stakeholders from the governance, market and society, such as educational institutions can play a leading or influencing role in governing the organization of the cluster and the knowledge flows and networks within the cluster. As a consequence of the economic crisis and aging population the Dutch government is forced to take a step back and her investments will possibly decrease (RLI, 2014a). Though, this also means that there might be increasingly more space for local initiatives of civic entrepreneurs that collaborate with other actors such as the local government and educational institutions (RLI, 2014b). This may lead to a change in the main leadership in organizing the knowledge and organization networks within clusters. Moreover, the leaders that pop-up from the local level might even have a better strategic insight in what's best for the cluster than the 'official' leaders (Ebbekink et al., 2015).

All of the widespread known cluster advantages, that are easy to mention and recognize, but much harder to create, are only reflected in practice in a well-functioning cluster where all of the mentioned stakeholders work together to collectively respond to opportunities and treats. Hereby guarding a balance between openness and protection and between local and global orientation of the cluster, while being able to estimate risks and to safeguarding mutual benefits is important. A lot of cities try, on their journey to create a successful cluster, to copy strategies and concepts that were used and successful in other cities. Policy makers seem to think that copying the 'form' automatically steers on the same process. This all costs a lot of time and money and results in mixed results. The economic theory about clusters seems to be solid and clear while the policy theory might sometimes be the opposite. Kooij et al. (2012) emphasize the importance of getting inspired by innovative hypotheses and concepts on local cluster of campus environments in order to foster the knowledge spillover creation and capture. However, this should be done not only by copying concepts from elsewhere, but also by combining concepts on the basis of the own ambitions of certain clusters or campuses. Furthermore, the way in which local clusters function and specialize further as a part of larger global production networks (GPNs) also determines a lot about the functioning of clusters (Dicken, 2010).

### *Rotterdam*

As mentioned the cluster theory gained notoriety around the globe and is widely involved in policies. Many municipalities involve aspects of Michael Porters' cluster theory or derived ideas and entrepreneurial initiatives in their policies in some way (Kooij, Lagendijk, Moonen & Peeters, 2012). So does also the municipality of Rotterdam.

For a long time the economic structure of Rotterdam has been dominated by the industries (related to and) surrounding the port of Rotterdam. Even though these sectors are economically still very important for the city of Rotterdam, the direct employment it provided and provides has been dropping in the past (Groen, 2000). Therefore, the municipality realized the economy had to be broadened and renewed and the city's strength should be derived from the port related industries

only, but a more differentiated metropolitan service economy. Around the millennium change the municipality worked on this goal in perspective of the 'Grote Steden Beleid' (GSB), which had to accelerate the process of change from a 'working city' to a 'work and living city', from an industrial city to an industrial and service economy city and from 'sameness' to 'variation' (Gemeente Rotterdam, 1999). Also clustering fitted into this new approach and policy in order to create a differentiated and more attractive inner city of Rotterdam.

The development of the medical cluster in Rotterdam has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Hereby, Rotterdam tries to anticipate on the idea of the medical care sector as a growing sector (Ernst & Young, 2011). Rotterdam is developing into a world leader in the field of healthcare and the medical industry. As of 2014, the Rotterdam medical sector provides 58.479 jobs (50.673 jobs in 2013 (Gemeente Rotterdam, 2013) in over 2773 establishments, comprising 10 hospitals and 13 health care institutes. Added up the medical cluster of Rotterdam represents 19% of local employment in 2014 (Deloitte, 2015), a growth of 1% in relation to the 18% it represented in 2011 (Ernst & Young, 2011). The expectation is that in 2020 or 2030 the health sector is the number one sector of Rotterdam instead of the number two (A. Visser, 2015).

The jobs are primarily generated in the public sector. It is considered to be important that Rotterdam also develops in the private sector as well (Ernst & Young, 2011). In general *'Rotterdam is an emerging medical hot spot in biotech and virology/pharmacy with strong connections with med-tech, food and applied chemistry and life science supporting activities'* (Deloitte, 2014, p.2). Key players such as the Erasmus Medical Centre, Erasmus University Rotterdam and the Municipality of Rotterdam join forces to provide an impulse for innovation in the health sector (gebiedsontwikkeling.nu, 2012).

Also the medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from Rotterdam to the cities of Leiden and Delft with a high concentration of life science and medical technology, educational and research institutions. Medical Delta is one of four Europe's top regions in biosciences, medical technology and health entrepreneurship (Deloitte, 2014). The Netherlands is number 8 on in Europe within the field of attracting foreign investments over the past 10 year in the sector health & life sciences. The Netherlands attracts about 3% of the foreign investments in health and life sciences (Ernst & Young, 2011).

*'The location-demands of firms differ per specific industry and business activities. For firms in the life sciences are the presence of highly educated staff and the presence of fiscal and digital infrastructure very important'*  
(Ernst & Young, 2011, p.25)

Also the business climate to establish for foreign companies in the medical cluster of Rotterdam is quite favorable on all aspects regarding, accessibility, the presence and availability of a skilled labour force and highly valued knowledge institutions, unique facilities for the medical centre, a fiscal attractiveness for foreign companies (Deloitte, 2014; van der Steen, p.c., 2015; Goumans, p.c., 2015; Weggelaar, p.c., 2015; Veerkamp, p.c., 2015; Perik 2015).

In the medical cluster of Rotterdam medical, cultural and educative institutions, inhabitants, entrepreneurs, housing associations, developers and the municipality function as stakeholders. For the reason the development that the medical cluster of Rotterdam has been developing over a relative longer period of time, involving many different kinds of stakeholders the cluster has had time

to develop an own cluster ecosystem and a way of cluster governance. This makes this case very interesting in researching cluster governance, because the lessons learned in the cluster, which can be both negative and positive, could be very insightful in relation to both building on theory about cluster governance and to bringing up practical insights for key players and stakeholders in the cluster itself.

## **1.2. Research objective**

The topic steers on a research that is both focused on theory and on practice, where the theoretical part might have more gravity, since the topic is not primarily focused on an intervention in an existing situation, which is the practical part (Verschuren & Doorewaard, 2007). However, spreading the insights that this research is going to provide among key players in the field of practice regarding cluster governance in the medical cluster of Rotterdam might eventually lead to interventions. Moreover, this research' goal is to contribute to the creation of theory about the topic of cluster governance. According to Verschuren & Doorewaard (2007) a research objective is build up out of two parts. The first part, the external objective, contains elements that make clear what to expect at the end of the research, what should be done with the gained knowledge. The second part of the objective, the internal objective, is about what data, information and insights need to be acquired in order to reach the previous part of the objective.

To translate these elements of a proper research objective to this research topic. Following from the research framework the general goal of this thesis is to gain more insight into how and by whom knowledge processes and cluster initiatives are organized and governed within the medical cluster of Rotterdam and how this contribute (or not) to the strength of the cluster on the long term. Hereby incorporating how clusters specialize within the worldwide knowledge dynamics of the related cluster and how this is governed and organized. These elements are part of the internal objective. This all in order to contribute to the academic debate about cluster governance and to inform cluster stakeholders and other key players about the how their cluster is governed, which is part of the external objective.

From this the following concrete objective of this research put in one phrase is:

***To gain in-depth insight into how and by whom knowledge processes and clustering initiatives are organized and governed within the medical cluster in Rotterdam also in relation to how the cluster specializes itself within the worldwide knowledge dynamics of the health sector, in order to contribute to theory about cluster governance and to provide useful information that key players in the cluster might use for their cluster governance structure.***

### 1.3. Research questions

The research question indicates what should be done substantively in order to achieve the research objective. Research questions should be efficient and steering of nature. An answer on a question and the related gained knowledge should contribute to the research objective in order to be efficient. In order to be steering, it should be clear from the research questions what should happen to carry out the research (Verschuren & Doorewaard, 2007). Derived from the research objective of the previous paragraph, the main question of this thesis is the following:

***How and by whom are knowledge processes and clustering initiatives in the medical cluster of Rotterdam organized and governed in response to main cluster dilemmas and challenges on the global and local level?***

Derived sub-questions from this main question are the following:

- *What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?*

This sub-question will focus on the case study of the medical cluster of Rotterdam starting from the global level (more about the case study and strategy see Paragraph 2.4 and Chapter 3). This question is important in relation to the main question, because it focuses on the aspect of cluster governance regarding the specialization of a cluster within a GPN. Therefore, it is needed to explore how the medical cluster in Rotterdam does this by first outlining what the key characteristics and who key stakeholders of the cluster are. In order to understand this process it is necessary to investigate what the specialization of the local case is regarding the related GPN. Furthermore, the answer on this sub-question will map out future challenges, which are crucial for the following sub-questions.

- *How are cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?*

This sub-question is crucial in relation to the main question, because it focuses on the central aspect of it namely; cluster governance in the cluster. Answers on the previous two sub-questions provide the theoretical starting point and the position of Rotterdam in the medical GPN and its challenges and in what way the local is going to be linked to the global challenges, which both follow from the previous sub-question. This question focuses on how these challenges and specialization activities are being managed and governed on the basis of the role of networks between key actors in the local medical cluster of Rotterdam regarding collaboration, reflexivity, building common strategic knowledge and tactical capabilities.

- *What is the local role and response of key players and leaders within the local cluster governance network in view of the current challenges in the medical cluster of Rotterdam?*

This sub-question will build further upon the answer on the previous sub-questions, especially the fourth question. This sub-question will nuance the previous question by focusing on what the role of leadership is within these cluster governance networks and how this will be encouraging or discouraging for the overall cluster development.

All of these questions are viewed from a spatial perspective on innovation and economic enhancement.

## 1.4. Relevance

### 1.4.1. Academic relevance

Within the economic geographical academic debate the concept of clusters has been elaborated on extensively. For over more than 100 years spatial agglomeration benefits of locally clustered related companies and organizations have been recognized and acknowledged. Classical theories of among other Marshall (1890), with his theories about *Marshallian industrial districts*, Perroux (1955) with his *growth pole* theory and Myrdal's (1957) with his theories about *cumulative causation* of economic growth in regions, formed the starting point of Michael Porter's work. Especially the work of Michael Porter has made a substantial contribution to the development of academic theory about economic clusters and has also been implemented in policies around the world to a great extent, possibly sometimes on a passed way.

Much theory has already been built on the notion of clustering concepts and their advantages (Asheim, Cooke, & Martin, 2006), which has led to the widespread interest in the topic of policy makers. Multiple authors, of which among others Cooke (2002) and Weterings et al. (2007), have elaborated on the question whether clusters can be built or not. Brenner (2004) suggests that clustering can be partly guided by policy in an early stage of the clustering development in order to bind firms to the region. However, other authors strongly question Brenner's statement (Weterings et al, 2007).

Despite the rapid spread and development of local cluster policies, the amount of success and results differ (Hospers, Desrochers, & Sautet, 2009; Ebbekink & Lagendijk, 2010; Weterings et al., 2007). As a consequence of the mixed results, a lot of insecurity exists about which interventions and policies are most effective. According to Boschma (2004) policymakers face hard dilemmas while trying to make and govern a cluster. It is hard to determine when policy makers should intervene and the amount of influence decreases when time passes and almost disappears when the cluster really exists. Then the cluster develops a specific economic dynamic, which leads to path-dependent regional development whereby firms and other key players drive and start governing the cluster dynamics themselves. Governments turn into facilitators instead of creators.

All of the widespread known cluster advantages, that are easy to mention and recognize, but much harder to create, are only reflected in practice in a well-functioning cluster where all of the mentioned stakeholders work together to collectively respond to opportunities and treats. Where it is also important that people and firms in the cluster trust each other in order to perform to the best of their abilities while not engaging in opportunistic behavior (Asheim, et al., 2006, p.147). So while much theory has been created about the concept of clusters itself and about whether clusters can be built, not so much theory is created about how existing clusters and cluster initiatives are or should be organized and are governed. Where the question about the role of the government has been elaborated on, theory about the role of other key players within clusters, their leadership and the relation between different key players could be deepened further.

Authors that wrote about the topic of cluster governance argue that 'cluster governance' requires a co-production of a variety of cluster stakeholders (Cooke, 2002; Wolfe and Creutzberg, 2003; Lyall, 2007). This is however a challenging task involving different actors that have different and sometimes conflicting, aims and perspectives. Academically it is important to reflect on the development of the right form of cluster governance and co-production in existing clusters. This thesis therefore strives to develop further on these concepts of clusters in relation to cluster



governance and the organization of cluster initiatives and knowledge flows and hereby aims to deepen the related theories.

In doing so, this thesis is inspired by and builds upon the work of Miranda Ebbekink. She recently finished her PHD research, which was the result of the research project 'Help een Piek?! Sturen op innovatie door middelgrote gemeenten', which was part of the research program of Platform 31 'Kennis voor Krachtige Steden' (Ebbekink, Hoogerbrugge, Lagendijk and Kerkhof, 2015). In her research three clusters played a central role, the water technology cluster in Leeuwarden, the energy cluster in Twente and the Health Valley in Nijmegen. This thesis tries to contribute to cluster governance theory by projecting some elements of the research of Miranda Ebbekink on the medical cluster of Rotterdam.

#### **1.4.2. Societal relevance**

Caused by processes such as globalization, international competition and the economic crisis almost all Dutch regions or municipalities try to involve cluster and campus ideas in their policies. A lot of investments have been done, while a lot remains unclear about which investments work and which don't. This is of course not only interesting for the academic debate as mentioned in the previous paragraph, but it is at least as important for the local society and actors involved. Local cluster stakeholders should be aware of the 'endogeneity trap' (Lagendijk and Pijpers, 2012, p.632). This means that one should not create an over-deterministic view on cluster related advantages. One should not think that the factors and processes within the region automatically create welfare. Cluster stakeholders should therefore be aware of the notion that; *'rather than a causal force, proximity presents a potentiality.'* (Lagendijk and Pijpers, 2012, p.632).

Innovations do not automatically work, but run on the deliberate, synergistic actions of a group of similar-competent change agents. Cluster stakeholders should therefore be aware of the role of 'cluster governance' that can play an important role in establishing the right entrepreneurial climate for them. Also the role of leadership here is very important.

*'Establishing leadership and organizational structures that can deliver key resources previously absent but necessary for cluster-based economic development is also vital for policy to have a reasonable chance of success.'*  
(Cooke, 2002, p.186).

Therefore the societal relevance of this thesis could be to inform entrepreneurs, policy makers and other key figures in clusters about what measures they could take in order to enhance the organization of knowledge flows and innovation in the cluster. Furthermore, the involved organizations, firms and other key players might benefit from this thesis because the outcomes might help strengthen those organizations in the cluster in achieving the goal of being more innovative. Also more insight into the organizational structures in the cluster could help to recognize efficient and inefficient leadership and knowledge networks.

## 2. THEORETICAL FRAMEWORK

The following chapter tries to explain several concepts and theories that are relevant and important for this research. This chapter covers a theoretical background and the relevance of these concepts and theories are explained both as their relation with each other. This is also summarized in a conceptual framework and operationalization at the end of the chapter.

### 2.1. Michael Porter and the cluster notion

#### 2.1.1. The global local paradox and the new economy

As mentioned in the introduction we are living in an era of increasing globalization where information-technology is taking control, transport costs are falling and diminishing trade barriers are seen as a driving factor of the eroding of the significance of location and the eroding value of the concentration of firms for economic success (Dicken, 2011). Factors such as social change and technological development, which occurred at the end of the 20th century, have affected firms' location choices (Schiller, 2001). The process of globalization and technological developments, such as the Internet, triggered the increase of firms that became footloose (Dicken, 2011). This caused that the importance of economic geography and locations seemed to fade and physical distance between places seemed not to matter anymore (Atzema, van Rietbergen, Lambooy & Van Hoof, 2012). According to the 'hyper-globalists' we live in a borderless world, where location and distance are no longer relevant (Dicken, 2007; Atzema & Boschma, 2005). Castells (1996) argued that those mentioned forces cause that 'spaces of places' are being replaced by 'space of flows', because anything can be located anywhere and can easily be moved elsewhere.

Contrariwise, these developments seem to steer on the opposite direction. Processes such as globalization and technical developments, are fostering the relevance of locations in relation to economic growth. Competitive advantages are being found locally concentrated in the form of rivalry, specialized skills, knowledge and institutions, which results in local spatial embedding. Partly caused by these processes, the competitiveness of Dutch cities and regions has been tested extensively in recent years. Not only do neighboring regions compete with each other over firms, knowledge, labour, investments etc., they also have to compete with regions on the European or even on the global level. According to Atzema & Boschma (2005) globalization seems to steer on an increase of interregional inequality and enhances competition and the specialization of regions. Therefore, certain places flourish more than others and specialize themselves. One of the most striking examples is of course the cluster of Silicon Valley; the ultimate innovative cluster. Apparently, geography and distance does seem to matter to some extent. Porter himself explains the importance of proximity as follows:

*'In a global economy-which boasts rapid transportation, high-speed communications, and accessible markets – one would expect location to diminish in importance. But the opposite is true. The enduring competitive advantages in a global economy are often heavily localized, arising from concentrations of highly specialized skills, knowledge, institutions, rivalry, related business, and sophisticated customers' (Porter, 1998, p.90)*

Globalization fosters the concentration of related business, since they are able to relocate themselves in locally concentrated areas that foster the local specialization and economic growth. This seemingly conflicting notion of the returning importance of proximity in an increasingly globalizing and technological advanced world is often referred to as the global-local paradox (Ebbekink et al, 2015). The proximity where it is about is much more 'organized' as part of a network society and economy. The emphasis is not that much on logistic proximity, but on shared knowledge, confidence and vision, or to the formation. In other words it is about what Storper (1997) describes as 'untraded interdependencies'. It is this organization of this proximity that is captured by the concept of clustering.

Michael Porter was one of the firsts to notice this changing context of the economy by arguing that 'the new economy' or 'Knowledge economy' characterized by an increasing level of globalization, internationalization and competition. And he recognized that this led to the need for distinctiveness and economic growth based on specialization in clusters. And that this was especially true for knowledge intensive and innovative industries and activities (Porter, 2000). Most of the discussed theories about clusters are the work of Michael Porter, who is seen as a prominent economist of the Harvard Business School. Especially his publications and bestsellers *The Competitive Advantage of Nations* (1990) and *On Competition* (1998b) caused his theories to gain widespread recognition around the world. He is seen as the founder of the contemporary academic cluster debate.

### **2.1.2. What are clusters and clustering initiatives?**

*'The very central idea of the perception of clusters is that proximity matters'* (Asheim, Cooke & Martin, 2006, p.218). The cluster concept is based on the principle idea that the geographical concentration of firms and organizations from a related sector provides several advantages. Two kinds of geographical clusters can be distinguished; generalized and specialized clusters. The notions of externalities are key for both types. These externalities are considered to be the positive 'spillovers' that occur when activities on a particular location are in some way interconnected. The connection between the activities can be direct, through specific transactions, or indirect. The key notion of the clustering concept is that the cluster as a whole is greater than the sum of the separate parts alone. The explanation for this phenomenon is to be found in the advantages caused by spatial proximity (Dicken, 2011).

Human activities are eager to concentrate in urban areas and urban agglomerations, which is where the concept of generalized clusters does refer to. Related benefits are often referred to as urbanization economies. The existence of generalized clusters can be declared by the fact that the general concentration of activities provides a basis for cost sharing regarding all kinds of services. Especially in larger cities, a variety of economic, infrastructural and social facilities and infrastructures can be provided where that would be much harder if the demand for those facilities was much more geographically dispersed (Dicken, 2011, p.70).

However, the type of clusters that is central in this research is not the generalized cluster, but the specialized cluster. And that is also the type of clustering activities Porter elaborated on extensively in his work. Central in this theory is the idea that the physical concentrations of firms of specialized sectors form a catalyzing force for economic growth in a region. According to Weterings et al. (2007) and Porter (1998) the geographical proximity of firms and other related institutions regarding the cluster specialized sectors helps to establish a specific setting. Within this specific

setting there advantages that they bring out; learning processes, knowledge spillovers, innovation and competition can be stimulated on the one hand and the geographical closeness provides the involved actors agglomeration benefits on the other hand. According to Desrochers & Sautet (2004) the growth in the cluster is not only contributing to the cluster itself, but also to the geographical area in which it is located and thereby also to the economy as a whole. Porter himself defines (specialized) clusters as follows. Clusters are:

*‘Geographical concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate.’*  
(Porter, 1998, p. 197).

Two central aspects of his definition are key. First, there is in a certain way in which businesses in a cluster are linked. The links can be both horizontal (complementary products or services) and vertical (in the sense of a customer-client relation in production and selling chains). Secondly, the businesses located in a cluster are only part of the cluster if they are geographically proximate (Asheim, Cooke & Martin, 2006). Moreover, clusters are not bound to certain industries but can occur in many types of industries, in smaller fields or local industries. Also they can be located in both rural and urban areas and in both advanced and developing economies. Although, as one might expect, clusters in advanced economies are likely to be way more developed (Porter, 1998b in Porter 2000). In our contemporary world clusters cannot be viewed separately from wider theories concerning competitive strategies in the global economy.

Though, the geographical scope of a cluster is not fixed and could be seen as relative. According to Porter (2000) it is a matter of perspective whether how a cluster is conceptualized;

*‘The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighboring countries, the scope relates to the distance over which informational transactional, incentive and other efficiencies occur.’*  
(Porter, 2000, p.16).

Porter’s work initially focused on the national level, but his perspective and focus changed over the years leaning more towards the regional and local level (Weterings et. al., 2007). However, the geographical scale of clusters is still not fixed and this is often an aspect of his work that is being criticized; *‘Porter’s work betrays a major weakness in understanding the issue of geographical scale. The cluster definition stretches alarmingly from the local to the national and back again with bewildering facility’* (Asheim, Cooke & Martin, 2006, p.11).

### **2.1.3. Porter’s position among classical theories**

Within the academic debate the concept of clusters has been elaborated on extensively. For over more than 100 years spatial agglomeration benefits of locally clustered related companies and organizations have been recognized and acknowledged (Desrochers & Sautet, 2004). Especially the work of Michael Porter has made a substantial contribution to the development of academic theory about economic clusters and has also been implemented in policies around the world to a great extent, possibly sometimes on a passed way. Though, Porter is has not invented regional economic

development. Classical theories of among other Marshall (1890), with his theories about *Marshallian industrial districts*, Perroux (1955) with his *growth pole* theory and Myrdal's (1957) with his theories about *cumulative causation* of economic growth in regions formed the starting of Porters work. Porter's work also mirrors in many ways more recent studies about among others learning regions and innovative milieux (Asheim, 1996; Malmberg and Maskell, 2002). In order to understand the ideas of porter, some background information about the work of the previous mentioned authors is useful to understand from what starting point Porter developed his theories.

To address the work of Marshall, Perroux and Myrdal in a chronological way, first the work of Marshall is should be addressed. In his book Principles of economics (1890) Alfred Marshall argued that firms, which are located in a region where other firms and related organizations concentrate, can benefit from local agglomeration benefits, also known as economies of scale or Marshallian externalities. Caused by the regional division of labour, processes of specialization cause growth in the so-called Industrial Districts where both large and small firms can benefit from the economies of scale the districts bring out (Porter, 2000). Examples of those benefits, that are also some of the benefits that Porter mentions, are technical spillovers of information, the presence of local specialized suppliers and local educated pool of labour. As Marshall himself puts it in his central statement;

*An increase in the aggregate volume of production of anything will generally increase the size, and therefore the internal economies possessed by such a representative firm; that it will always increase the external economies to which the firm has access; and thus will enable it to manufacture at a less proportionate cost of labour and sacrifice than before'*  
(Marshall, 1890, pp. Book IV, Chapter XIII).

Following on from the idea that the economy concentrates and specialized more in some regions than in others the ideas of Perroux (1955) were very popular. Perroux (1955) argued that key firms (the growth pole) are central for economic development in a region (Weterings et al, 2007). Because of position in a growing sector and connections to other companies the opportunities for the 'multiplier' effect occurred that creates the 'growth pole', where the smaller companies could also benefit from the success of the larger companies, because they could profit from the availability of cheap but qualitative good products and a better local infrastructure network (Weterings et al. 2007). Myrdal (1957) connected to the ideas of Perroux (1955). With his theory about cumulative causation he argued that a prosperous region with economic growth can provoke more economic growth. More recently the ideas of learning regions or the 'innovative milieu' made their entrance in economic geographical theories, which Camagni (1991) in Asheim (1996) describes as; *'The set, or the complex network of mainly informal social relationships on a limited geographical area, often determining a specific external 'image' and a specific internal 'representation' and sense of belonging, which enhance the local innovative capability through synergetic and collective learning processes.'* (p.393)

The authors discussed above proved the importance of looking at economic growth with a geographical perspective and the ideas of Marshall have contributed a lot to the basic thoughts of Porter (Weterings et al., 2007). However, the final remark about innovation brings us to the distinction of the notion of Porter compared to the more classical authors, because the work of Porter is less about costs reducing advantages and more about advantages regarding the returns, such as the increase of innovation (Atzema & Boschma, 2005). Furthermore, Porters notion is more

comprehensive in the sense that it is not limited to certain sectors, but covers a wide network of connected companies and other institutions and the importance of the role of the government (Desrochers & Sautet, 2004, p. 234).

## **2.2. GPNs and their connectivity to local clusters**

The above mentioned cluster theory seems to be very concerned with local activities. However, the functioning of specialized clusters is being influenced by more than only local factors. Certain places flourish more than others and places specialize themselves locally, while trying to link up to global production networks (Dicken, 2010). In the following part, the importance of GPNs in relation to local clusters is being explained.

### **2.2.1. Intertwined networks**

When the global economy is analyzed most often the level of countries is the understandable conventional unit of analysis. All the statistical data we need for economic analysis, such as on production, trade, FDI etc. are collected into national 'boxes' (Dicken, 2011). However, considering the changes occurring in the organization of economic activity, that level is no longer satisfying. As we have seen in the introduction and the previous paragraph that, caused by globalization, production processes are no longer contained by national boundaries as they did before, which leads to a need to break out of the limiting national boxes.

Dicken (2011) finds the solution or 'glue' as he calls it in the concept of connectivity. Since the contemporary globalization processes caused that different parts of the world economy are becoming more and more interconnected in both different quantitative, but more substantively, different qualitative manners in comparison to the past;

*'The world economy consist of tangled webs of production circuits and networks that cut through, and across, all geographical scales, including the bounded territory of the state'*  
(Dicken, 2011,p.52)

While thinking about networks it is of critical value to realize that they comprise relational thinking. There is a need to theorize and understand socioeconomic processes tangled and mutually constitutive (Mitchell,2000 in Dicken, 2011). Figure 1 is a simplified analytical framework of the global economy comprising such networks. One should note that this is an idealized view of the in reality much more complex world. Dicken (2011) emphasizes that it gives a structural perspective about globalization processes and outcomes and also points out of how key actors behave. Considering the latter, the role of power relationships is very important. The networks and actors are interconnected and organized by very unequal power relationships.

The three layers should not be seen as hierarchical levels, but should be viewed as different mutually interconnected parts. It is important to understand the relations between the different slices. The networks of the middle slice are for example embedded in wider institutional macro structures that are part of the world economy (the above slice) and grounded in the dominant spatial structures of the physical world (Dicken, 2011)

For global production networks the central slice is the primary focus. However, in order to not underestimate the broader social, cultural, political and economic macro-structures that influence the actions of actors in networks, the upper slice should not be ignored. This for the reason that the decision-making of actors is socially and institutionally situated and it is important to understand the broader structures and conventions of economic, social and political rules and procedures (Dicken, 2011).

Regarding these institutions, according to Gertler (2010) economic action is shaped by a set of rules, which are actively produced and reproduced over time and different kind of sets of rules are logically possible under capitalism. Institutions and the conventions they propagate throughout the economy are actively produced

through social and political processes. Examples of institutions are regulations, legislation and economic systems as well as informal norms that regulate the behavior of economic actors. Economic actors that can be determined are for instance firms, managers, investors or workers. They together govern the workings of labour markets, educations and training systems, industrial relations regime, corporate governance, capital markets, the strength and nature of domestic competition. Together they shape the set of economic rules (Gertler, 2010). Institutions and conventions keep on to be manifested in specific configurations in specific places, for instance on the nation state level. It could be said that institutions are territorially embedded (Dicken, 2011).

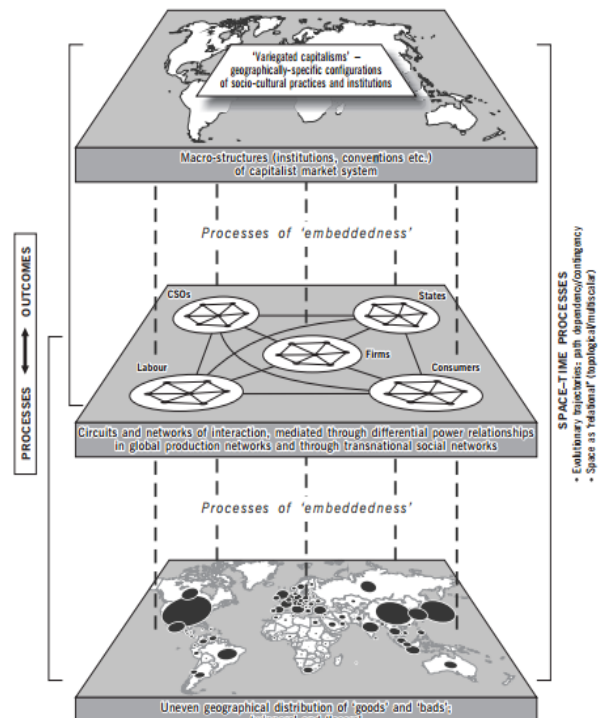


Figure 1. Tangled webs. Source: Dicken (2011) figure 3.1

### 2.2.2. Global production networks (GPNs)

*'The production, distribution and consumption of commodities, goods and services are set within this geographically differentiated macro –structural framework and occur through complex webs of production circuits and networks'*  
 (Dicken, 2011, p. 56).

The quote of Dicken stated above covers the notion of production networks, which can operate at several geographical scales. Here the focus is on global production networks, what not necessarily implies that a GPN should spread the entire world. The global aspect suggests that GPNs are very geographically extensive and are integrated across the boundaries of nation states. The central notion of a GPN is the circuits of operations, functions and transactions that are interconnected through which a specific commodity, good or service is produced, distributed or consumed (Dicken, 2011 p. 56). In sum, the core of a GPN is to transform inputs into outputs (See Figure 2)



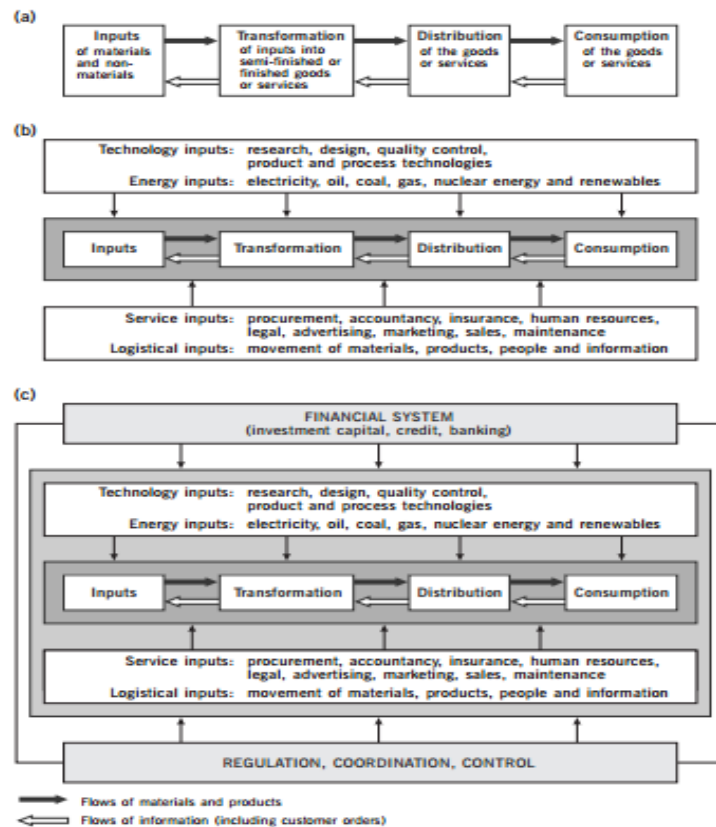


Figure 2. Components of a production circuit. Source: Dicken (2011) figure 3.3

### Actor-centered networks in the global economy

Individual production circuits are entangled in wider production networks, which contain inter- and intra-firm relationships. GPNs are not only technical-economic mechanisms that cover the concepts described on the previous page.

*‘They are also simultaneously economic and political phenomena, organizational fields in which actors struggle over the construction of economic relationships, governance structures, institutional rules and norms and discursive frames. GPNs thus exist within the ‘transnational space’ that is constituted and structured by transnational elites, institutions, and ideologies.’*

(Levy, 2008, p.948 in Dicken, 2011, p.59)

The changing spatial configuration of the world economy is shaped by the behavior and actions of and interactions between five central actor-centered networks (See Figure 3) consisting out of transnational corporations, states, a pool of labour, consumers and civil society organizations. This is done by their verifying involvement in different production circuits and networks.

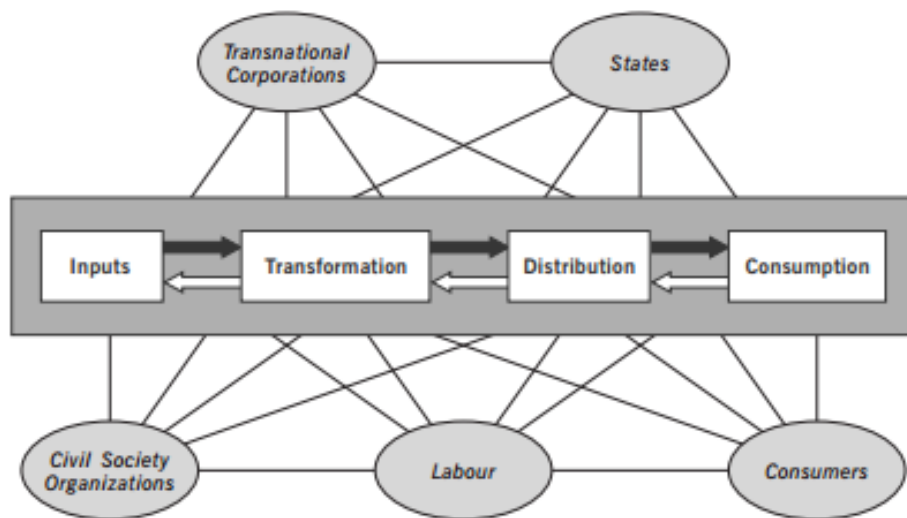


Figure 3. Major actor-centred networks in the global economy. Source: Dicken (2011) figure 3.4

### 2.2.3. Global-local articulation; Strategic coupling

Two sets of networks can be distinguished in the global economy. On the one hand there are organizational networks in the shape of production circuits and networks (Dicken, 2011). On the other hand there are geographical networks in the shape of localized clusters of economic activity (which are discussed extensively in Paragraph 2.1.1.). Both of these networks increased in complexity. Global production networks both integrate firms and parts of firms, as argued before, but also incorporate national and local economies. This can have huge consequences for the local economic development and well-being. Furthermore, local unique characteristics can also influence the working and shape of larger-scale processes. Once again, geography matters! Though, this principle is rather complex. Figure 4 covers the central dimensions of the complex relationships of these different sets of networks.

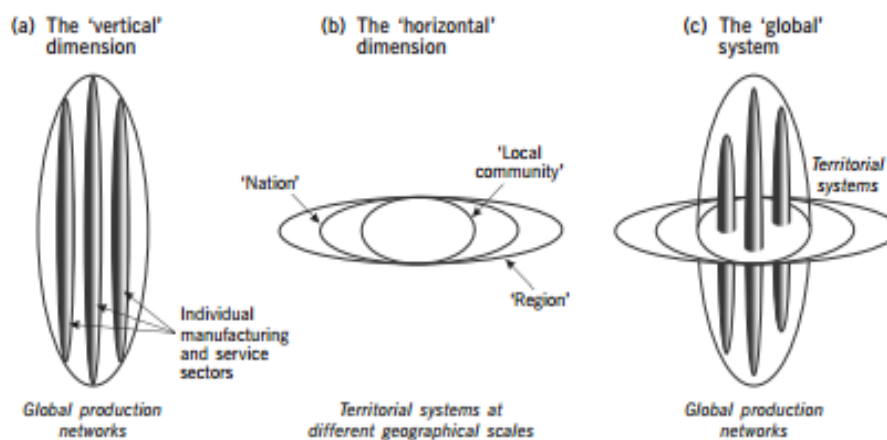


Figure 4. Interconnecting dimensions in a globalizing economy. Source: Dicken (2011) figure 3.10

This multidimensional worldview made the world much more complex. Innovation, a requirement to maintain competitiveness and position on economic markets, no longer happens only inside organizations. It now takes place through all kinds of external knowledge spill over and exchange relationships. This happens on the one hand on the local level within the local economy or community, also referred to as 'local buzz'. This specific local economy can take shape in the form of a spatial economic cluster as discussed in the previous paragraph. As outlined in that paragraph one of the advantages or characteristic of economic clusters is that knowledge and learning processes take place, often on the basis of local flows of spatially sticky tacit knowledge (Wolfe & Gertler, 2004) (see also next paragraph). Though, these knowledge flows are not necessarily limited to the local level and 'local buzz'. Developed and vibrant clusters tend to develop intensive linkages to other clusters by sharing knowledge internationally (Bathelt, Malmberg and Maskell, 2002). Clusters can exchange knowledge through so called 'global pipelines', which connect to places over larger distances. This encourages one to wonder about the answer on the question how local clusters are situated within an international hierarchy when the local knowledge base is part of a more complex and geographically stretching set of knowledge flows (Wolfe & Gertler, 2004, p.1074).

Several authors argue that for clusters to prosper, a cluster should look for complementary learning partners and try to link up to and integrate with global innovation networks. However, to create and maintain such an international co-productivity of mutual advantage relationships with partners is not easy. The answer might be found within the concept of strategic coupling. Coe, Hess, Yeung, Dicken and Henderson (2004: 474) emphasize the importance of strategic coupling in the following fragment as such:

*'Regional assets can become an advantage for regional development only if they fit the strategic need of global production networks, the process of 'fitting' regional assets with strategic needs of global production networks requires the presence of appropriate institutional structures that simultaneously promote regional advantages and enhance the regions articulation in global production networks.'*

Originally, the concept of strategic coupling is demarcated in terms of assets and needs, which can be brought together by an interface mediated by a range of institutional activities across different geographical and organizational scales (Coe et al., 2004: 469). Simply said, strategic coupling refers to the route of matching local assets with global network demands. Jacobs & Lagendijk (2014) are fine tuning the description of strategic coupling by proposing that strategic coupling is the 'overall capacity accumulated within a specific local economy and a specific GPN to align interest and activities, with the aim of improving value creation and value capturing the local and the global level' (p.49).

In relation to clusters, the relation between the local dimensions of the cluster and the other levels of governance within clusters are embedded are interesting for this matter (Wolfe & Gertler, 2004). In order for clusters to prosper, they should search for both near and far learning partners and integrate in innovative knowledge networks expanding their localities (Wolfe, 2009; Wolfe & Gertler, 2004). As Wolfe and Gertler (2004) argue, institutions are the factors that hold clusters together. Though, these institutional structures are not only found at the local level. Clusters seem to be nested within, other spatial scales such as the regional and the national innovation systems, both as even global relationships. According to Wolfe and Gertler (2004) in order for clusters to flourish in their local and global position central is the aspect of learning. Learning from the past and their

(international) learning partners, which they should be able to quickly find, in order to change competitive condition in the global economy. Several authors emphasize this role of path-dependency in relation to the current position in relation to the global economy (Wolfe, 2009; Nauweleers, 2001; Wolfe & Gertler, 2004)

*‘Experience demonstrates that regional and local governments, as well as cluster members themselves, can generate associational strategies to improve their chances of economic development. The successful initiation of this kind of process depends upon the ability to collaborate across boundaries, both geographic and social’*  
(Wolfe, 2009, p.187)

In order for clusters to collectively work on this process of current and future strategic coupling several aspects need to be taken into account. In the first place, in relation to strategic coupling for clusters specifically it is important to wonder about what the local specialization of the cluster in relation to the global production network is? How should a desirable position be safeguarded in relation to global challenges and how should the cluster be promoted to the outside world without considering all outsiders as competitors instead of inspiring co-producers? It is about strategic international positioning and profiling (by for instance acquisition activities). In this context Ebbekink et al. (2015) argue that it is important for clusters to explore their ‘niche’ or unique specialization; ‘smart specialization’.

Secondly, it is important to formulate a clear positioning strategy guided by the mentorship of civic entrepreneurs (see Paragraph 2.3.1). The positioning strategy should be specific, pragmatic, current, and clear of nature and should determine clear priorities, structures and focus. Structures can refer to individual action or the alignment of cluster stakeholders in (international) consortia. Focus can refer to the re-focusing and re-branding of the above-mentioned specialization of the local economic cluster.

Third, related to the latter, clusters should determine a cluster brand that can be used to distinguish itself. It should be authentic and striking and be carried out locally and globally by all of the cluster stakeholders, which should be able to relate to the brand; *‘cluster marketing is not only the task of the government of the cluster organization, but of every individual cluster stakeholder’* (Ebbekink et al., 2015). In for instance the Medicon Valley on the Danish and Swedish border, where the aim is to become Europe’s hub for life sciences R&D and production, the public sector took the leading role in coming up with a cluster approach based around the Medicon Valley brand (Lundequist & Power, 2002). The stimulation of an internationally known cluster brand was considered to be important, because *‘This stress on the brand’s primacy in cluster-building seems to be based on actors’ recognition of the fact that in the highly competitive world of modern global medicine and biotech it is the availability of skills and knowledge combined with an active and dynamic venture capital market that are centrally important to a regions’ success in nurturing existing and new firms. The concept and its associated policies should then be seen as having been built to link into and symbolize a picture of a strong and attractive (for both staff and venture capitalists)’* (Lundequist & Power, 2002, p.692). Lundequist & Power (2002) thereby argue that *‘other complementary institutions, of regional development, next to public institutions, shouldn’t be neglected and that such institutions must proceed from a strong cluster-brand and must also try as far as possible to give the private sector a significant ‘stake hold’ in their vision as well’* (p.693).

Fourth, people should be acting as each others' ambassador in international networks of scientists, firms and other existing networks by, finally, using civic entrepreneurs' strategic intelligence and connect to the shared cluster identity (See next paragraphs) (Ebbekink et al., 2015) in order to reach near and far learning partners as Wolfe (2004) emphasizes as important.

Paying attention to these aspects of strategic coupling in cluster governance is very important for the reason that in that way common 'cluster pitfalls' can be overcome. Examples of these are described by Ebbekink et al. (2015) as; hindering the making of above-local cluster connections, considering all external connections as competition instead of valuable completions to the own cluster characteristics, an acquisition-bias where top town acquisition policy is focused on making connections to for instance large MNC's instead of the support bottom-up growth by entrepreneurship, an exaggerated local focus and empathy cluster branding.

The way in which cluster stakeholders collectively work on the strategic coupling process of 'their' cluster as discussed above is part of the local cluster governance system. While this paragraph about strategic coupling introduced the topic of cluster governance and is part of cluster governance the next paragraph will elaborate on the notion of cluster governance further.

### **2.3. Cluster governance**

Porter (1998) pays not so much attention to the role of actors within the institutional system of the cluster and of the region or nation the cluster is located in. Though, it is also important that people and firms in the cluster trust each other in order to perform to the best of their abilities, while not engaging in opportunistic behavior (Asheim, et al., 2006, p.147).

The concept of cluster governance does pay attention to these more institutional aspects. The way in which a variety of cluster stakeholders manage co-produce and organize cluster initiatives and flows of knowledge that could enhance the functioning of the cluster as a whole can be in short the description of cluster governance (Cooke, 2002, Wolfe and Creutzberg, 2003; Lyall, 2007). 'Good' or 'successful' cluster governance is however a challenging task involving different actors that have different and sometimes conflicting, aims and perspectives. Here the concept is unraveled by first exploring the cluster governance network, then outlining what is being governed and finally by elaborating on who is governing; the role of leadership in cluster governance. The latter is going to be the focus of this thesis.

#### **2.3.1. Network governance**

The following paragraphs outline what is being governed in cluster governance and which players play a leading or crucial role in the cluster governance process. Though, first it is crucial to be aware of that all of their interactions and guiding activities are embedded in the whole cluster governance network, which is coordinated by the crucial cluster players. Networks are very much recognized as a central system of multi-organizational governance and can be defined as; *'groups of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal.'* (Provan and Kenis, 2007, p. 231). Jones, Hesterly and Borgatti (1997, p.914), refer to network governance as the *'inter-firm coordination that is characterized by organic or informal social systems, in contrast to bureaucratic structures within firms and formal contractual relationships between them'*.

The networks can have various forms in the sense that they can be introduced by network members themselves or instructed from for instance an external actor. It can be externally governed or participant-governed. The latter can be in the extreme case for example, that the cluster is governed by one participant or collectively by a various number of possible members. A challenge is to define network membership (Jones, Hesterly and Borgatti, 1997). Important in relation to studying cluster governance is that not the separate nodes of the cluster governance network need to be explored but the system of coordination as a whole, often referred to as the network governance (Provan and Kenis, 2007). There are various ways in which the governance network can be established and characterized. This also determines by what concepts decisions on policy are being made in the cluster governance network (Lyll, 2007). Examples of these are policy networks, policy communities, advocacy coalitions and issue networks. These concepts all aim to conceptualize the current changed ways of policymaking. But what people play influencing and important roles in relation to leadership in the cluster governance network? The following sub-paragraph will provide the answer to that question. And what exactly is being governed by and within these networks? The final sub-paragraph will elaborate on that.

### **2.3.2. Who is governing? Leadership in cluster governance**

According to Weterings et al. (2007) many authors argue that a certain level of 'steerability' is possible in forming clusters and all of the previous discussed aspects are what is being 'governed' in this context. Though, not only what is being governed but also who is governing it is an important question, which brings us to the role of leadership. The following quote points out the importance of 'good leadership' in clusters.

*'Establishing leadership and organizational structures that can deliver key resources previously absent but necessary for cluster-based economic development is also vital for policy to have a reasonable chance of success.'*  
(Cooke, 2002, p.186).

A condition for a well-functioning cluster governance structure is that the clusters stakeholders work together in order to properly respond to internal and external opportunities and challenges. Cluster stakeholders are (representatives of) government institutions, firms, knowledge institutions, educational institutions, money providers, including banks and development agencies, and supporting organizations such as cluster organizations, intermediaries and labour unions (Ebbekink et al., 2015).

However, establishing good leadership might be a challenging task. Boschma (2004) argues that the regional public policy maker faces a dilemma in trying to act as a leader. Cluster policy of government is doomed to fail, because policy makers find themselves in an impossible situation according to Boschma (2004). Why? For the reason that it is for the policy maker hard to determine when clustering activities should be stimulated, since the leaders at the administrative level of governance do not necessarily carry the strategic knowledge that is so crucial for the development of the cluster (See Previous paragraph). They also do not have suitable resources to make real changes directly, nor the motivation to risk their own position in the organization, development system and official policy network (Sotarauta, 2009). Moreover, the possibilities to influence the cluster with economic or spatial instruments decrease over time. Once the cluster exists it develops its own

economic dynamics and external governments could only play a facilitating role, where more room for the local firms and other involved organizations form the local cluster dynamics itself (Weterings et al., 2007).

Though, importance of the (local) government should not be underestimated. In order to govern a cluster successfully it is argued that a cooperative government is necessary (Ebbekink et al., 2015). Despite the arguments that clusters can't be built with policies, the government and regional development officers play an important part as a facilitator in the whole cluster enhancing process of co-production.

Unfortunately, governments often view themselves as an accelerant and leader of clustering activities. This attitude is called governmental activism by Borrás (2009) and is filled with all good intentions rather than arrogance. However, facilitating clustering requires an attitude to where policy indirectly facilitates opportunities within the cluster that the cluster stakeholders and local organizations should directly use as follows from Sotarauta's (2009) following quote;

*In regional development, the question is about 'a mixture of highly diffused and reflexive governance capability resulting in inter-institutional overlap and contact... and forms of leadership in which the main task is not to dominate but to guide, arbitrate and facilitate'*  
(Sotarauta, 2009, p.895)

The assignment of the regional development officers is to increase the opportunities and alternatives for other cluster actors, such as firms, knowledge institutions, intermediaries and cluster organizations and they're aiming at boosting the total cluster development. In those contexts they should aim at establishing the context for collective action of these cluster stakeholders. (Sotarauta, 2009). Ebbekink et al. (2011) contribute to that by arguing that effective cluster facilitation asks for a re-focus from an outward orientation to an inward orientation, where the policy motivation of 'cluster building' is going to be replaced by 'policy leverage'. Hereby it comes down to the idea of not reserving the people, money and time for an individual cluster project, but rather deploy resources to be able to eliminate public inefficiencies and facilitate the other cluster stakeholders in the natural development of the cluster; cluster facilitation = policy leverage. The challenge of this leverage system is to be found on 3 coordination levels (Ebbekink et al. 2015);

1. **Horizontal coordination;** cluster facilitation needs to go further than the economic department in order to contribute to a holistic approach. All government officials need to be aware of the clustering notion during their daily practices.
2. **Vertical coordination;** cluster facilitation crosses the borders of scale and jurisdictions in the sense of interaction in the sense of tuning local, regional and national policy actions whereby cross-over's are embraced and in the cooperating process clustering elements are granted to the other institutes involved when it contributes to the cluster as a whole.
3. **Political coordination;** cluster facilitation is not a one-off and temporary project. Instead it is a long term affair, which can be conflicting with the temporal appointment of public figures with the power to influence policy that tend to steer upon short term successes rather than a long term strategy. Therefore there should be focused upon political coordination that safeguards stable, predictable political leadership and commitment. (Ebbekink et al. 2015)

But where and who are then the true leaders and local cluster encouragers that should then use and contribute to this provided context by a facilitating government? Sydow, Lerch, Huxham and



Hibbert, (2010), point out that cluster leaders can be found both on the individual level and on the organizational cluster actor level, both formally appointed and informally developed and within centralized or decentralized structures, regardless the nature of the cluster stakeholder organization. These are the places where the right people are and clusters need the right people. The right people who come together at the right place and time that help built the cluster and maintain its success. However, finding the right persons and determining who is going to be the main leader is a point of discussion. The true added value, capacities and functions or roles of the unofficial leaders that are crucial in clusters, are not that well-defined and often debated in the academic spheres (Sotarauta and Pulkkinen, 2011).

Possibly the top-down leader view should be replaced by a more nuanced view of leadership/guidance. A kind of distributed leadership within the clusters, where leaders are focused on guiding their partners, other cluster stakeholder for instance (which could be in the cluster but also beyond) and these leaders perceive themselves as being just a member of a network that is being led by a different actor (Sydow, Lerch, Huxham and Hibbert, 2010, p. 339).

*'Distributed leadership is not something 'done' by an individual 'to' others, or a set of individual actions through which people contribute to a group or organization . . . [it] is a group activity that works through and within relationships, rather than individual action.'*  
(Bennett et al. 2003, p. 3 in Bolden, 2011, p. 251-252)

The aspects of the concept of distributed leadership provide a framework for 'examining the day-to-day practice of leadership and management' instead of being only focused on 'leaders and leadership structures, functions and roles'. Notions related to the concept of distributed leadership are for instance 'shared leadership', 'collective leadership' 'collaborative leadership' 'co-leadership' and 'emergent leadership' (Bolden, 2011, p.256). What all of these notions have in common is the shared belief that leadership is not the single responsibility of one person or cluster stakeholder, that the a more collective and systemic understanding of leadership as a social process must be advocated (Bolden, 2011)

In relation to cluster governance, the (distributed) leadership 'is recursively linked to the development of (the networks in) the cluster' (Sydow et al., 2010, p. 339). For these networks to be strong whole, shared views about the cluster purpose, the cluster identity as discussed in the previous paragraph, does support leadership and is on the other hand constituted from leadership practices. And since clusters provide a range of locations for leadership to develop and embed, some positions might be more visible to other cluster members (Sydow et al. 2010). In relation to the notion of distributed leadership there should be a bigger emphasis on the role of civic entrepreneurs according to Ebbekink et al. (2015).

Civic entrepreneurs are a different kind of leaders on the basis of who they are. Civic entrepreneurs are the people that contribute to the strength and success of a cluster by working in and on it every day. Civic entrepreneurs know all the ins and outs, strategic opportunities and treats and everything what is going on in the cluster. They can be both embedded publicly or privately and can be found in the government, semi-government or private organizations in the cluster. Civic entrepreneurs are people that are connected to a certain organization or institute but do not let those institutional boundaries restrict their actions regarding enhancing the cluster as a whole and they therefore need to be familiar with several institutional worlds and political relationships and affairs. Also important to recognize is that they do not necessarily have to represent the highest

function of the organization they represent. Thought, respect and status are the other hand very important. It is of course important that people representing the highest functions also support the cluster, but civic entrepreneurs are being nominated in a bottom-up way by the cluster itself and therefore can be representatives from a broad spectrum Ebbekink et al (2015).

Also the (distributed) leadership by civic entrepreneurs has different structural characteristics. This means that it is not limited to one institute or individual. Every cluster demands and supplies its own civic entrepreneurs. Who then are suitable candidates and what should their capabilities be? Ebbekink et al. (2015) describe it as to 'fulfill certain roles at the right crucial moments, by using complementary sources of power and competences in order to maintain and encourage the cluster initiatives and developments rather than cause the developments to jam'.

In order to reach their goals, leaders, both in the form of policy officers or civic entrepreneurs, can use certain forms of power (Sotarauta, 2009; Svetina, 2004). Ebbekink et al. (2015) constituted an overview of power sources distinctive for civic entrepreneurs. The first source of power is the power of relations, where civic entrepreneurs use and exploit their networks derived from personal contacts. The second kind of power is described as the power of interpretation, where the civic entrepreneur controls crucial information and derives its convincing power from this knowledge. Thirdly, a civic entrepreneur can use its expert power, where it can transfer insights derived from their own skills and professional intelligence. The fourth and final source of power a civic entrepreneur can use is the power of reference, where the civic entrepreneur functions as a role model in the cluster where he or she is being admired for their charisma and personality.

#### *Institutions as possible restrictor for leading cluster players*

A cooperative attitude of crucial players and leaders in the cluster is of course desirable, but in case the local context prevents or hinders desirable activities another step has to be made. In that case processes can only start if the institutional setting also evaluates and transforms in the same direction with the outcomes established during the learning processes. The changing economic order, that is often referred to as the knowledge economy (see the first paragraph of the theoretical chapter), makes actors in regional development policy-creating environments look for ways in which old institutions can be changed to make them fit better with the knowledge economy (Cooke, 2002 in Sotarauta and Pulkkinen 2011).

Unfortunately, institutional settings are filled with official and unofficial rules. These rules can be imposed by society, employers or by yourself unknowingly. Institutions and the conventions they propagate throughout the economy are actively produced through social and political processes. Examples of institutions are regulations, legislation and economic systems as well as informal norms that regulate the behavior of economic actors. Economic actors that can be determined are for instance firms, managers, investors or workers. They together govern the workings of labour markets, educations and raining systems, industrial relations regime, corporate governance, capital markets, the strength and nature of domestic competition. Together they shape the set of economic rules (Gertler, 2010). Institutions and conventions keep on to be manifested in specific configurations in specific places, for instance on the nation state level. It could be said that institutions are territorially embedded (Dicken, 2011).

Normann and Johnsen (2009) argue in Sotarauta and Pulkkinen (2011) that in the arenas of regional innovation system studies, cluster studies, and several knowledge-dynamics-focused work that the writers focus on challenges, practices, and solutions. They do on the other hand not focus so much on leadership and/or politics. Sotarauta and Pulkkinen, (2011) on the other hand aim therefore

to introduce institutional entrepreneurship to the debate related to regional development and cluster studies in order to raise more awareness about the role of the individual actor (the institutional entrepreneur) when analyzing institutional change for regional development.

*‘The term institutional entrepreneurship refers to the ‘activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones’*  
(Maguire, Hardy and Lawrence, 2004: 657 in Garud, Hardy and Maguire, 2007, p.956)

It is possible that they are in the position to change or attack institutional arrangements, but it does not necessarily have to be that way. The assumption about who institutional entrepreneurs actually are assuming that they are mayors, leading policy makers, and other higher authorities is false. However, many rules are not that easy to change, because deviating from existing ways of doing can have negative financial, moral and cognitive consequences (Garud et al., 2007). Therefore, many institutions are continually being reproduced over time. It might be desirable to release cluster stakeholders from their destructive institutional setting. This however is a hard and challenging activity. More and more the literature is willing to recognize the role of individual actors in changing and forming institutions (Gertler, 2010; Garud et al, 2007; Sotarauta and Pulkkinen, 2011).

### **2.3.3. What is being governed with cluster governance?**

#### *Knowledge flows*

As we have seen in the theoretical part about the concept of clusters in the case knowledge comprises a large amount of tacit knowledge the geographical closeness is key. These types of knowledge are most effectively being spread by personal contacts and communication both as by skilled works that go through inter-firm movement. Nevertheless, the advantages of geographical proximity alone seems to be overestimated by the stated above, because pure closeness alone is not enough/sufficient to declare the local knowledge spill over's (Asheim et al, 2006). Opportunities are to be found in qualitative networks of knowledge flows true the cluster. Networks provide a key role in the successfulness of clusters. Important here is the amount of 'embeddedness' of local institutions into a very dense network of knowledge allocation and sharing between agents or actors. Actors within such networks are for instance businesses, knowledge institutions, staff, clients, suppliers or other agents that are involved in the on-going activities within a cluster (Dutrénit & Vera-Cruz, 2003).

Though, it is in relation to elaborating on the concept of cluster governance important to distinguish two different kinds of knowledge flows in clusters. On the one hand there are substantial knowledge flows and spillovers that contain the professional knowledge that is related to the sector(s) of the local specialized cluster, which consists out of codified knowledge and tacit knowledge. Codified (or explicit) knowledge can formally be expressed in documents, software, hardware, blueprints etc. for example. Codified knowledge can rather easily be transmitted over a large distance. Tacit knowledge on the other hand has a very steep 'distance decay' curve. The key characteristic of tacit knowledge is that it is highly personalized knowledge carried and possessed by individuals and is virtually impossible to make explicit and to communicate to others and is therefore much more 'sticky' (Dicken, 2011, p. 440).

Tacit knowledge can also be subdivided further. Firstly, transfers of research results between regionally fixed research institutes and private firms produce tacit knowledge. Secondly, one of the most important knowledge flows; personified in highly qualified staff, flow directly from research organizations to private businesses. These flows are embodied in people that graduate from universities and move to and between firms as labour force. Third, entrepreneurial skills can also be distinguished as knowledge flows. Agents in the form of entrepreneurs use the existing knowledge base and provide the base for a local cluster formation. The knowledge acquired can be diffused in several ways. For instance by the spinoff of new firms from large anchor firms within a cluster or campus, the movement of staff within a cluster and the flows of entrepreneurial skills venture and project investments (Van der Werf, 2014).

#### *Strategic intelligence knowledge flows*

On the other hand a more strategic kind of knowledge and knowledge flows can be distinguished. This kind of knowledge is more relevant to the concept of cluster governance. As we have seen one of the biggest challenges in light of enhancing cluster development is, knowing what to do, by whom it should be done and at what moments. The question then is; what are the strategic policy actions that start the cluster engine to run. A possible answer to that is that presence of so called strategic knowledge or intelligence, which refers not necessarily to concrete knowledge, but rather to insight. Strategic intelligence comes from practice and is the ability to oversee the cluster and know its competences and weaknesses for now and for the future. A carrier of strategic intelligence is pragmatic, can recognize problems and quickly determine and formulate the treatment or policy (Ebbekink et al., 2015).

In order to reach strategic intelligence a collective learning process, with input and engagement of a group of civic entrepreneurs that operate as messengers, is needed. By regular communication, discussion and validation the involved people know what is going on in the cluster can internalize this and link it to their own position in the cluster. It is important that the civic entrepreneurs and others involved become each others' 'sparring partners', and in order to do this there needs to be frequent (face-to-face) contact. By this controlling systems individual strategic intelligence develops and together a "epistemic community" as Haas (1992) calls it, can be developed.

In order to spread this strategic intelligence that has been acquired by mostly civic entrepreneurs in the strategic learning process, also to the other key figures that are needed in the implementation phase. Institutional learning is a communal learning process that is facilitated by civic entrepreneurs. The focus is on reaching awareness, adaption and initiate action. Institutional learning starts with exposing cluster stakeholders to the previous mentioned strategic intelligence, where the ones that have to decide to take action do not necessarily have to be the ones that have the strategic knowledge. Cluster stakeholders, the ones with power, should be convinced of the ideas of the civic entrepreneurs, who carry the strategic intelligence and know what the challenges should be addressed in order to contribute to the cluster as a whole rather than only contributing to individual cluster stakeholder interests.

In order to try to reach this a couple of framing steps have to be taken. The first step is diagnostic framing, where problems are being identified. Second prognostic framing, where solutions are being formulated and third motivational framing, where motives and win-win situations are being analyzed. On the base of these framing activities, civic entrepreneurs can determine what all of the engaged inputs should and can be (Benford and Snow, 2000). If this is done in the right way, the

information is communicated in a personal way in the sense that the information is received accordingly to the institutional and interest position of the receiver. In that way all of the cluster stakeholders should be able to identify with and understand the logic of the strategic intelligence communicated with them.

However, unfortunately often, the seeming solidarity that clusters bring out publically, turn out differently and not so naturally in practice (Leibovitz, 2003). This is understandable, because it is quite difficult to make actors with different agenda's, cultures, motives, interests and obligations to work together. According to Burfitt and Macneil (2008) one can expect certain problems related to cluster coordination. Actors might want to engage in cluster agreements and collaboration to profit from the promising benefits clusters could bring about. But sometimes the agreements and involvements lack real engagement with the cluster. Therefore an affective clustering asks a certain mind-set that reaches to the core of the involved organization. In other words it can be called the cluster identity.

The idea is that, for clustering activities to succeed, all of the involved actors (civic entrepreneurs and cluster stakeholders) should create and share an overarching identity based on the shared cluster beliefs and mutual dependence (this is not the same as a cluster brand that is used to communicate with the outside world as discussed in the paragraph about strategic coupling). Key is that cluster stakeholders know what the win-win conditions regarding the cluster initiatives are before engaging in the cluster. As a consequence organizations then need to understand and recognize that their own interests are best met by participating convincingly in the cluster initiatives. It is desirable that this identity exists before engaging in agreements and cooperation. Not everybody has to engage. This means that actors that do not want to engage in the existing cluster identity, they will not contribute to the success of the cluster and therefore do not have to get involved till they change their attitude towards the cluster identity in order to prevent them to become the element of the chain (Ebbekink et al., 2015).

In communicating this cluster stakeholders should be aware of the role of trust and personal proximity. These are very important in relation to the flows of strategic knowledge in relation to cluster governance. As we have learned from the first paragraph of this chapter, physical proximity matters for clusters. Moreover, within the cluster this translates into the importance of personal proximity, connections and trust. It is even argued by some authors that not only personal proximity matters, but also the personalities of the persons for that matter (Ritala and Kleymann 2012). '*Not just anyone has the entrepreneurial ability and personal character to contribute to cluster formation*' (Ritvala and Kleymann, 2012, p. 493). Related to personality, respect for one another is also an important aspect in order to trust each other and therefore Ebbekink et al. (2015) argue that it is important for cluster stakeholders to frequently visit each other in order for one to become more approachable to stimulate cooperation initiatives.

According to Cooke (2002) all cluster initiatives should provide conditions to create trustful relationships among economic actors. Especially firms tend to underestimate and under value trust in economic relations. Though, research confirms that firms learn most from other firms. However, this means that firms sometimes have to trust competitors, which can be controversial.

Personal proximity goes a step further and refers to the amount of aspects people have in common in their personal dimensions and patterns of behavior. Characteristics, features and beliefs determine personal dimensions. Personal proximity can create a connection between people that leads to mutual acceptance and tolerance, trust and involvement. These connections can play a crucial role in initiating cooperative behavior and its successfulness, which explains the importance of

personal proximity. Cluster governance should focus on personal proximity and connections between key players and pay attention to possible negative side effects by considering people's feelings (Ebbekink et al., 2015). This all would contribute to the amount of 'embeddedness' of local institutions into a very dense network of knowledge allocation and sharing between agents or actors, which is considered to be important (Dutrénit & Vera-Cruz, 2003).

## **2.4. Conceptual framework**

In the previous paragraphs the theoretical background of the relevant concepts in relation to the main question;

***'How and by whom are knowledge processes and clustering initiatives in the medical cluster of Rotterdam organized and governed in response to main cluster dilemmas and challenges on the global and local level?'***

And related sub-questions;

- *'What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?*
- *How are cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?*
- *What is the local role and response of key players and leaders within the local cluster governance network in view of the current challenges in the medical cluster of Rotterdam?'*

were outlined. Along the way also the relations between the different relevant concepts; 'Economic clusters', 'Global production networks', 'strategic coupling' and 'cluster governance' consisting out of 'what is being governed' and 'who is governing' were discussed. In this section the theoretical framework is translated into a visual conceptual model of the discussed concepts that tries to capture the relations between the concepts. In Figure 5 this conceptual model is presented. How the concepts of the conceptual model relate to each other is described below in the following two paragraphs.

### **2.4.1 Conceptual model**

In this section the theoretical framework is translated into a conceptual model of the discussed concepts and it tries to capture the relations between them. In Figure 5 this conceptual model is presented. In the following paragraph every individual concept of the conceptual model is going to be operationalized by linking it concrete theoretical standards that are central in gathering analyzing and describing the data. Chapter 3, which provides the methodological framework, elaborates upon this further by explaining how these theoretical standards are used to gather data and how conclusions from the empirical results are going to be drawn.

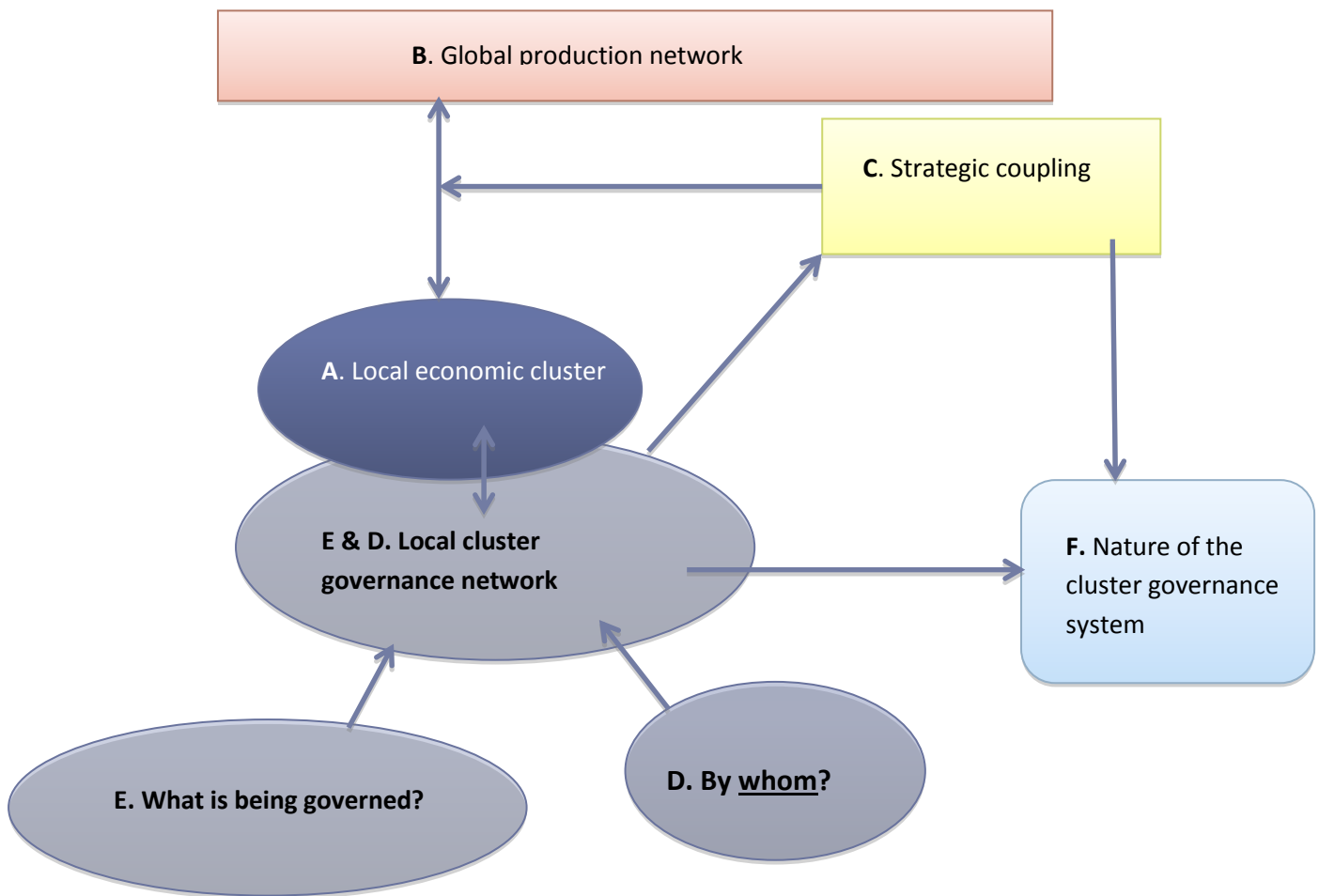


Figure 5, Conceptual model

#### 2.4.2 Operationalization of theoretical concepts

In the previous paragraph the conceptual model (Figure 5) is provided. In this paragraph the central concepts of the model are going to be operationalized and the relations between them as outlined in the visual conceptual model are explained. With the operationalization of the central concepts, these concepts are being made measurable and it is being made clear what aspects of the relevant concepts need to be measured. Also the theoretical standards and theses regarding all concepts are being outlined below. Chapter 3 will then explain how this exactly is measured, how questions are posed, how findings are going to be analyzed and how conclusions are to be formulated and is in that way an extension of the operationalization. First theoretical concept A 'The local economic cluster' and B 'Global production network' of the conceptual model (Figure 5) are outlined. These concepts are not being measured by this research, but were important in determining the research object, the boundaries of the case study (medical cluster of Rotterdam) and in selecting relevant study material.



**A. Local economic cluster**

1. **Specialized clusters are:** 'Geographical concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, associated institutions (for example universities, governmental agencies, and trade associations) in particular fields that compete but also co-operate.
2. The **geographic scope** of clusters ranges from a region, a state, or even a single city to span nearby or neighbouring countries. The scope relates to the distance over which informational transactional, incentive and other efficiencies occur.
3. **Cluster stakeholders** are (representatives of) government institutions, firms, knowledge institutions, and educational institutions, money providers, including banks and development agencies, and supporting organisations such as cluster organisations, intermediaries and labour unions.

Figure 6, Concept A

**B. Global production network**

1. 'The world economy consist out of tangled webs of production circuits and networks that cut through, and across, all geographical scales, including the bounded territory of the state'
2. The central notion of a GPN is the circuits of operations, functions and transactions that are interconnected through which a specific commodity, good or service is produced, distributed or consumed
3. The changing spatial configuration of the world economy is shaped by the behaviour and actions of and interactions between five central actors-centred networks. Which consist out of transnational corporations, states, a pool of labour, consumers and civil society organizations. This is done by their verifying involvement in different production circuits and networks.

Figure 7, Concept B

The relation between concepts A and B (Figure 6 and 7) in the conceptual framework is explained by concept C about strategic coupling in Figure 8 that has connections to both the concept of 'local economic cluster' (A) and concept B 'Global production network' of the conceptual model (see Figure 5). Below concept C 'Strategic coupling' is operationalized.

### C. Strategic coupling

Paragraph 2.2.3 comes up with several reasons why strategic coupling is important for the cluster governance structure. Is the cluster carries out the activities related to strategic coupling below, the cluster is contributing to the strength of the cluster governance structure based on the literature. The cluster tries to link up to global innovative networks expanding their localities in order to find both near and far learning partners to enhance the local cluster. Important aspects of strategic coupling are:

1. The local cluster stakeholders know the local specialisation and position in the global production network; **smart specialization**
2. A clear **positioning strategy** is formulated guided by the mentorship of civic entrepreneurs by
  - i. Profiling the cluster by **acquisition**
  - ii. The positioning strategy can be carried out in different structures such as **consortia** or by **individual acts**
3. The local cluster should determine a **cluster brand** that can be used to distinguish itself, which is carried out by all the cluster stakeholders. Re-focussing or re-branding is possible
4. People should be acting as **each others' ambassador in international networks** of scientists, firms and other existing networks by using civic entrepreneurs' strategic intelligence and by contributing to the shared cluster identity, in order to be able quickly find both near and far learning partners
5. Once strategic coupling is not carried out properly the cluster is sensitive to **several pitfalls**:
  - iii. Hindering making the above-local cluster connections
  - iv. Considering externalities as competitions instead of valuable completions
  - v. Top down based acquisition rather than encouraging economic growth by stimulating bottom up entrepreneurial initiatives
  - vi. Exaggerated local focus
  - vii. Empty cluster branding

Figure 8, Concept C

#### *Operationalization of concepts related to cluster governance*

As argued in the previous chapters the local economic cluster (concept A in the conceptual model, Figure 5) needs a well-functioning cluster governance system that governs the local economic cluster. Responding to GPN challenges by proper strategic coupling that is described under concept C is one aspect of cluster governance. This explains the link between concepts C and D & E. Concepts A 'Local economic cluster' and D&E 'Local cluster governance network' overlap but are not considered being exactly the same in the conceptual model for the reason that some economic clusters exist without a well-functioning cluster governance network, but do function better with a well-functioning cluster governance network. Below the aspects of the local cluster governance network are described by outlining 'Who is governing; leadership in cluster governance' (concept D in figure 9) and by outlining 'What is being governed in the cluster governance network' (concept E in Figure 10).

**D. Cluster governance network; Who is governing?; leadership in cluster governance**

1. Important in relation to studying cluster governance is that not the separate nodes of the **cluster governance network** need to be explored but the system of coordination as a whole, often referred to as the network governance.
2. **Cluster stakeholders** are (representatives of) government institutions, firms, knowledge institutions, and educational institutions, money providers, including banks and development agencies, and supporting organisations such as cluster organisations, intermediaries and labour unions.
3. A condition for a well-functioning cluster governance structure is that the **cluster stakeholders work together** in order to properly respond to internal and external opportunities and challenges. This should be done by;
  - i. **A facilitating government aiming at policy leverage:**
    1. Governments often view themselves as an accelerant and leader of clustering activities. This attitude is called **governmental activism** by and is not desirable for cluster governance.
    2. The assignment of the regional development officers is to increase the opportunities and alternatives for **other cluster actors, such as firms, knowledge institutions, intermediaries and cluster organisations** and they're aiming at boosting the total cluster development. The challenge of this leverage system is to be found on 3 coordination levels;
      - a. **Horizontal coordination:** all government officials need to be aware of the clustering notion during their daily practises
      - b. **Vertical coordination;** cluster facilitation crosses the borders of scale and jurisdictions in the sense of interaction in the sense of tuning local, regional and national policy actions whereby cross-overs are embraced and in the cooperating process clustering elements are granted to the other institutes involved when it contributes to the cluster as a whole.
      - c. **Political coordination:** cluster facilitation is a long-term affair and there should be focussed upon political coordination that safeguards stable, predictable political leadership and commitment.
4. Not only the governmental representatives fulfil a leading role, but cluster leaders can be found both on the individual level and on the organizational cluster actor level, both formally appointed and informally developed and within centralized or decentralized structures, regardless the nature of the cluster stakeholder organisation. In this context **distributed leadership** leads to a strong cluster governance structure:
  - i. Distributed leadership advocates the notion that leadership is not the single responsibility of one person or cluster stakeholder, but that a more collective and systemic understanding of leadership as a social process must be advocated.
  - ii. In relation to cluster governance, the **(distributed)** leadership 'is recursively linked to the development of the (networks in) the cluster'
  - iii. In relation to the notion of distributed leadership there should be a bigger emphasis on the role of **civic entrepreneurs:**
    1. Civic entrepreneurs are the people that contribute to the strength and success of a cluster by working in and on it every day.
    2. They can be both embedded publicly or privately and can be found in the government, semi-government or private organisations in the cluster. It is of course important that people representing the highest functions also support the cluster, **but civic entrepreneurs are being nominated in a bottom-up way by the cluster itself and therefore can be representatives from a broad spectrum.**
    3. Also the (distributed) leadership by civic entrepreneurs has different structural characteristics. This means that it is not limited to one institute or individual. They are connected to a certain organisation or institute but **do not let those institutional boundaries restrict their actions regarding enhancing the cluster as a whole** and they therefore need to be familiar with several institutional worlds and political relationships and affairs.
5. In cluster governance **institutional barriers** can be a restrictor:
  - i. In case the local context prevents or hinders desirable activities another step has to be made. In that case processes can only start if the institutional setting also evaluates and transforms in the same direction with the outcomes established during the learning processes.
  - ii. The **institutional entrepreneurship** refers to the activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones in order to overcome institutional barriers. However, many rules are not that easy to change, because deviating from existing ways of doing can have negative financial, moral and cognitive consequences.

Figure 9, Concept D

## E. Cluster governance network; **what is being governed and in what way?**

### *Knowledge flows*

#### 1. **Codified and Tacit knowledge**

- a. **Codified knowledge** can formally be expressed in documents, software, hardware, blueprints etc. for example. Codified knowledge can rather easily be transmitted over a large distance.
- b. **Tacit knowledge** on the other hand has a very steep 'distance decay' curve. The key characteristic of tacit knowledge is that it is highly personalized knowledge carried and possessed by individuals and is virtually impossible to make explicit and to communicate to others and is therefore much more 'sticky': transfers of research results, highly qualified staff, graduated labour force, and entrepreneurial skills.

#### 2. **Strategic intelligence knowledge flows**

- a. One of the biggest challenges in light of enhancing cluster development is, knowing what to do, by whom it should be done and at what moments. The question then is; what are the strategic (policy) actions that start the cluster engine to run. A possible answer to that is that presence of so called strategic knowledge or intelligence, which refers not necessarily to concrete knowledge, but rather to **insight**.
- b. A carrier of strategic intelligence is pragmatic, can recognize problems and quickly determine and formulate the treatment or policy (often civic entrepreneurs see previous section)
- c. In order to reach strategic intelligence a **collective learning process**, with input and engagement of a group of civic entrepreneurs that operate as messengers, is needed
- d. **Institutional learning** is a communal learning process that is facilitated by civic entrepreneurs. The focus is on reaching awareness, adaption and initiate action. Institutional learning starts with exposing cluster stakeholders to the previous mentioned strategic intelligence, where the ones that have to decide to take action do not necessarily have to be the ones that have the strategic knowledge
- e. **A challenge of the institutional learning and reaching strategic knowledge** is that it is quite difficult to make actors with different agendas, cultures, motives, interests and obligations to work together.
  - i. Therefore effective clustering asks a certain mind-set that reaches to the core of the involved organisation; **the cluster identity** based on the shared cluster beliefs and **common interests and mutual dependence**
  - ii. In communicating this cluster stakeholders should be aware of the role of trust and **personal proximity**. **Personal proximity** can create a connection between people that leads to mutual acceptance and tolerance, trust and involvement
  - iii. It is important for cluster stakeholders **to frequently visit each other** in order for one to become more approachable to stimulate cooperation initiatives. **Important here is the amount of 'embeddedness' of local institutions into a very dense network of knowledge allocation and sharing between agents or actors.**

Figure 10, Concept E

This paragraph explained the relations between the central concepts of this research outlined in the conceptual model and operationalized these concepts in the sense of providing an overview of important theoretical standards of the concepts that need to be measured in the case study of the medical cluster of Rotterdam. The following Chapter 3 builds upon this paragraph in respect of explaining how these theoretical concepts are exactly measured, with what material, how questions are posed, how findings are going to be analyzed and how conclusions are to be formulated.

### 3. METHODOLOGICAL FRAMEWORK

In the previous chapter a theoretical and conceptual framework and operationalization of the related concepts is given to provide a guideline in order to collect and analyze relevant data. This methodological chapter is of relevance to make sure the data was collected in a useful way in order to be able to answer the main research question. This section will indicate how the research objective will be achieved and how the answers on the research questions will be found based on the theoretical operationalization in Paragraph 2.4 of concepts A to E of the conceptual framework (Figure 5). In short, it is described here how the research will be conducted. The study will consist out of a combination of several philosophies, methods and strategies. First the research strategy will be discussed, including a strategy to gather valid data. Paragraph 3.2 is about the research material and elaborates on the sort of data that needs to be collected and how and where to find this accompanied with a discussion about analyzing the data and related possible difficulties.

#### 3.1. Research strategy

According to Verschuren and Doorewaard (2007) the strategy is not the most important. The most important aspect of a successful research is to constantly focus on a systematic approach to gather the answers on the research questions. A research strategy is generally understood as the whole of relating decisions about the way in which the research will be conducted (Verschuren & Doorewaard, 2007, p. 159). This research tries to be of a qualitative in-depth nature, based on both theory and practice. The in-depth approach for the research is chosen for the reason that the research needs to be based on both a solid framework of existing theories about the generic knowledge-founded interpretation of clusters and cluster governance. Furthermore, an in depth-approach is suitable because the topic is rather complex of nature and, partly caused by the complex nature of the topic, the research is highly dependent on the personal perceptions of the participants in order to properly answer the main question.

First an in-depth literature study has been carried out exploring the concepts that are part of the theoretical and conceptual framework (see Chapter 2). This first part of the research consisted out of desk research. Desk research is a strategy that uses material that has been produced by others. Though, by reflecting on these insights and comparing different views in literature one can come to new understandings (Verschuren & Doorewaard, 2007). Different points of view of different authors that wrote about theories related to clusters and cluster governance have been studied and compared. This strategy is useful and interesting for the first part of the research to be able to create a decent theoretical basis in order to understand the empirical reality later on.

The empirical part of the research strategy consists out of a case study of the medical cluster in the region of Rotterdam where this cluster is put in perspective of the theoretical concepts central in Paragraph 2.4. Although some authors view case study research not as a methodology, but a choice about what is going to be studied, Creswell (2013) does view it as a methodology. '*A case study research is a qualitative approach in which the investigator explores a real-life contemporary bounded system (the case) (...) through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audio-visual material, documents and reports)*' (Creswell, 2013, p.97). The case study is conducted within a both by time and space bounded system. The case in this thesis is bounded by space; the region of Rotterdam and by time; within a period of a couple

of months ranging from March-May 2015 the data has been collected. The state of the case within this period of time has been investigated, while incorporating ideas of the stakeholders about the past and the future. A case study is a relatively intensive approach of in-depth nature and the data that is collected is in most cases of qualitative nature (Creswell, 2013; Verschuren and Doorewaard, 2007). This serves the research question and objective rather well, since the objective is to *gain in-depth insight into how and by whom knowledge processes and cluster initiatives are organized and governed within the medical cluster in Rotterdam, also in relation to how the cluster specializes itself within the worldwide knowledge dynamics of the health sector.*

Every method has its pros and cons. One of the cons of the case study method is that the external validity could be not that strong. This for the reason that the restricted or limited, but rather in-depth, data collection causes that the research findings are hard to generalize. The researcher therefore has to keep in mind that the research outcomes cannot just be applied to other cases. Though, when doing case study research the internal validity is often very strong, because of the in-depth approach, the intense and nimble character of the research. Also other advantages of the method can be pointed out. One of these is that the case study research provides the opportunity to obtain an integral image of the specific research object, in this case in short; cluster governance in the medical cluster of Rotterdam. Secondly, the method has a nimble nature, which makes it possible and easier to change tracks when needed. For instance, when changes in the cluster governance structure in the medical cluster of Rotterdam are going on while conducting the research, it might be possible to respond to that directly. Also the research outcomes are more likely to be recognized and accepted more easily, because the researcher works with the respondents and participants in close proximity (Verschuren & Doorewaard, 2007).

The methodological chapter should outline the steps that are going to be taken to carry out the research. Therefore it is important to focus now more on the specific content elements that also relate to the theoretical chapter and conceptual framework, because these are central elements in gathering, analyzing and interpreting the data and drawing conclusions (see Paragraph 2.4). The case study can roughly be sub-divided into three parts, elements or steps where the strategy is to work from the global to the local. This is also the order in which the conceptual model is described in Paragraph 2.4 and how the outcomes are described in Chapter 4 to 6. The first part focuses on the level of the Global Production Network (GPN). The first part of the case study consists out of an in-depth literature study exploring the global developments and challenges within the health sectors' GPN (See Figure 1) in relation to what this means for the position of the medical cluster of Rotterdam towards these global developments and challenges.

The second part of the case study will be mainly based on practice and will zoom in locally on the medical cluster in Rotterdam and its link to the GPN. The local cluster governance form is going to be explored in relation to how strategic coupling (see concept C of the conceptual framework and Chapter 5 for the results) of the cluster is governed. The third part of the case study then focuses on how and by whom local knowledge processes and cluster initiatives within the medical cluster of Rotterdam are organized and governed locally with a special focus on the role of leadership (central elements here are concepts D and E of Paragraph 2.4). The strategy behind these three steps is to start from the global level and then working towards or zooming in to the local level.

By studying this case the foregoing mentioned theoretical elements will be deepened and tested. The case study is a strategy that makes use of empirical research of a certain phenomenon within the actual context of practice. Different types of evidence can be used. It offers opportunities to get an overall picture of the research object, in this case the medical cluster in Rotterdam, by

revealing subtleties, motives and considerations of the key players in the cluster that determine the specific form of cluster governance in the medical cluster of Rotterdam (Creswell, 2013). What methods and materials will be used within this case study exactly will be explained in the next paragraph.

### **3.2. Research methods and material**

The research material for this research, which provides the information to be able to answer the main question, for the first part of the research (the desk research) makes use of relevant books, articles, papers and other documents that are the research objects for that part of the research. For the remaining part of the research the research material is going to be mainly derived from persons, who then become the research objects. Face-to-face semi-structured interviews (20 interviews have been carried out, see Appendix 2 for the list of respondents) have been made use of in order to gather the relevant data. For the respondents the main criteria were that they are key figures and/or stakeholders within the local cluster or play a key role in developing local cluster policies (see also concept A.3 of the conceptual framework). Therefore as a start there is spoken with representatives of all of these stakeholder initiatives who then made further references to relevant cluster stakeholders. In doing so the three key players, the government or municipality, the market and knowledge institutions have all been addressed since they are all represented here as promoters of the cluster and therefore as cluster stakeholders (See Appendix 2).

The method of interviewing is chosen for the reason that this way of qualitative research inquiry is very suitable for gathering information out of complex issues, which this thesis addresses. By asking specific questions the researcher can control and influence the conversation in order to focus on the information that is needed to answer the research questions. The interviews have been semi-structured and the conceptual framework of the relevant theoretical concepts has been the central source of inspiration for the interview guide (see for the interview guide appendix 3). In this way an interactive conversation could occur (Creswell, 2013). Though, a remark about political sensitiveness must be made. The respondents could misunderstand some questions or they might tend to give answers that are politically correct. The interviewer must be aware of that and try to persuade the respondent to give valid answers.

After the data had been collected, the data needed to be interpreted and analyzed in a right way. The answers from the interviews are put in the context of the different sub-questions in order to provide an answer to the right questions for that matter. Also all the gathered data needs to be placed in the context of the framework that is outlined in the theoretical chapter. After the interviews were conducted the interviews were transcribed, coded and analyzed, with the help of the program Atlas.ti based on the operationalization of the theoretical concepts outlined in paragraph 2.4. Once the raw data had been analyzed, the local cluster governance network (See theoretical Chapter 2) could be outlined in the chapters that discuss the results of the research.

In the chapters that describe the empirical results the results are put in perspective of the elements of the operationalized concepts of the conceptual model by constantly comparing the empirical results of the medical cluster of Rotterdam with the theoretical standards of 'a good cluster governance system' (See paragraph 2.4.2). Each chapter provides a sub-conclusion on each sub-question central in that chapter at the end of that chapter. Below table 1 provides a summary of the

methodology described above and an overview of the content of the following empirical chapters including which theoretical elements are the point of reference in each chapter.

**Table 1, Overview strategy per sub-question and reading guide**

Sub-question	Methods	Tools	Location of empirical results and central concepts of the conceptual framework
<b><i>What is the current position of the Rotterdam medical cluster in the medical global production network (GPN) and which key GPN challenges are significant for future development?</i></b>	<i>Case study of the medical cluster Rotterdam:</i> In-depth literature study supplemented by empirical insights gained by the in-depth face-to-face structured interviews with key players in cluster	For the literature see Ch. 8. References  For the respondents see Appendix 2  For the used interview guide see Appendix 3	Chapter 4; concept A, B and concept C.1 of the conceptual model are central in the text
<b><i>How are cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?</i></b>	<i>Case study of the medical cluster Rotterdam:</i> In-depth face-to-face structured interviews with key players in cluster	For the respondents see Appendix 2  For the used interview guide see Appendix 3	Chapter 5; All elements of concept C 'Strategic coupling' of the conceptual model are central in the text and the empirical results are reflected on those concepts
<b><i>What is the role and response of key players and leaders within the local cluster governance network in view of the current challenges in the medical cluster of Rotterdam?</i></b>	<i>Case study of medical cluster Rotterdam:</i> In-depth face-to-face structured interviews with key players in cluster	For the respondents see Appendix 2  For the used interview guide see Appendix 3	Chapter 6; All elements of concept D and E of the conceptual model are central in the text and the empirical results are reflected on those concepts

This master thesis is carried out for the Radboud University Nijmegen but also as part of an assignment of the internship organization Public Result (See appendix 10).

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## *Research outcomes*

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## 4. GPN CHALLENGES IN THE MEDICAL SECTOR AND THE MEDICAL CLUSTER OF ROTTERDAM

### 4.1. Introduction

This chapter will focus on answering the first empirical sub-question; ***What is the current position of the medical cluster Rotterdam in the GPN of the health sector and which key GPN challenges are significant for future development?*** The answers of the different parts of this rather long sub-question are discussed below under different paragraphs. As the research methods outline the strategy is to work from the global to the local. Therefore this chapter starts with paragraph 4.2 that focuses on international trends and challenges of the GPN of the health sector that provide challenges that are significant for the future development of the medical cluster of Rotterdam based on the operationalization of the GPN concept B in paragraph 2.4.2. Then Paragraph 4.3 introduces the case area of this research further; the medical cluster of Rotterdam and its stakeholders (based on the operationalization of concept A 'Local economic cluster'). Here the factual characteristics and specialization of the medical cluster of Rotterdam are described. Point C.1 of the conceptual framework shows that an important aspect of strategic coupling is that the local cluster stakeholders know the local specialization and position in the GPN, which is called smart specialization. Therefore the end of Paragraph 4.2 reflects upon the relation between the GPN trends and challenges and the local specialization of the medical cluster of Rotterdam. Paragraph 4.3 closes this chapter with a sub-conclusion answering the sub-question mentioned above.

### 4.2. International trends and challenges of the healthcare sector

This paragraph is focusing on international trends and challenges of the GPN of the health sector that are significant for the future development of the medical cluster of Rotterdam based on the operationalization of the GPN concept B in paragraph 2.4.2 that argues that local clusters are influenced by and influence themselves the GPN of the related sector.

#### General trends in health care

*Global healthcare spending will rise by 5.3% up until 2017*  
*European healthcare spending projected to rise by 9% up until 2017*  
*Netherlands' healthcare expenditures 14.9% of GDP, 68 bln Euro, Euro 5.350 per capita.*  
(InnovationQuarter, 2015, p.6)

Social and demographic developments are more and more going to be of influence of challenges that determine the development of the health care sector in general. Especially the on-going aging population and the general increase of the world population strongly increase the demand of healthcare (Ernst and Young, 2011; Kamerling, p.c. (personal communication), 2015). Related to that Europe has the second largest life science and health market worldwide and the Netherlands are the 6nd largest economy in Europe (InnovationQuarter, 2015, p.3). For Europe in specific InnovationQuarter (2015, p.4) outlines several aspects that are the drivers of the growth such as the increase o; 'Operational efficiency, alliance activity, emerging markets, specialized small scale

Mergers and acquisitions, rising wealth, focus on niches, the aging population and the increasing of people suffering chronic diseases' (Medical Delta, 2014)

A related challenge in relation to the increasing demand for health care is the question how society can keep health care affordable while safeguarding the high quality of the health care that is provided (InnovationQuarter, 2015). This for the reason that health care costs are increasing partly for the reason that more and more solutions are being found for more and more illnesses and diseases (Drijfhout, p.c., 2015; Perik, p.c., 2015; Baas, p.c., 2015).

The latter is boosted by the fact that also in the medical sector socio-economic and technical developments have had major consequences on the exchange of knowledge and skills on the medical field. For example, surgeons in Chicago can intercontinentally coach other surgeons through Skype or related forms of communication. In that way new insights could be exchanged quickly, the Internet plays in this context a very important role (Goumans, p.c., 2015; Weggelaar, p.c., 2015). The Internet provides the possibility for hospitals and medical research institutes around the world to share large databases with information about patients and (the treatment) of diseases and illnesses in order to do research with large populations. Academic medical centres have the task to do research. Patient investigations are naturally linked to patients. The developments are that hospitals have to take larger samples to safeguard the validity and reliability of the research and in order to test new products and medicines. 'Detailed studies are needed to prove the cost and medical effectiveness of these technologies as well as its effects in the quality of life' (Kun, 2001, p.155). Therefore these researches linked to the academic medical centres need to focus on international cooperation in order to share data. This is especially useful for investigations into rare diseases, because the locally collected data is far but enough to do valid research with (Verweij, p.c., 2015).

Though, the process of developing medicines is a lengthy and expensive one. On average it costs a billion euro to develop a new medicine (Baas, p.c., 2015; Schol, p.c., 2015; Drijfhout, p.c., 2015; van der Steen, p.c., 2015). First, the idea should be there. Well then there will be applied for a patent on it, which means that test tube experiments will have to be carried out. Those tests are done with animals in the first place and later on with humans. In case the outcomes produce positive data of efficacy for humans, it is proven the medicine works very well. Though, in the trajectory to this point very little capital is available. This is called the valley of death;

*'The so-called "valley of death", a place in which promising basic research findings go that fail to make their way into (or out of) clinical trials and therefore never have a chance to develop into therapies for patients (...) Translating the knowledge from biomedical science into clinical applications that help patients has been compared to crossing a valley of death because of the many issues that separate the bench from the bedside and threaten to stall progress.'*  
(Meslin, Blasimme & Cambon-Thomsen, 2013, p.1)

Well in this stage, it is very difficult to get innovations to reach the wider market. In addition, getting the approval for developing medicines is increasingly difficult (Drijfhout, p.c., 2015; van Rijn, p.c., 2015; Kamerling, p.c., 2015). One way to collect funds in relation to the increasing costs for healthcare it is more and more important for find partners in the international network of researchers and other cooperating organizations for the reason that international funds often go to very large consortia (Drijfhout, p.c., 2015). Challenges related to this are to bring in/score as much as possible international studies that need to be carried out. In particular the studies that make sure the health care is going to be improved. Once a local research group is allowed to carry out the study,

clusters can maintain an advantage in knowledge and that is very important (van der Steen, p.c., 2015). This adds up to the first trend Moritz (2015, p.1) describes in his article about the healthcare economy where he argues that partnerships are increasingly important to success; *'In today's hyper-competitive environment, companies must collaborate on innovative products and services, combining complementary expertise to fill individual gaps'*. Also in relation to the sharing of consumer data Moritz (2015) argues that securing patient data and ensuring privacy will be vital to healthcare institutions' successes.

For the health sector in the Netherlands there is also a more local challenge. In the Netherlands it is agreed that the health care is divided in several 'zorglijnen'; the 0-lijn, the care people are expected to organize themselves, 1e-lijn are the general practitioner or family doctors, the 2e-lijn are the common regional hospitals and the 3e-lijn are the academic hospitals (van der Brug, van Mechelen-Gevers & te Lintel Heekert, 2012). The challenge is that nobody is really responsible for guiding the patients through these lines of health care providers and due to legislation it is prohibited to organize this in the sector. Moreover, the influence of healthcare insurers is substantial here (Westerlaken, p.c., 2015; A. Visser, p.c., 2015).

*'While knowing that it would be best for the patient to help him or her at the best place and time, the ones controlling the place and time or the ones who could control it such as the health insurer are primarily driven by financial arguments'*  
(Westerlaken, p.c., 2015)

### **International market trends of the medical sector**

When products are successfully developed and have survived the valley of death, new medicines, products, devices or working methods in the medical sector almost always know an international market (Kamerling, p.c., 2015).

Partly in relation to the aging population *'there are in particular increasing demands on e-health care services and smart technologies needed for frail elders with chronic diseases and also for those experiencing active aging'* (Lattanzio et al. 2014, p.247). In this context developments in home automation (domotica) provide opportunities (A. Visser, p.c., 2015). This is very much related to the topic of 'healthy aging', which is very trending and a lot of start-ups are focusing on this (Oomens Meer, p.c., 2015). Also related to this are the developments in the field of medical devices; related to measuring and diagnosing illnesses. People can do more and more by themselves, because of the development of medical devices. For example, people can do urine and blood pressure tests at home by themselves (Moritz, 2015; Oomens Meer, p.c., 2015). This can then on the other hand help reducing the high costs in the health care sector (Lattanzio et al. 2014).

Furthermore, the ICT and technical sector are developing really fast and this also has its impact on the medical sector (Perik, p.c., 2015). Moritz (2015) emphasizes the importance of it in his second trend that is going to determine the health care economy where he describes that the digital technology is a crucial focus now and in the future. As mentioned the process of up scaling to international markets is very challenging especially in the field of e-health and med-tech activities, which are related to upcoming technical innovations and niche markets such as minimal-invasive instruments and imaging (Ernst & Young, 2011; InnovationQuarter, 2015; Lattanzio et al. 2014; Medical Delta, 2014). And this can be a future challenge since e-health is part of new and promising developments within the health sector (A. Visser, p.c., 2015). Entrepreneurs are trying to develop their initiatives but get stuck after testing their products on only a few practical cases. Reaching the

European market seems to be very challenging for these new initiatives (Baas, p.c., 2015; Schol, p.c., 2015).

In addition 'within the pharmaceutical industry a change can be observed in the chain from a vertical oriented chain to an ecosystem where the patient is a central element.' (Ernst and Young, 2011, p.14). This development is related to the concept of personalized medicine (Baas, p.c., 2015; Drijfhout, p.c., 2015; Oomens Meer, p.c., 2015) as the following fragment underlines;

*'A new class of patient-driven health care services is emerging to supplement and extend traditional health care delivery models and empower patient self-care. Patient-driven health care can be characterized as having an increased level of information flow, transparency, customization, collaboration and patient choice and responsibility-taking, as well as quantitative, predictive and preventive aspects. The potential exists to both improve traditional health care systems and expand the concept of health care through new services'*  
(Swan, 2009, p.492)

In order to be able to provide personalized medicine, the development of DNA sequencing is going on; *'Enabled by high-throughput technologies in DNA analysis, genomics introduces a further dimension to individualized predictive medicine. Determining an individual's unique genetic profile in respect to disease risk and drug response will have a profound impact on understanding the pathogenesis of disease, and it may enable truly personalized therapy.'* (Mancinelli, Cronin & Sadée, 2000) By analyzing people's DNA it can become clear which medicines will work for that person and which not, what hereditary diseases people can be facing during their lives. (Ernst & Young, 2011; Oomens Meer, p.c., 2015)

Though, the current development strategy of the pharmaceutical industry, based on blockbusters, does not fit with these individualizing developments and for both companies and hospitals focusing on this theme it is hard to collect funds (Drijfhout, p.c., 2015). Large pharmaceutical companies are to a lesser extent working on the development of new medicines themselves. The large companies execute technology scouts and tend to buy up smaller companies local regions. This leads to the fact that research activities are more localized and locations are going to close. Therefore it is a challenge for regions to preserve the larger pharmaceutical companies that are present to maintain also the existence of the smaller companies that are being bought up (Baas, p.c., 2015). This adds up to the first trend Moritz (2015) describes in his article about the healthcare economy where he argues that partnerships are increasingly important to success.

### **International flow of patients and students**

Slowly but surely not only the medical products travel internationally but also patients travel towards the supply of good medical care and cure with the purpose of obtaining health care, including elective surgery and even long-term care. (Ramirez de Arellano, 2007; Westerlaken, p.c., 2015; Pols, p.c., 2015; Verweij, p.c., 2015). This trend is also being referred to as 'medical tourism' and 'health tourism' (Lunt & Carrera, 2010, p.28). In the United States it is already relatively conventional to travel, not only for cosmetic surgery, but also for serious medical treatment over far distance. Lunt & Carrera (2010, p. 28) describe this trend as 'the organized travel outside one's local environment for the maintenance, enhancement or restoration of an individual's well-being in mind and body'. This is driven by the fact that certain treatments are already legal and available in one country and still forbidden or still in development in other countries. Or just simply by the reason that in one place

there is more knowledge and skills on a certain medical field than in other places (Ramirez de Arellano, 2007). *I literally saw an American patient that asked for medical care asking where he could pay for it with his credit card in his hand. That was something we hadn't seen before.*' (Westerlaken, p.c., 2015). Caused by the erosion of funds for the hospitals, hospitals are specializing more and more and therefore the local market is sometimes not sufficient. Therefore more and more specialized hospitals need to deliberate about what they can supply for the world population (Verweij, p.c., 2015).

Not only patients but also students and are internationally searching for the best places to study or do a PhD research. Students might want to study at a foreign place for the reason that that university offers a certain medical related (research) master that is not offered elsewhere (Drain et al, 2007; Verweij, p.c., 2015; Bieringa, p.c., 2015). This would be desirable because *'graduate students might remain ambassadors of the country from which they have graduated from in their own country or anywhere they spend the rest of their live. Besides that, during their stay, many of them attract their relatives to visit them and the country, which improves the economy on tourism point of view. Also more on the regional level the flow of students is part of current developments'* (Exceedsmedacs, n.d.). Academic medical centres have the task to teach and train future doctors on the basis of the most recent scientific insights in the field of the healthcare sector. In relation to the development described above, about the fact that hospitals have to specialize more and more, because of the erosion of funds, students do not see and learn enough anymore when staying in just one particular university medical centre. For that reason students will have to travel between several specialized hospitals in order to be fully and properly trained. The teaching hospitals are responsible to ensure the quality of education and are therefore 'forces' to collaborate more and more (Verweij, p.c., 2015).

### **4.3. Introducing the case area; the medical cluster of Rotterdam**

#### **4.3.1. The medical cluster of Rotterdam**

The development of the medical cluster in Rotterdam has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Hereby, Rotterdam tries to anticipate on the idea of the medical care sector as a growing sector (Ernst & Young, 2011). Rotterdam is developing into a world leader in the field of healthcare and the medical industry. As of 2014, the Rotterdam medical sector provides 58.479 jobs (50.673 jobs in 2013 (Gemeente Rotterdam, 2013) in over 2773 establishments, comprising 10 hospitals and 13 health care institutes. Added up the medical cluster of Rotterdam represents 19% of local employment in 2014 (Deloitte, 2015), a growth of 1% in relation to the 18% it represented in 2011 (Ernst & Young, 2011). The expectation is that in 2020 or 2030 the health sector is the number one sector of Rotterdam instead of the number two (A. Visser, p.c., 2015).

The jobs are primarily generated in the public sector. It is considered to be important that Rotterdam also develops in the private sector as well (Ernst & Young, 2011). In general *'Rotterdam is an emerging medical hot spot in biotech and virology/pharmacy with strong connections with med-tech, food and applied chemistry and life science supporting activities'* (Deloitte, 2014, p.2). Key players such as the Erasmus Medical Centre, Erasmus University Rotterdam and the Municipality of Rotterdam join forces to provide an impulse for innovation in the health sector (Gebiedsontwikkeling.nu, 2012).

Also the medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from Rotterdam to the cities of Leiden and Delft with a high concentration of life science and medical technology, educational and research institutions. Medical Delta is one of four Europe's top regions in biosciences, medical technology and health entrepreneurship (Deloitte, 2014). The Netherlands is number 8 on in Europe within the field of attracting foreign investments over the past 10 year in the sector health & life sciences. The Netherlands attracts about 3% of the foreign investments in health and life sciences (Ernst & Young, 2011).

*'The location-demands of firms differ per specific industry and business activities. For firms in the life sciences are the presence of highly educated staff and the presence of fiscal and digital infrastructure very important'*

(Ernst & Young, 2011, p.25)

Also the business climate to establish for foreign companies in the medical cluster of Rotterdam is quite favorable on all aspects regarding accessibility, the presence and availability of a skilled labour force (which is a general challenge of the GPN in the health sector and therefore an advantage for Rotterdam) and highly valued knowledge institutions, unique facilities for the medical centre, a fiscal attractiveness for foreign companies (Deloitte, 2014; Innovation Quarter, 2015; van der Steen, p.c., 2015; Goumans, p.c., 2015; Weggelaar, p.c., 2015; Veerkamp, p.c., 2015; Perik, p.c., 2015). Below the key players of the medical cluster of Rotterdam are briefly introduced while highlighting their specialization and focus areas.

#### **4.3.2. An introduction to the cluster stakeholders**

Below the key players, based on what cluster stakeholders are according to concept A.3 of the conceptual framework in Paragraph 2.4, are briefly introduced (representatives of most of them have been interviewed, see Appendix 2). More details about with whom they work together in what way and what activities they organize will be discussed in more detail in the different parts of Chapter 4 and 5 and Appendix 4. While introducing the key players, their specializations, niches and or fields of focus are described as well. This is put in perspective of the theoretically argued importance of smart specialization (point C. 1 of the conceptual framework).

#### **Medical Delta**

The medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from Rotterdam to the cities of Leiden and Delft and are characterized by a high concentration of life science and medical technology educational and research institutions and this collaboration is considered to be very important for the development of the medical cluster in Rotterdam (all respondents, p.c., 2015; InnovationQuarter, 2015). Medical Delta started off in 2007 consisting out of a small board including the deans of the UMC's of Leiden and Rotterdam. At that moment the intention existed to initiate a new public-private partnership project where researchers and entrepreneurs in the field of life science where being connected in order to stimulate innovation. That was the start and Medical Delta has been build up and grown into a Triple Helix organization. Now the universities of Leiden, Delft and Rotterdam and their UMC's are involved both as the municipalities of these three cities and the Province of South-Holland (Kamerling, p.c., 2015; Perik, p.c., 2015). Furthermore, over 300 entrepreneurs in the region are being involved in projects and

activities (Deloitte, 2014). More activities are being done with more and more participants. It is for instance a possibility that the Universities of Applied Sciences from the 3 involved municipalities plus the one of The Hague are also going to be involved in the near future (Kamerling, p.c., 2015; Perik, p.c., 2015; Goumans, p.c., 2015).

*‘As a cluster organization we can support - amongst others - entrepreneurs who are trying to reach the international market with an introduction in other international networks we are connected to’*  
(Kamerling, p.c., 2015)

Within the organization of MD there is a coordination council, which is responsible for the cluster organization as a whole and this council consists out of the members of the board of directors of the Erasmus MC, the TU Delft, The EUR, the RUMC, the University of Leiden (see Figure 11), supplemented by the 3 town counselors that cover the medical field in their cities, the deputy of the province of south Holland and the director of MD Menno Kok and the cluster coordinator Roel Kamerling. A group at the more operational level linked to MD consists out of senior government officials of these 9 institutes and a 5-8 senior, open-minded scientists. This last group is the group where new innovative ideas emerge and are exchanged (Kamerling, p.c., 2015). ‘In the last three years, over 40 medical technology related start-ups spun out of knowledge institutes in the Medical Delta; a result of institutes fuelling many joint professorships and joint educational programs at BSc-PhD level in life sciences’ (biomechanical engineering, molecular sciences, entrepreneurship etc.) (Deloitte, 2014, p.4). The fields of research MD is focused on are targeted molecular Technology, Imaging and image-guided medicine, interventions & care and vitality. These four themes cover the whole medical sector (Medical Delta, 2015).

Medical Delta		
Academic Partners	Incubators	Science parks
Delft university of Technology	Biopartner center Leiden	Bijl Science park Leiden
Erasmus University Rotterdam	Erasmus MC Incubator	Rotterdam Science Tower
Erasmus university medical center	Yes Delft!	
Leiden University		
Leiden University Medical Center		

Figure 11, Overview Medical Delta partners and facilities

#### *Specialization Leiden, Delft and Rotterdam*

Since MD consists out of the merging of three cities and their knowledge institutions they all have their own identity within the collaboration. The cluster initiative of Medical Delta is considered to be promising for the reason that the different involved cities’ specializations are complementary. Originally large pharmaceutical companies are located in Leiden. Examples are Johnson & Johnson and AstraZeneca, but there are also several smaller pharmaceutical companies located in Leiden (Baas, p.c., 2015). In Leiden different stakeholders have for over the past 10 years invested in the development of the Leiden bioscience park where now about 130 companies are established (Perik,

p.c., 2015; Goumans, p.c., 2015). Delft specializes in technology with the engineers trained and working at the Delft University of Technology. They focus for instance at minimally invasive instruments for surgery or medical imaging techniques (InnovationQuarter, 2015; Kamerling, p.c., 2015). The specialization of Rotterdam could be roughly described as providing substantial health care (Weggelaar, p.c., 2015).

*'Cluster stakeholders aim at turning the medical cluster of Rotterdam into an ICT-healthcare city. They've been working on that for a long time and still are and I think that there are chances for that specialization'*  
(A. Visser, p.c., 2015)

Though, Rotterdam has also a lot more to offer than that. For instance in relation to having access to (international) markets it is important to organize the important medical paperwork in the right way. Firstly, in producing new medicines it has to be proved that the medicine works and will only have acceptable side effects; the clinical trials. Secondly, in producing medical technology CE Marking is important. A CE mark indicates that the product is safe and there are several categories depended on how severe the device is that is launched on the market. In America this is called an FDA approval and the government does it. The first thing customers will do when considering buying medical products is investigating whether the safety marks are in order (InnovationQuarter, 2015; Kamerling, p.c., 2015).

In the region of Rotterdam a lot of expertise is located focuses on performing that kind of tests. In Europe companies who are being certified by the government do these tests. Often these companies collaborate with the hospitals. The whole infrastructure of performing those tests is present in the region of Medical Delta. Moreover, the CE marking in the Northern part of Europe, including the Netherlands is known for higher quality. Those elements together make the whole testing and validating of medical products something Rotterdam can internationally launch itself with at the international markets (InnovationQuarter, 2015; Kamerling, p.c., 2015).

As mentioned these specializations are complementary and interesting crossovers can emerge. For instance, the TU Delft has been working on tables in surgery rooms that are better for the health of the surgeons (Kamerling, p.c., 2015). Also in Delft the link to the Medical field has been made by the building of a 'proton clinic', that provides certain ways of radiation in the treatment of patients that suffer from cancer. There are only a few of these allowed to be built, so this is very specialized and they expect for about 2500 patients a year (Drijfhout, p.c., 2015).

### ***InnovationQuarter***

InnovationQuarter is a regional development agency for the province of South-Holland. Shareholders are the big cities in South-Holland, the local universities, the academic medical centres, the Province and the Ministry of Economic Affairs. They benefit from economic growth in the province of South-Holland (Schol, p.c., 2015). They fund innovative and fast growing companies, assisting foreign companies to settle in South Holland and organize cooperation between innovative entrepreneurs, knowledge institutes and the government. The division of Life Sciences & Health is one of the divisions of InnovationQuarter. Other divisions are for instance Clean Tech, Smart Industry and Safety and Security (Schol, p.c., 2015; Baas, p.c., 2015). The city of Rotterdam fulfills an important role, but InnovationQuarter is focusing on the area that Medical Delta covers, which means a larger area than just the city of Rotterdam.



In addressing foreign countries in respect of interest them for the region (acquisition) InnovationQuarter makes some choices. They look at strengths and want to respond on opportunities. They are outlined in so-called propositions, which are being used in the approach of foreign companies. InnovationQuarter for example attends conferences in among others the US and Asia, where they expect to meet companies with international ambitions. InnovationQuarter tries to interest them in the Netherlands as a kind of entrance to Europe. Next to the field of acquisition InnovationQuarter is also focused on business development. That department has the goal to align, businesses, knowledge institutions and what else is needed in consortia in order to achieve new innovation in the regional cluster of Medical Delta. Next to that there is the InnovationQuarter fund, consisting out of 58 million, which can be used to invest in start-ups that are at the frond step of participating in the market or to invest in already growing companies that need investments to grow further. In that way InnovationQuarter supports in funding initiatives. Though, 50% of the amount of funding needs to be private money (Baas, p.c., 2015, Schol, p.c., 2015; Kamerling, p.c., 2015)

### **Rotterdam Partners**

Rotterdam Partners is a publicly funded organization that is focused on the acquisition of foreign companies specifically for the city of Rotterdam (Oomens Meer, p.c., 2015; Veerkamp, p.c., 2015; van Rijn, p.c., 2015). Rotterdam Partners describes itself as the promoter of the economy of Rotterdam and is focused on attracting foreign companies and on guiding the larger internationally oriented firms in Rotterdam. Since the medical sector has a large share in the economy of Rotterdam, Rotterdam Partners also focuses medical related companies and activities. Rotterdam Partners does this while focusing on what companies are doing at the strategic level and on what trends and developments are going on in the sectors of companies that are being focused in relation to innovation (Oomens Meer, p.c., 2015; Veerkamp, p.c., 2015).

### **Municipality of Rotterdam**

The development of the medical cluster in Rotterdam has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Hereby, Rotterdam tries to anticipate on the idea of the medical care sector as a growing sector (Ernst & Young, 2011). More about the local activities and organization of the Municipality of Rotterdam is described in especially Chapter 6. The municipality of Rotterdam has encouraged the development the Rotterdam Science Tower (see also Figure 11); *'The Rotterdam Science Tower is a representative facility for organizations in the medical cluster and is an integral part of the Medical Delta. It is a multifunctional, multi company building; a mix of laboratory space, offices pace and facilities for medical education. The facility satisfies all national and international standards and requirements that apply to the establishment of laboratories, including ML-II,BSL-II and FDA. The tenant on the 20th floor has even been granted a ML-III permit.'* (Deloitte, 2014. P.6). Within the science tower there is a Lab Hotel, which offers researchers and companies readily available laboratory facilities for short or long periods of time. The laboratories are Microbiologic Laboratory class II (ML-II) ready and provided with all permits required (Deloitte, 2014. P.6).

Also located in the Rotterdam Science Tower is the Erasmus Centre of Entrepreneurship. Driven by the conviction that entrepreneurship is the primary condition for realizing progress, the Erasmus Centre for Entrepreneurship (ECE) offers a learning environment where companies can improve their entrepreneurial skills by gaining new insights and turning ideas into innovation. The ECE Campus is home to more than 50 innovative companies (of which around 3 or 4 are medical)

(Oomens Meer, p.c., 2015) and is the stage for many entrepreneurship events. Furthermore, they've built an infrastructure to foster ambitious entrepreneurship and empower a global community of 20.000 entrepreneurs who can solve worldwide challenges – creatively and effectively. It is an initiative of the Erasmus school of Economics and the Rotterdam school of Management of the Erasmus University' (ECE, 2015).

### **Medical institutions**

The city of Rotterdam has 11 hospitals in total, regional, specialized and academic of nature (Zorkaart Nederland, n.d.) and Rotterdam is connected to even more hospitals in the region (See for more details about the names and nature of the hospitals Appendix 5). In the centre of this group of hospitals is the Erasmus Medical Centre. The Erasmus Medical Centre is an academic hospital and the biggest academic centre of the Netherlands, one of the best academic hospitals in Europe and world's third ranked medical research centre according to the Times Higher Education rankings (All of the respondents, p.c., 2015; Deloitte, 2014). *'With almost 10.000 employees and 700 medical specialists, the Erasmus MC is also a significant employer in Rotterdam'* (Deloitte, 2014, p.3) The academic part of the Erasmus MC is part of the Erasmus University of Rotterdam. For a long time the Erasmus MC was the only MC that provided all of the academic medical specialization educations, but had to choose to focus on some specializations that the Erasmus MC has the most expertise of; highly specialized medical care (15 out of 20 respondents, p.c., 2015).

In producing new medicines it has to be proved that the medicine works and will only have acceptable side effects; the clinical trials and CE marking. In the region of Rotterdam a lot of expertise is located focuses on performing that kind of tests. In Europe companies who are being certified by the government do these tests. Often these companies collaborate with the hospitals. The whole infrastructure of performing those tests is present in the region of Medical Delta. Moreover, the CE marking in the Northern part of Europe, including the Netherlands is known for higher quality. Those elements together make the whole testing of medical products something Rotterdam can internationally launch itself with at the international markets (Kamerling, p.c., 2015).

The Erasmus MC is also known for the specialization in carrying out large-scale population studies on societal and medical topics. The success of these studies is partly owed to the fact that the population is very willing to participate in preventive research in the field of stomach / intestinal / liver diseases (Verweij, p.c., 2015; Veerkamp, p.c., 2015). Furthermore, the Erasmus Medical centre is also successfully carrying out national researches (Veerkamp, p.c., 2015). Other specializations of the Erasmus Medical Centre that are top of the bill worldwide are the following; the field of cancer research, the field of heart and vascular diseases, cardiology, radiology, genetic sequencing and the field of genetics in relation to aging. Those are the fields of the Erasmus MC that are known for its quality internationally (Verweij, p.c., 2015). But they are also developing on the field of personalized medicine and bio imaging (Westerlaken, p.c., 2015; van der Steen, p.c., 2015). To encourage research in these fields, Erasmus MC offers a number of high standard facilities:

- Medical library
- Proteomics centre
- Experimental medical instrumentation Erasmus optical imaging centre
- Erasmus mc stem cell institute
- Erasmus centre for bio medics
- Applied molecular imaging Erasmus MC
- International office (Deloitte, 2014; InnovationQuarter, 2015)

Also the Erasmus MC offers a skills lab; 'a unique medical-technical training centre where medical specialists, residents (OR, IC) and staff are trained in innovative skills. The courses are lectured by (medical) specialists worldwide and vary from basic laparoscopic and surgical skills to flexible endoscopy and nerve reconstructions.' (Deloitte, 2014, p.6). The Erasmus MC Incubator is located in the Rotterdam Science tower with about 5 spin-offs (Oomens Meer, p.c., 2015).

### ***Technology transfer office (TTO)***

The TTO of the Erasmus MC is involved in all innovations made by Erasmus MC researchers and clinicians; discoveries and new developments that can lead to, for example, new drugs and medicines, new ways to make health care more efficient the care, or new medical techniques. TTO assists in bringing these new developments available for society. TTO does this by defining the focus, protecting the innovation and by assisting in the negotiations with market participants (Drijfhout, p.c., 2015). Related to TTO is the Erasmus Incubator located at the Science Tower, where starting entrepreneurs and spinoffs (founded on Erasmus MC intellectual property) are guided in their developments in order to grow and develop their company and products further.

### ***University of Applied Sciences of Rotterdam***

Next to the Erasmus University and the Erasmus MC related to it another higher education institution in Rotterdam is the University of Applied Sciences of Rotterdam. They provide educational programs for nurses and a lot of paramedical specifications. Furthermore the University of Applied Sciences of Rotterdam also has knowledge centres such as the knowledge centre for health care innovation (Goumans, p.c., 2015). There they program, and execute the outcomes of researchers that have been carried out by the University of Applied Sciences of Rotterdam as well.

### ***Local businesses***

There are only 50 to 80 purely medical companies in Rotterdam of, depending on which crossover related companies are included (Perik, p.c., 2015). Health care involved it becomes a lot more (Oomens Meer, p.c., 2015). One of the biggest medical companies in Rotterdam is Viroclinics, one of the top businesses in the field of virology (all respondents) with around 80 employees. Other companies focus among others more and more on personalized medicine (Westerlaken, p.c., 2015), e-health, healthy aging, imaging minimal invasive instruments, med-tech and home automation (domotica) (InnovationQuarter, 2015; Oomens Meer, p.c., 2015). International renowned companies in the Rotterdam medical cluster include Viroclinics, Omega Pharma and Unilever. Furthermore, the presence of a strong life sciences, food and chemical cluster offers numerous opportunities for crossovers (Deloitte, 2014).

### ***VNO-NCW Regio Rotterdam***

VNO-NCW Regio Rotterdam is the regional network organization for entrepreneurs. Members are directors and majority-shareholders and board members of companies in the region. The organization believes creativity and synergy through cooperation, especially cooperation between members from different industries and lobbies for the interest of the regional corporations at the level of the Province of South-Holland and the level of the municipality of Rotterdam. VNO-NCW Rotterdam involves the city centre of Rotterdam and 17 smaller surrounding sub-municipalities.

Over the past couple of years the awareness about the importance of focusing on specific target groups from a specific sector in order to stimulate innovation in the production chains, by

linking people and making connections has grown. For that reason VNO-NCW has initiated also meetings based on a specific content, given shape by entrepreneurs from that sector itself. For the health care sector of Rotterdam this network initiative is called Zorgpower (See Appendix 8) (Bieringa, p.c., 2015).

According to the standards of concept C 'Strategic coupling' in Paragraph 2.4 the cluster should try to link up to global innovative networks expanding their localities in order to find both near and far learning partners to enhance the local cluster. An important aspect of strategic coupling is that the local cluster stakeholders know the local specialization and position in the global production network, which is called smart specialization (point C.1). Above the cluster stakeholders and their divergent medical fields of focus and specialization are described. The specialization of Rotterdam could be roughly described as providing substantial health care with links to ICT where the most of the activities are clustered in and around the Erasmus MC (Weggelaar, p.c., 2015; Kamerling, p.c., 2015; Perik, p.c., 2015; Verweij, p.c., 2015).

Though, Rotterdam has also a lot more to offer than that as it is active on all the upcoming challenges in medical fields described in Paragraph 4.2. It would do shortage to these other fields of expertise in Rotterdam to frame the medical sector or Rotterdam solely in one field. The medical cluster of Rotterdam does not seem to have a very clear specialization. Tessa Vreeken (p.c., 2015) of the municipality of Rotterdam argues that it is hard to describe the specialization of the medical cluster of Rotterdam for the reason that so much is happening in the medical field. This can be seen as an advantage, because the medical cluster Rotterdam has all kinds of things to offer and responds to many current international GPN challenges, though in respect of the theoretical standards regarding strategic coupling not all the stakeholders of the medical cluster of Rotterdam do know the local specialization and position of the medical cluster of Rotterdam in the medical GPN and therefore the medical cluster of Rotterdam does not have a real clear smart specialization. More about the remaining aspects of strategic coupling in the next chapter.

#### **4.4. Sub-conclusion**

This chapter focused on answering the first empirical sub-question; **What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?** The answers of the different parts of this sub-question have been discussed above under different paragraphs based on the theoretically derived hypotheses of the concept of strategic coupling under concept A, B and C.1 of the conceptual model (Figure 5). Here a summary of this answer will be provided.

Regarding international challenges in the GPN of the medical sector several trends and challenges that are significant for future cluster development can be distinguished. Especially the on-going aging population and the general increase of the world population strongly increase the demand of healthcare. This caused the emergence of the question how society can keep health care affordable while safeguarding the high quality of the health care that is provided because more and more solutions are being found for more and more illnesses and diseases. This is also boosted by the fact that also in the medical sector socio-economic and technical developments have had major consequences on the exchange of knowledge, skills and students on the (academic) medical field. Still the process of developing medicines is a lengthy and expensive one and the valley of death is a challenge for all medicine and medical product development. One way to collect funds in relation to

the increasing costs for healthcare it is more and more important and a challenge for researchers and research groups to find partners in the international network of researchers and other cooperating organizations and to work together in consortia. Furthermore, there are in particular increasing demands on e-health care services and smart technologies needed for frail elders with chronic diseases and also for those experiencing active aging'. Also, the ICT and technical sector are developing really fast and this has its impact on the medical sector in the form of crossovers. Also the medical sector is transforming into an ecosystem where the patient is a central element and personalized medicine and related medical niches are upcoming. Related to this not only the medical products and patient data travel internationally, also the patients travel towards the supply of good medical care and cure. Finally, at the local scale it is in the Netherlands a challenge to guide patients through the artificially created 'zorglijnen' and to make sure the patients gets the best health care at the right place.

Regarding the position of the medical cluster of Rotterdam in the GPN of the medical sector the development of the medical cluster in Rotterdam, which is a growing sector, has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Also the medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from the municipality of Rotterdam to the municipalities of Leiden and Delft. For that reason Medical Delta is for the medical cluster of Rotterdam an important cluster stakeholder. Other important cluster stakeholders are the local businesses, VNO-NCW, development and acquisition organizations Rotterdam Partners and InnovationQuarter, all hospitals and medical institutions in the region of Rotterdam. Especially the Erasmus academic hospital (Erasmus MC), with the Erasmus University as the mother university and the TTO connected to it plays a central role. Other educational institutes such as the University of Applied Sciences of Rotterdam are also involved in the medical cluster.

According to the theoretically derived issues regarding concept C 'Strategic coupling' of the conceptual framework in Paragraph 2.4 the cluster should try to link up to global innovative networks expanding their localities in order to find both near and far learning partners to enhance the local cluster. As point C.1 states an important aspect of strategic coupling is that the local cluster stakeholders know the local specialization and position in the global production network, which is called smart specialization. The medical cluster Rotterdam has all kinds of things to offer and responds to many current international GPN challenges, though in respect of point C.1 regarding the concept of strategic coupling not all the stakeholders of the medical cluster of Rotterdam do know the local specialization and position in the medical GPN, for the reason that there are so many medical fields of focus. So despite the fact that many actors in the medical cluster of Rotterdam do have acquired a position in the GPN of the health sector, the medical cluster of Rotterdam does not have a real clear smart specialization; something that could be seen as undesirable.

The next chapter will discuss the process of strategic coupling further in outlining the response of the medical cluster of Rotterdam to the trends and challenges described above.

## 5. RESPONDING TO GLOBAL CHALLENGES

*'For an economic cluster like the medical cluster of Rotterdam it is very important to know how to connect to international markets. Or more important, that the cluster stakeholders know how to do that, because a cluster can't make those connections by itself.'*  
(Kamerling, p.c., 2015)

### 5.1. Introduction

This chapter will focus on answering the second empirical sub-question; ***How are cluster challenges governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?*** The answers of the different parts of this sub-question are discussed. Paragraph 4.2 discusses the way in which local cluster activities that are a response to the international trends and challenges of the health sector are governed and organized. This question is particularly related to Paragraph 2.4 that describes the concept C of the conceptual framework; 'strategic coupling'. Paragraph 4.3 already elaborated on the first aspect of concept C strategic coupling about smart specialization. Therefore this chapter starts with the standards posed in point C.2 of the concept of strategic coupling. Finally, this chapter closes with a sub-conclusion answering the sub-question mentioned above.

### 5.2. Strategic coupling

#### 5.2.1. Positioning strategy

Based on the issues posed in point C.2 of the concept of strategic coupling a well-functioning strategic coupling process includes clear positioning strategy (figure 8). Here the positioning strategy of the medical cluster of Rotterdam is going to be outlined.

#### ***Acquisition***

As point C.2.i of the conceptual framework argues a clear positioning strategy consists out of profiling the cluster (and its smart specialization) by acquisition activities. In order to get local companies linked to international markets or to get the medical cluster of Rotterdam linked to international companies or health care institutes that might want to establish in a new place, acquisition is very important. (Veerkamp, p.c., 2015; Baas, p.c., 2015; Schol, p.c., 2015; Oomens Meer, p.c., 2015; Bieringa, p.c., 2015). For Rotterdam the institute of Rotterdam Partners, the local development agency, plays a very central role in this context. One of their main tasks is to tempt (foreign) companies to establish in Rotterdam or to make new partnerships (Oomens Meer, p.c., 2015). They actively try to link the local to the global by asking a lot of questions to local firms about their developments and needs. In that way they try to get an overview of which companies are working in which sub-sector within the medical sector and are eager to meet and do projects with international partners. Rotterdam Partners tries to make as many interesting matches as possible, while emphasizing the importance to be unique and innovative in their connections to the local firms.

Next to the local-global relations they also try to make matches on the local scale of the medical cluster of Rotterdam (more about the local cluster network in Paragraph 5.2). For the reason that Rotterdam Partners used to be part of the municipality and is now a semi-public organization, Rotterdam Partners has also very close ties with the municipality of Rotterdam and tries to support the medical program of the municipality in their activities, by knowing their problems and challenges and trying to meet those (Oomens Meer, p.c., 2015).

The institute of InnovationQuarter is participating in the same activities as Rotterdam Partners, but at the wider geographic level of the province of South-Holland. InnovationQuarter has a special division focusing on the health care and life sciences sector as well (Baas, p.c., 2015; Schol, p.c., 2015). InnovationQuarter also works together with The Netherlands Foreign Investment Agency (The NFIA) of the Ministry of Economic Affairs and has people installed on the Embassies and Consulates Worldwide, in countries where the Netherlands many trades with. So for example in the US there are 6 or 7 stations and where people constantly carry out acquisition for sectors that are important for the Netherlands. They then make contacts with those companies and also advocate the story of InnovationQuarter. Then the NFIA connects those companies to InnovationQuarter (Schol, p.c., 2015).

For the reason that InnovationQuarter has limited resources in assisting companies and for their acquisition activities, they every year choose a theme to focus on. For this year they have for instance chosen to focus on the theme non- and minimal invasive instruments. In that respect they are closely linked to the Medical Delta initiative where the UMC's and the TU Delft are working together in research projects in order to develop these minimal invasive instruments. Also in general there are many businesses focusing on this more and more and InnovationQuarter sees this as a unique specialty and a sub-sector of the medical sector. InnovationQuarter then makes, together with a consultancy agency, a strategic proposition on this theme, which also provides the internationally active players in this field on a hit list, and uses that in their acquisition activities by directly addressing those players (Schol, p.c., 2015).

The aim is to choose different themes based on the local specialization every year. InnovationQuarter hopes that that will contribute to a stronger specialization and branding internationally of the medical cluster of Rotterdam. Besides that InnovationQuarter also has close connections with Medical Delta in order to be close to the academic field, in order to be fully briefed about the current developments and local innovations. When the right people are brought together and a substantial product is going to be developed, InnovationQuarter can go work on a proposition to use internationally in their acquisition activities. For that reason the acquisition division of InnovationQuarter is very much focused on combining local strength with international challenges and opportunities (Schol, p.c., 2015). In this way the medical cluster of Rotterdam overcomes the pitfall of strategic coupling described in point C.4.v; Top down based acquisition rather than encouraging economic growth by stimulating bottom up entrepreneurial initiatives. And point C.4.vi; an exaggerated local focus is also overcome by this international focus of the medical cluster.

For the reason that InnovationQuarter and Rotterdam Partners are both focusing on the same kind of activities in a partly overlapping area it is important that the two tune their activities well. They both also work together with local firms, but on that field Rotterdam Partners is more focused on Rotterdam. Though, for the acquisition activities it is very important to work together (Oomens Meer, p.c., 2015);

*'In the field of acquisition activities there is a lot of cooperation in the region. It is actually not possible to look at the acquisition strategies separately'*  
(Oomens Meer, p.c., 2015)

An example of such collaboration between the two development agencies is the fact that they organized a start-up event together for 15 Dutch companies in the e-health sector. To show who is doing what and which connections could be made to be more competitive on the international market. And that is then where InnovationQuarter and Rotterdam Partners come to help with while dividing tasks in working together (Oomens Meer, p.c., 2015).

Also the municipality of Rotterdam is aware of the necessity to work together with these partners in order to attract foreign companies. The municipality cannot do this by itself and therefore needs close ties with these institutes that focus on acquisition (Perik, p.c., 2015). Ton van der Steen argues that there are still many steps to be taken on the level of acquisition for the reason that despite a good business climate, relatively few companies decide to establish in this region. A. Visser (p.c., 2015) agrees and suggests undertaking more trade missions initiated by the municipality, because this would be good for the entrepreneurial climate in Rotterdam, partnerships and the cluster as a whole.

Related to the challenges in the GPN of the health sector discussed in Paragraph 4.3 in order to respond to the upcoming international flow of patients and to also attract these patients to come for their treatments to Rotterdam there are several challenges. First of all it is important to internationally show what Rotterdam has to offer in relation to providing health care. In this respect Rotterdam Partners also engages in profiling the Erasmus MC for instance. Research outcomes are most often only published in trade press. The content of these publications often involve the nature of the clinical trials and sometimes R&D partnerships between scientists and large companies. Of course, the trade press is very interesting and important for scientists themselves, but it might be fruitful to also create stories accessible and understandable for a wider audience. This audience could be companies or possible (international) patients for instance. Rotterdam Partners is willing to play a role in translating the information from the medical trade press into accessible stories for the normal market and normal consumers. In that way a story can be created that can be used to more successfully brand the medical cluster or Rotterdam at particular themes (Oomens Meer, p.c., 2015). One of the steps that already have been taken in this context is the development of an English newsletter that Rotterdam Partners sends to Dutch embassies and consulates and also to Dutch companies that are established abroad in order to keep them also up to date with the developments in the Medical Cluster of Rotterdam. The aim is to be able to reach about a million people with these activities in the future (Oomens Meer, p.c., 2015). Next to that it is quite challenging to bargain with the health insurers, what they are going to insure and what not in relation to these international flow of patients. Once a patient is willing to travel to Rotterdam, but the health insurers are not willing to pay, then there has to be thought about a way to cover that issue. For instance by addressing and talking to different health insurers, but this can be very complicated (Verweij, p.c., 2015).

In order to respond to the challenge and trend of the upcoming international student flows the students itself are very useful to profile the educational services that Rotterdam has to offer. Rotterdam has to offer some master specializations that are considered to better than elsewhere or only available in Rotterdam (Verweij, p.c., 2015). Though, some medical centres abroad also offer some masters or PhD tracks that are not available in Rotterdam. Therefore the Erasmus MC works together with international governments or boards of universities. There are for instance about 40



Chinese students and also a couple of Indian students that follow a promotion project in Rotterdam and when finished go back to their homelands. This also has some advantages for the Erasmus MC for the reason that these students once they have returned to their countries are going to tell about the education they had in the Netherlands, in Rotterdam. In that way these students are able to profile Rotterdam in a positive way to some extent and contribute to the acquisition of new students. Moreover, to be connected to their home universities also provides the opportunity for researchers from Rotterdam to expand their academic network (Verweij, p.c., 2015). Also when it is known that the best students and workforce are in Rotterdam this will also attract new firms. Therefore Rotterdam also needs to be stimulating (foreign) study to study and finally stay in Rotterdam (Bieringa, p.c., 2015).

### **Consortia structures**

According to point C.2.ii a clear positioning strategy can be carried out in different structures such as in consortia or by individual acts. Here the carrying out of the cluster positioning strategy in consortia for the medical cluster of Rotterdam is discussed. Individual acts what consortia are made of, but more concrete individual action is outlined in paragraph 4.2.3.

A very important aspect of internationalization according to Roel Kamerling is funding. Often when companies want to extend their business internationally capital is needed e.g. to finance the up scaling for the reason that instead of one only serves the Dutch market, one suddenly has to serve new markets. Sometimes one also has to set up an office with sales and marketing. All of this requires funding and this might be quite challenging for smaller companies (Kamerling, p.c., 2015). In this context InnovationQuarter the development organization of the province of South of Holland provides those companies opportunities

Not only for businesses but also in the academic world competition increases. For Rotterdam and the Erasmus MC it is a big challenge to find enough money and flows of funds and grants that help to position the Erasmus MC (Verweij, p.c., 2015). Lots of studies are being carried out based on research funding. Though, the funding stream decreases. Therefore it is expected that scientists are forced to agree in partnerships with business, or in collaborations with other research groups to get together as many grants and resources as possible in order to do research. To collect funds it is more and more important and a challenge for researchers and research groups to find partners in international networks and to work together in order to reach results in the medical field (Westerlaken, p.c., 2015). This is for the reason that international funds often go to large consortia (Drijfhout, p.c., 2015).

The link to the level of Europe has been made by the participation in the KIC Health (consortia) (Pols, p.c., 2015; Veerkamp, p.c., 2015). The European institute for innovation and technology (EIT) organizes KIC's, which are European partnerships between knowledge institutions and businesses focused on addressing societal challenges. In order to foster a quick start in the first year of the partnerships the EIT provides a grant of 5 million Euros. EIT has several focus points and one of them is EIT Health. The winner of the EIT Health call is the consortium called 'Innolife'; a European consortium consisting out of more than 140 partners from business, research organizations and universities from the 14 EU member states (More about the EIT health and Innolife in Appendix 4). The goal EIT Health has set for itself is to create by 2018 90 new products a year, 70 new start-ups and to let 1 million students participate in online educational programs (European Institute of Technology, n.d.). The general goal of EIT Health is to diminish the fragmentation of the different health care systems in Europe, to provide companies access to European markets and to reduce the

time span that it takes to bring medical and health care products on the market (Goumans, p.c., 2015; Perik, p.c., 2015; Veerkamp, p.c., 2015; Pols, p.c., 2015).

The Netherlands are fairly well represented the Innolife consortium. For Rotterdam it is TNO and the Erasmus MC (For other participants see Appendix 4). Moreover, one of the 6 the EIT Health co-locations is (probably going to be) established in the city of Rotterdam (Veerkamp, p.c., 2015). The idea to participate was at the time coming from Huib Pols who was at the time the dean of the Erasmus Medical Centre and TNO. The initiative came from the Erasmus MC, which is part of Medical Delta and for the reason that it has been built up in that way it contributed to the strength of the Medical cluster of Rotterdam and Medical Delta (Veerkamp, p.c., 2015). In this respect, Ellen Perik considers especially the Erasmus MC, Medical Delta and firms like Siemens for instance as very important partners for the city of Rotterdam. According to Huib Pols (p.c., 2015) the knowledge exchange in this respect with other clusters participating in the EIT health such as the Karolinska Copenhagen, Imperial College of Oxford and the cluster around Paris the Pierre Marie University are important for the enhancement of the medical cluster of Rotterdam.

Another example where the Medical Cluster of Rotterdam is part of is the research program Horizon 2020. This is a European research program; there are all kinds of funds spent for specialized research purposes. There is a lot of money available, about 70,2 billion Euros for the next 6 or 7 years. 2,7 billion of this total amount of money is reserved for the EIT as described above. The program aims to simplify the European funding for research and innovation on the level of both the program structure and the rules of participation (European Institute of Technology, n.d.).

According to point C.2.i of the conceptual framework a clear positioning strategy consists out of profiling the cluster (and its smart specialization) by acquisition activities. The Medical cluster or Rotterdam is able to do this by a well-functioning collaboration between the acquisition agencies that overcome the pitfall of top-down oriented acquisition by incorporating the local specializations in the propositions and the pitfall of an exaggerated local focus. Though, for the reason that the smart specialization of the region is not that clear the profiling isn't clearly being carried out by all of the cluster stakeholders. On the other hand the medical cluster of Rotterdam and especially Medical Delta are aware of the importance of a clear profile and are successful in profiling the cluster. For instance in structures of consortia such as in respect of the EIT Health and Horizon 2020. Also the successful alignment in above-local consortia with all kind of (competitive) partners related to the medical sector the medical cluster or Rotterdam also overcomes pitfall C.4.ii; Considering externalities as competitions instead of valuable completions.

### **5.2.2. Cluster brand**

*'The strength of the medical cluster of Rotterdam is that it has to offer such a wide spectrum of medical and health care products and services, but at the same time this can be very difficult in branding and profiling the cluster'*  
(Baas, p.c., 2015)

According to point C.3 (Figure 8) which poses further theoretical the standards of strategic coupling cluster should determine its cluster brand that can be used to distinguish itself and which is carried

out by all of the cluster stakeholders and re-focusing or re-branding is possible. Therefore in relation to this case this paragraph will look into the cluster brand of the medical cluster of Rotterdam.

The city of Rotterdam has for a long time been branded with the main focus on the port of Rotterdam. The medical cluster as such has not been branded that extensively despite the fact that the sector has such a large share in the economy of Rotterdam (Deloitte, 2014; Goumans, p.c., 2015). However, the medical cluster of Rotterdam internationally is not that known. Though, when it is possible to successfully link in to the Medical Delta initiative (see Paragraph 4.2) the region is geographically and substantially representing something internationally. In the eyes of foreign investors the different cities of Rotterdam, Leiden and Delft are actually just one region (Weggelaar, p.c., 2015). Moreover, the main (research) activities in Rotterdam, Leiden and Delft are complementary and form for many people a logical whole (See Paragraph 4.2).

*'I always think in the terms of the Medical Delta Region. The medical cluster Rotterdam is not that internationally known. If we want to represent something internationally we should accept that we are part of a larger medical region' (..) 'I consider Medical Delta as a large promising stimulator of the positioning and branding of the region and therefore indirectly for the branding and positioning of the medical cluster of Rotterdam.'*  
(Perik, p.c., 2015)

Also in writing the positioning paper for the medical sector of Rotterdam not the medical cluster of Rotterdam is mentioned, but it is described as 'the region of Rotterdam' rather than the city of Rotterdam in order to not exclude the Medical Delta Partnership that is more comprehensible for international partners (Perik, p.c., 2015; Bieringa, p.c., 2015).

However, at some points it is not strategic to align all activities under the Medical Delta brand for the reason that some institutions have been able to create a strong brand by themselves. At the level of participating in the world of science, when spoken of the medical cluster of Rotterdam, this region is primarily known for the academic Erasmus Medical Centre. The Erasmus Medical centre is internationally exporting knowledge of high quality and in that way linking up to international production networks. For the reason that the Erasmus MC researches are of high quality, it bears fruit for the global brand awareness of the Erasmus MC. The extent to how familiar people/ or other scientists are with the Erasmus Medical Centre depends upon what research groups and specialisms the scientific output is about (Van den Bogaert, p.c., 2015).

In order to brand these specializations the Erasmus MC can advertise itself by putting these scientists or researches in the spotlights and in that way linking faces to certain divisions (Weggelaar, p.c., 2015). Also according to Jaap Verweij (p.c., 2015) the scientists should be and most often are the centre of attention and the recognizable face of projects. This is for the reason that their foreign relations are recognizing them. In the second place the Erasmus Medical Centre is the name that knows international fame instead of the 'Medical Cluster of Rotterdam'. For that reason researchers are put in the spotlights under the brand of the Erasmus Medical Centre.

In relation to the Medical Delta coalition a comparable 'spotlight' strategy is followed (Kamerling, p.c., 2015). The Medical Delta universities have appointed 11 'Medical Delta Professors' in 2014, which all have a double job position both in a medical environment as in a technical environment. They are for instance working at the TU of Delft and at the LUMC or at the TU Delft and the Erasmus MC. In that way, the Medical Delta coalition tries to connect its different partners and is strategically providing civic entrepreneurs (point D.4.xi of the conceptual framework) more space to

carry out and communicate their strategic knowledge regarding the medical cluster. This contributes to point C.4 of the conceptual framework of strategic coupling. Moreover, these professors are open to new ideas and are also willing to carry these out as is already demonstrated by the fact they are anxious to have this double position and fuel long-term cooperation in between the two research groups. Thus Medical Delta's cluster ambassadors are created (Kamerling, p.c., 2015; Weggelaar, p.c., 2015).

Jaap Verweij (p.c., 2015) argues that in order to properly brand a medical cluster people are needed that have knowledge about how to brand and can link that knowledge to the medical activities, that these people need to understand to some extent. Rotterdam Partners is willing to play a role in translating the information from the medical trade press into accessible stories for the normal market and normal consumers. In that way a story can be created that can be used to more successfully brand the medical cluster or Rotterdam at particular themes (Oomens Meer, p.c., 2015).

Regarding the branding activities of the Medical Cluster of Rotterdam and Medical Delta there are some challenges when it's put in the perspective of the standards posed in point C.3 the conceptual framework. It is possible to build a strong brand name, for instance 'Medical Delta', but that is only going to work when the cluster stakeholders feel connected to that brand. For the larger organizations such as the Erasmus MC it would not be contributively to break down this strong brand they've built in order to align it under the name of MD. People will not feel connected to that and be afraid to lose their identity. And when MD brand is going to be too dominant it will maybe be at the cost of the identity of the Maastad hospital or the Fransiscus guesthouse for instance (van der Steen, p.c., 2015; Westerlaken, p.c., 2015). That will lead to pitfall C.5.v of Empty cluster branding of and that is something that the medical cluster Rotterdam is very sensitive for. Therefore for Rotterdam it is a challenge to build up a strong regional brand, this means connecting to the Medical Delta brand, while respecting the identity of the local players that are part of the medical cluster Rotterdam such as the Erasmus MC.

### **5.2.3. Using the right people in the right network(s)**

Based on point C.4 of the concept of strategic coupling of the conceptual framework that emphasizes the importance of the acting of people as each others' ambassador in international networks of scientists, firms and other existing networks by using civic entrepreneurs' strategic intelligence and contributing to the shared cluster identity in order to be able to quickly find both far and near learning partners, here the situation regarding point C.4 for the medical cluster of Rotterdam is outlined.

In order to connect local clusters to GPN networks of the medical sector it is important to actively search for new connections yourself as cluster stakeholders, but also to make use of existing networks in an intelligent way. Professionals realize that when they work together more can be achieved. When linking into international networks and markets a local cluster has accesses to people that are again active in other international networks. Through those connections it will be possible to learn more from other medical clusters. For instance how things are done in the medical clusters in Switzerland, in Sweden and other Anglo-Saxon countries, because they are according to Anton Westerlaken doing better and in that way in some ways inspiring for Rotterdam (Westerlaken, p.c., 2015). For these reasons it is important to link the local to the global. Medical Delta considers it also as its role to provide these networks (Kamerling, p.c., 2015).

*'In order to international challenges in the health sector and to connect to global production networks Rotterdam Partners, InnovationQuarter and Medical Delta play a big role. Next to that existing networks of scientists and of firms are being made use of'* (Vreeken, p.c., 2015).

### **Network of scientists and doctors**

As posed in the part of challenges for the health care sector (Paragraph 3.3). Academic medical centres have the task to do research. Clinical trials are naturally linked to patients. The development is that hospitals have to take larger samples to safeguard the validity and reliability of the research. Therefore this research linked to the medical centres needs to steer upon international cooperation in order to share data. This is especially useful for investigating rare diseases, because the locally collected data is far but enough to do valid research with (Verweij, p.c., 2015; Drijfhout, p.c., 2015; van den Bogaert, p.c., 2015; Weggelaar, p.c., 2015).

Medical academic centres are in relation to regional hospitals generally better connected to international networks because they are linked to research groups to share large amounts of data to do good research (Westerlaken, p.c., 2015) and therefore create their own connections and networks (Drijfhout, p.c., 2015). *'For research academics linked to the Erasmus MC find their own buddies in the world. They have their own network and as an academic hospital we try to coordinate that in a modest way in the sense that it is more practical to work only with 300 hospitals rather than 300.000.'* (Verweij, p.c., 2015).

Not only the Erasmus Medical Centre, which is linked to the university, has international connections. Also the Rijndam Revalidation Centre has links with research groups in for instance Toronto. Challenges here are to expand these networks (in order to) and to qualify for grants and subsidies and to divide the scarce resources in these networks. This can be done in two ways; firstly to maintain good network relations and secondly by producing output of high quality (van den Bogaert, p.c., 2015).

These network connections are for instance found and maintained by the scientists from Rotterdam that contribute to international congresses, presenting their research findings (Kamerling, p.c., 2015). These presentations can contain the output arising from public-private partnerships in which a Rotterdam based firm and a research group cooperated. At the same time the specific product of that company is than being promoted and made attractive through the network of the scientists and potential clients, e.g. doctors. Also these scientists often know each other very well for the reason that they always see and talk to the same people at these congresses (Kamerling, p.c., 2015).

Ton van der Steen (p.c., 2015) recognized the challenge for local firms to market their products internationally and considers it as an opportunity to be able to make use of the scientist's networks. Furthermore, he also argues that on the other hand firms can also do (part of the) studies that need to be carried out. In that way academics support these firms. For example, in Rotterdam there is the company of Cardialysis that participates in studies for devices in cardiology. These could be supported more by academics from different specializations by being linked to their networks to be able to execute a better marketing for their products and services (van der Steen, p.c., 2015). In this respect especially academics of the Medical Cluster of Rotterdam act as each others' and as firms' ambassadors in international networks according to point C.4 of the conceptual framework. And by letting the individual scientists do what they think is good for the medical cluster the medical

cluster of Rotterdam is providing space for civic entrepreneurs and their strategic intelligence, which these academics might be and have, such as the Medical Delta professors.

### ***Network of firms***

As mentioned, making use of existing networks is one way to connect to GPNs. In that respect large (multinational) companies already create and are linked into international networks, for instance companies like Philips and Siemens (Kamerling, p.c., 2015; van Rijn, p.c., 2015). For that reason it is interesting for smaller companies to have a good relationship with larger companies in order to benefit from their international networks. On the other hand smaller firms are more flexible; a small business is often much more innovative and faster in the further development of a product than a large company that often cannot implement changes that quickly. For that reason larger companies and smaller firms often initiate joint ventures for instance (Kamerling, p.c., 2015).

And according to Pieter van Rijn 'in order to build a well-functioning cluster, it is very desirable for a cluster to have a couple of big industrial players' and that is something that Rotterdam lacks to some extent. Also Ton van der Steen argues that there are in this respect some steps to be taken. The cluster around the city of Eindhoven; the Katharina hospitals and the higher education institutes are closely linked to Philips that has also linked itself to the TU Delft in order to focus on innovation in health care in relation to business activities. That is something that Rotterdam lacks (Goumans, p.c., 2015).

For that reason Medical Delta tries to improve that situation and tries to connect as many (small) companies as possible to international networks of other firms. This is done by organizing and facilitating network meetings or the organization of projects where larger and smaller companies can meet and get to know each other (Kamerling, p.c., 2015). For that reason it is important for Rotterdam to be connected to the Medical Delta collaboration (Goumans, p.c., 2015).

Furthermore, at the level of the Province of South-Holland InnovationQuarter is trying to link into international networks of firms. For example they are now running a project in the Hospital of Den Haag with a doctor there that works together with an American company that provides part of the (new) technology central for that project. In that way the region is connected to these international companies that have already some projects in the region, but are not yet established here. Though, also these projects can create employment and therefore need to be encouraged. Moreover, based on that relation the opportunity is created to initiate new projects through the network of that, in this example American, relation (Schol, p.c., 2015; Baas, p.c., 2015). In this respect there is the opportunity in the medical cluster of Rotterdam for businesses to make use of each others international networks. Though, it cannot be said that (representatives of) firms are acting as each others' ambassadors in international networks when we compare the situation or Rotterdam with the standards outlined in point C.4 of the conceptual framework. But with medical Delta as an intermediary in making the connections in this potential networks at least opportunities can be created.

### **5.3. Sub-conclusion**

This chapter focused on answering the second empirical sub-question; ***How are cluster challenges governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?*** The answers of the different parts of this sub-question have been discussed above

under different paragraphs based on the theoretical standards regarding concept C of the conceptual model; strategic coupling. Here a summary of this answer will be provided.

Regarding a clear positioning strategy (point C.2) the medical cluster of Rotterdam is able to contribute to this by a well-functioning collaboration between the acquisition agencies that overcome the pitfall of top-down oriented acquisition by incorporating the local specializations of firms in the propositions and also overcome the pitfall of an exaggerated local focus by their international orientation. Though, for the reason that the smart specialization of the region is not that clear, the positioning strategy isn't clearly being carried out by all of the cluster stakeholders. On the other hand the medical cluster of Rotterdam and especially Medical Delta are aware of the importance of a clear positioning strategy and are successful in profiling the cluster in both the structures of consortia such as in respect of the EIT health and Horizon 2020 and by individual acts such as in the case of promoting academic output and educational facilities by academics and students. Also the successful alignment in above-local consortia with all kind of (competitive) partners related to the medical sector the medical cluster of Rotterdam also overcomes pitfall C.5.ii; considering externalities as competitions instead of valuable completions.

For the matter of cluster branding activities of the Medical Cluster of Rotterdam and Medical Delta there are some challenges when it's put in the perspective of the standards of point C.3 of the conceptual framework. It is possible to build a strong brand name, for instance 'Medical Delta', but that is only going to work when the cluster stakeholders feel connected to that brand, which is not the case for all involved parties. For the larger organizations such as the Erasmus MC it would not be contributive to break down this strong brand they've built in order to align it under the name of MD. People will not feel connected to that and be afraid to lose their identity. That will lead to pitfall C.5.v (Figure 5) of empty cluster branding and that is something that the medical cluster Rotterdam is very sensitive for.

Especially academics of the Medical Cluster of Rotterdam act as each others' and as firms' ambassadors in international networks in accordance to point C.4 of the conceptual framework. And by letting the individual scientists do what they think is good for the medical cluster the medical cluster of Rotterdam is providing space for civic entrepreneurs and their strategic intelligence, which these academics might be and have, such as the Medical Delta professors. Regarding the international networks of firms there is the opportunity in the medical cluster of Rotterdam for businesses to make use of each-others international networks. Though, it cannot be said that (representatives of) firms are acting as each others' ambassadors in international networks when we compare the situation of Rotterdam with the theoretical standards in point C.4. Firms are especially not using the strategic intelligence of civic entrepreneurs in international networks. Here steps are to be made. Though, with medical Delta as an intermediary in making the connections in these potential networks at least opportunities can be created.

The next chapter will zoom in more locally and exploring the local cluster governance network and the role of the members that are part of that.

## 6. THE LOCAL CLUSTER GOVERNANCE NETWORK

### 6.1. Introduction

This chapter will focus on answering the final empirical sub-question; ***What is the local role and response of key players and leaders within the cluster governance network in view of current challenges in the medical cluster of Rotterdam?*** The answers of the different parts of this sub-question are discussed below under different paragraphs and will sketch the local cluster governance network. Paragraph 6.2 first discusses the way in which local cluster stakeholders collaborate in the network of knowledge allocation and sharing (based on point D.2-3 of the conceptual framework) in respect of clustering initiatives and exchanging codified and tacit knowledge flows (point E.1 of the conceptual model). Subsequently, Paragraph 6.3 sketches the mentioned opportunities and challenges for local collaboration between cluster stakeholders in relation to leadership, strategic intelligence and strategic collaboration in respect of improving the local cluster governance network (based on point D.3.i and D.4 of the conceptual model about the role of the government and civic entrepreneurs). Finally, this chapter closes with a sub-conclusion answering the sub-question mentioned above. The empirical results will in this chapter put in perspective of concepts D and E of the conceptual model outlined in Paragraph 2.4.

### 6.2. Collaboration initiatives exchanging tacit knowledge

*'I actually think that the collaboration between cluster stakeholders here in Rotterdam runs quite well (..) in general there is much and good collaboration. As I just said; 'Rotterdamers zijn doe-ers' (Weggelaar, p.c., 2015)*

#### 6.2.1. Collaboration between the medical institutions

Rotterdam has relatively many hospitals per square kilometer and according to van den Bogaert (p.c., 2015) that leads to a situation where *'competition and cooperation always go along together'*. The medical institutions of the medical cluster of Rotterdam have been introduced in Chapter 4 and are explained in more detail in Appendix 5. According to Verweij (p.c., 2015) the collaboration between the Erasmus MC and the regional hospitals can be quite difficult, because *'Hospitals have simply said just a task assignment, which they should complete and are just like firms; each others' competitors (..) that is actually an odd situation, but it is all about talking and negotiating with each other. So all the people who are involved, board members, academic scientists, medical specialists, the University of Applied Sciences and business in the region join that conversation'*. In respect of cluster collaboration between these institutions several interesting initiatives take place in Rotterdam.

The specialized hospitals are more or less loose independent units and get patients that are being referred by the other regional hospitals in the region for specialized care. The specialized hospitals also have connections to related national organizations; *'In that way we try to make collaboration agreements with similar institutions that are regionally connected. Or we at least try to make connections in some way.'* (Anonymous, p.c., 2015). The Erasmus MC, the academic hospital, is literally and figuratively speaking the centre in the hospitals in Rotterdam and has connections to all parties of health care providers in the region (van den Bogaert, p.c., 2015). Moreover, the Erasmus MC also is the centre of medical institutions, because it has the strongest focus on the wider



geographical perspective related to sub-regional, national, regarding the Top Clinical Hospitals foundation for instance (Westerlaken, p.c., 2015), and international connections (Chapter 5).

Regarding collaboration initiatives involving also the regional hospitals there are several initiatives that try to respond to the local challenge in the medical field described in Chapter 4 about the question how to guide patients in a better way through the 'health care chain'. In this context cluster stakeholders in the medical cluster of Rotterdam have initiated the SRZ foundation; the partnership between the ten hospitals in the Rijnmond Region with the goal to 'improve the quality of the healthcare in the region regarding institutional transcending matters and everything related to this' (Stichting SRZ, n.d.; van den Bogaert, p.c., 2015). More about the SRZ in respect of members and projects see Appendix 5.

Next to that there is the 'Beter Keten' initiative that is especially founded to respond to the challenge mentioned above. According to Huib Pols (p.c., 2015) this initiative is inspired by the cluster theory of Porter and several representatives of the involved institutes where send to Harvard and spoke to Porter about his ideas, followed classes and how to implement this in the health care chain of Rotterdam. Though, by doing this properly choices have to be made regarding more specialization and task division and this can sometimes be quite challenging regarding legislation prohibiting to much collaboration that would limit patients freedom of choice of healthcare providers (Westerlaken, p.c. 2015). Still the hospitals in the region of Rotterdam try to work more and more together also regarding exchanging medical staff what contributes to the quality and efficiency of health care provision. The hospitals at the southern part of the cluster work together quite intensively (See appendix 5) and are performing institutional entrepreneurship in overcoming institutional barriers as point D.5 of the conceptual framework described. These initiatives are primarily focused on the exchange of codified and tacit knowledge as described in point E.1 of the conceptual framework in Paragraph 2.4.

### **6.2.2. Collaboration between medical and knowledge institutions**

In the collaboration between medical and knowledge institutions the Erasmus MC plays a central role, for the reason that it fulfills tasks both as an educational institution and as a health care provider and is therefore involved in a number of initiatives and activities. Related to that at a more local level, several hospitals around the Erasmus MC are joined in the OOR. That is the 'onderwijs en opleidings regio' where 18 hospitals in Southwest region of the Netherlands collaborate (Verweij, p.c., 2015). According to Anton Westerlaken (p.c., 2015) connecting through educational and training programs is one of the most sustainable ways of connecting and laying out a sustainable network where people know each other and know where to find each other. The corporation of the hospitals in the Southern part of Rotterdam does respect that notion and is trying to align the several separate training facilities, internships, co-assistant vacancies and capacities of the regional hospitals under one control while involving the university, the Universities of Applied Sciences and the ROC's. Marleen Goumans (p.c., 2015) emphasized the importance of the educational programs teaching content that is in accordance with the reality in the healthcare institutions.

In respect of connecting knowledge to practice there is the academic education program 'Beleid en management gezondheidzorg' at the Erasmus University. This is not a medical education as such, but is focusing more on the policy aspects of the healthcare sector. This expansion of connections between knowledge institutions and medical institutions can be seen as something positive according to Oomens Meer (p.c., 2015). Though, it should be expanded even more. This related to issues that many of the respondents indicate; the connection between researchers and

scientists and what is needed to reach the market and this is not yet happening as it could or should be in the medical cluster of Rotterdam. Oomens Meer (p.c., 2015) suggests that educational programs of the EUR or University of Applied Sciences of Rotterdam focusing on entrepreneurship, marketing and business should also be linked to medical institutions. In that way new research outcomes might be easier linked to spin-offs in the future (Oomens Meer, p.c., 2015; Perik, p.c., 2015).

Linking research outcomes to practice is also encouraged by the valorization program of the TTO of the Erasmus MC (Drijfhout, p.c., 2015) (see Paragraph 4.3). More about the projects of the TTO in Appendix 6 and 8. These initiatives are primarily focused on the exchange of codified and tacit knowledge (point E.1 of conceptual framework). Though, some links between the different education programs are negatively influenced by institutional barriers (point D.5 of the conceptual framework), which are also related to the general labour market issues the municipality of Rotterdam has to deal with (Weggelaar, p.c., 2015; Goumans, p.c., 2015) (see Appendix 7). As far as could be identified with this research, institutional entrepreneurship (point E.5 operationalization) regarding the overcoming institutional barriers in the collaboration involving educational institutes could be pushed further in the medical cluster of Rotterdam.

### **6.2.3. Network events**

Cluster stakeholders emphasize the necessity to make connections between different entrepreneurs and institutes. There are so many small companies and start-ups in the region of Rotterdam that are all coming up with beautiful and interesting ideas, but they do not know about the thought process and activities of other related companies and medical institutes in the region (Bieringa, p.c., 2015; Oomens Meer, p.c., 2015). In that sense not every cluster actor is naturally 'embedded' in the network of knowledge sharing by frequently visiting each other in respect the standards posed in point E.iii of the conceptual framework. A cluster needs both entrepreneurs and scientists to do what they're good at; commercialize knowledge and products on the one hand and doing research on the other hand (A. Visser, p.c., 2015; Baas, p.c., 2015; van den Bogaert, p.c., 2015, Kamerling, p.c., 2015; Drijfhout, p.c., 2015). Therefore it is important to not to distract them from doing that while emphasizing that they have to be aware of what is happening around them. This for the reason that it is important that they are aware they are part of a larger whole and who else are part of that in order to create opportunities for them to respond to chances and challenges of cooperation.

*'There are many professors who work on promising projects, but they aren't good at bringing those to the market. Therefore a good and close connection with good entrepreneurs, which are present in the region, is needed'*

(Oomens Meer, p.c., 2015)

According to the majority of the respondents (p.c., 2015) making those connections is the task of intermediary institutes such as InnovationQuarter, Rotterdam Partners, The TTO with their valorization program, the Municipality of Rotterdam, Medical Delta or VNO-NCW Rotterdam as the following quotes underline;

*'The visual and physical encounter between those entrepreneurs is very important and there is always an organization or individual needed who facilitates these encounters'*

(Goumans, p.c., 2015)

*‘Development and innovation depend upon individuals and people with ideas and ambition, but also upon the people that facilitate a supportive context for these ambitious people’*  
(van den Bogaert, p.c., 2015)

*‘So the health care provider and the entrepreneur need to be guided to make sure the implementation will succeed’*  
(Perik, p.c., 2015)

VNO-NCW for instance organized as an intermediary the ‘Zorgpower’ network initiative. Other intermediaries are also trying to work together with VNO-NCW and both initiate similar network events (Bieringa, p.c., 2015). Medical Delta has for instance initiated the ‘Medical Delta Science Café’s’ and the University of Applied Sciences of Rotterdam has developed the ‘innovation square’ (Kamerling, p.c., 2015; Goumans, p.c., 2015). For details about these events see Appendix 8. The municipality is also contributing to the network by organizing and supporting several initiatives such as the Internet platform for health care institutes and entrepreneurs ‘Zorgportaal Rijnmond’ (A.Visser, p.c., 2015, Weggelaar, p.c., 2015). One of the examples that’s quite successful and well known in the Medical cluster of Rotterdam is the network event ‘Zorgontbijt’ to support innovation (all of the respondents, p.c., 2015). Another initiative is the ‘Health Innovation Challenge’ where the municipality of Rotterdam works together with the ECE of the Erasmus University, which is located in the Science Tower. Also the municipality asked the cooperation of VNO-NCW in this trajectory to link it to their ‘Zorgpower’ initiative (Bieringa, p.c., 2015; Vreeken, p.c., 2015). Together with Rotterdam Partners and InnovationQuarter the municipality also organizes sector meetings, where players from the field were asked to come and tell about the activities that go on in the field in order to create more visibility (Oomens Meer, p.c., 2015). For more information and details of these last three network initiatives see Appendix 9.

The knowledge exchange that is the consequence of these network events is primarily codified and tacit knowledge of the medical sector sometimes linked with entrepreneurial insights. However, the knowledge that the intermediaries have by knowing that the network events will contribute to the overall strength of the medical cluster and knowing how to contribute to that falls under the category of strategic intelligent knowledge flows. Point E.2a of the conceptual framework about ‘what is being governed’ in Paragraph 2.4 describes these initiatives as a response to the question ‘what are the strategic (policy) actions that start the cluster engine to run?’. More about the role of strategic intelligence carriers in the cluster governance network will be addressed in the next paragraph.

### **6.3. Leadership and strategic intelligence**

#### **6.3.1. The role of the government**

A condition for a well-functioning cluster governance structure is that the clusters stakeholders work together in order to properly respond to internal and external opportunities and challenges. This should be done by a facilitating government aiming at policy leverage (D.3.i of the conceptual framework). Within the economic department of the municipality of Rotterdam several sectors of focus have been chosen for the city of Rotterdam, partly because of the fact the municipality had to economize. One field of focus is the ‘Medical and Healthcare’ cluster. This section has a program

manager, account manager and three project managers, who are all supported by a secretary and assistants. (Perik, p.c., 2015; Veerkamp, p.c., 2015; Vreeken, p.c., 2015). With the help of this organizational structure the municipality of Rotterdam tries to overlook what is happening in the cluster as a whole and of course has the goal to increase the (economic) strength of the cluster in a facilitating way. There is also very much interaction with other divisions of the municipality in case matters are related to the medical cluster or concern crossovers. In that way the municipality tries to live up to notion of horizontal coordination (point E.3.i.1a) with the aim that all government officials need to be aware of the clustering notion during their daily practices. Though, whether this is also entirely true for all government officials remains questionable.

According to Vreeken (p.c., 2015) the municipality of Rotterdam should respond to the questions from the local business community and medical institutions and encourage them to develop by aligning the spatial planning in accordance to the stimulation of economic growth of the health cluster, providing support in the appliance of the right permits and licenses for cluster players, provide useful information and by linking cluster stakeholders to each other as an intermediary (van Rijn, p.c., 2015; Drijfhout, p.c. 2015). This is in accordance with the theoretical standards posed in point D.3.i.2 of the conceptual framework regarding the requested role of the government in cluster governance. Furthermore, the motto of the municipality is that it does not need to interfere too much with the market. The investments in the Rotterdam Science Tower are an exception to this (see more about this in Paragraph 4.3.2 and Appendix 9). Despite the many linkages the municipality has in the network, which causes the municipality to be in a central position of in the network (see Appendix 9), the municipality is not considered to be a leading or dominant player in the medical cluster of Rotterdam, but she is trying to play a facilitating role. This is both the expectation from other cluster stakeholders and the internal objective of the municipality itself (18 out of 20 respondents, p.c., 2015). By having this attitude the municipality of Rotterdam successfully overcomes the pitfall of governmental activism as point D.3.i.1 conceptual framework emphasizes as important;

*'The municipality of Rotterdam is not responsible for the cluster network, she is part of the network, but does contribute to the strength of the network in a facilitating way'*  
(Perik, p.c., 2015).

In order to fulfill its role properly the municipality of Rotterdam has hired an agency that educated the account managers of the municipality, who are responsible for the contact with the actors in the field, the proper way to 'network' and how to actively connect the right cluster players with each other. Also the account managers of the different divisions of the municipality, so not only the account manager of the medical cluster, visit all sort of network events in order to connect to the wider perspective of what Rotterdam has to offer. Doing this while looking at interesting players who could be linked to other players in respect of the enhancement of the clusters the account managers represent (Veerkamp, p.c., 2015).

Regarding the international aspect of cluster governance the municipality also acknowledges her facilitating role both as the responsibility to encourage the development of the cluster. Therefore, the municipality has close relations with the executive (semi-public) institutions in this field such as InnovationQuarter and Rotterdam Partners. Once every 6 weeks the program managers of the municipality and of the MD meet with representatives of InnovationQuarter to talk about the strategy and focus of their acquisition activities. The municipality brings up local issues and then a strategy is discussed on how to address these issues and who is going to do that (Baas, p.c., 2015).

Regarding the Medical Delta cooperation (primarily driven by (semi-) public institutions) in the collaboration between the province, the three municipalities (Leiden, Delft and Rotterdam) and universities of these cities it is important to frequently meet to discuss the focus and strategy of the Medical Delta as a cluster. This involves a lot of tuning and consulting (Kamerling, p.c., 2015). *'It is important to agree about the goals and focus, because if all players involved do want different things the cluster in its totality is a weak whole'* (Perik, p.c., 2015). Therefore, the key players need to constantly deliberate and communicate about the larger objective while still every municipality can have its own local application and remain their own identity and specialization (Perik, p.c., 2015). This contributes to the exchange of strategic knowledge about the medical cluster of Rotterdam in accordance with point E.2 of the conceptual framework and to the notion of vertical coordination (point D.3.i.1b). This in the sense that the cluster facilitation crosses the borders of jurisdictions in the sense of clustering in the sense of tuning local, regional and national policy actions whereby crossovers are embraced. Especially the Medical Delta initiative is a great example of an intermediary institute that carries out this vertical coordination;

*'An intermediary is needed to make the connection between the health care institutes, the municipalities and business. For that the MD is a great instrument, because representatives of all are aligned in that organization'* (Verweij, p.c., 2015)

According to point D.3.i.1c of the conceptual framework in Paragraph 2.4 a final standard for the role of the government in cluster governance is that there is 'political coordination'. This means that in respect of the idea that cluster facilitation is a long-term affair and there should be focused upon political coordination that safeguards, stable, predicable and political leadership and commitment. In this respect the municipality of Rotterdam is lacking. The program manager is visiting board members of other substantial institutions within the medical cluster on the level of working on a common strategy. This function has due to circumstances been fulfilled by multiple people in a limited period of time. This variety of representatives who might have had a different approach on things, is described by other cluster stakeholders (some would like to remain anonymous on this) as a destabilizing effect on the cluster governance network for the reason that he or she has to get to know all of the players in the field all over again. This also counts for the town counselor or Rotterdam that focuses on the medical sector; *'Well before you really know him he is already gone again, because new elections came up. That is complicated'* (Verweij, p.c., 2015). This does not contribute to the visibility and stability of the network in terms of political coordination.

An explanation of this destabilizing effect is to be found in the notion that, the right persons and people and building trust are very important in the cluster governance network. More about this will be explained in the next paragraphs.

### **6.3.2. Distributed leadership and civic entrepreneurs**

Within the cluster network there is not a sole dominant player or leader. Though, the large institutions such as the Erasmus MC are prominent players in Rotterdam for the reason that it has such mass in relation to the number of people that work there and the number of patients that are being treated there. Furthermore, Erasmus MC collaborates with a lot of other medical institutions of the region (Drijfhout, p.c., 2015; Verweij, p.c., 2015). Also *'Medical Delta is a big player in the network. Next to that there are no central key players with a dominant leadership position in the medical cluster of Rotterdam. Though, the Erasmus MC is of course a big employer, hence its central position, at least for the medical cluster Rotterdam'* (Vreeken, p.c., 2015). As mentioned, the

municipality of Rotterdam is once again linked to MD and does have a co-influence on the MD strategy (see previous paragraphs). The higher (geographical) level of MD as a cluster corporation is needed to provide a large framework to make the network more visible, to be able to connect players in the field but also to create an (internationally) recognizable image (Kamerling, p.c., 2015) (See Chapter 5); *'There is not one sole party that governs the policy of the medical cluster and that is also what makes it complicated. The overall governance is a matter of constantly consulting each other and tuning the strategies'* (Schol, p.c., 2015)

Regarding cluster governance it is, concerning making the right connections and contributing to a common vision, important to support the notion of distributive leadership and civic entrepreneurs (point C.4 of the conceptual framework). Many cluster stakeholders share this vision; *'people who are willing and able to look and act across the borders of the organization they are at first connected to. Than these people must be brought together to exchange ideas'* (Bieringa, p.c., 2015). *'Therefore are needed people who can think in an innovative way, do understand something about the field of medical and healthcare both as understand the way of thinking of entrepreneurs and thereby understanding the system'* (Weggelaar, p.c., 2015). *'I think in terms of people instead of firms. Of course I am aware of the fact that people work for a firm that I am interested in, but still I start with the people, because an organization exists out of people and these people need to manage to find each other'* (Goumans, p.c., 2015). *'The crucial people with the right ideas are most often not in strategic positions but are the people down at the operational level'* (de Jager, p.c., 2015).

Medical Delta has for instance assigned 11 'Medical Delta professors' in 2014, which all have a double job position both in a medical environment as in a technical environment. They are for instance working at the TU of Delft and at the LUMC or at the TU Delft and the Erasmus MC or at the trade union of mathematics and physics of Leiden and the Erasmus MC. In that way, the Medical Delta coalition tries to connect its different partners. And the collaboration between the academic medical centres runs smooth, also for the reason of distance and task division between them (Verweij, p.c., 2015). Moreover, these professors are open to new ideas and are also willing to carry these out as is already demonstrated by the fact they are anxious to have this double job position and fuel long-term cooperation in between the two research groups. (Kamerling, p.c., 2015; Weggelaar, p.c., 2015). In that way Medical Delta's cluster ambassadors as civic entrepreneurs are created in accordance with point D.4.ii of the conceptual framework, because these people work on the cluster every day, are not bounded by institutional barriers are nominated in a bottom up way. Also in this way they are stimulated to carry out all the power sources civic entrepreneurs can use. By having insight in the need of giving space to civic entrepreneurs the Medical Delta initiative shows that it possesses strategic intelligence regarding cluster governance of the Medical Cluster.

Next to the MD ambassadors room for other civic entrepreneurs is tried to be provided in general. As the quotes below indicate in a well-functioning cluster governance system that stimulates civic entrepreneurs, room must be created for bottom-up initiatives that are also well guided by strategic structures (Westerlaken, p.c., 2015).

*'At some network events and meetings there are primarily board members and at others many people from practice visit, but we both need them to come to a functioning whole in the end'*  
(Goumans, p.c., 2015)

*'All of the institutes we have organized are bottom-up initiatives and have also been developed in that way. If it would only be top-town coordinated it wouldn't work I think.'*  
(Kamerling, MD, p.c., 2015)

Also Pols (p.c., 2015) supports this notion by stating the following; *‘An overall cluster vision with a broad character is needed for the reason that there must be ‘scharrelruimte’ for people from practice to carry it out in their own way that they are happy to carry out. If there are too many standards partnerships should live up to, no sustainable collaboration will be come about. Grant the people that are connected at the bottom of the organizations their ‘scharrelruimte’ in order to let them flourish their creativity otherwise the cluster will miss opportunities’*. According to the theoretical standards posed in point D.4 of the conceptual framework, not only the governmental representatives fulfill a leading role, but cluster leaders can be found both on the individual level and on the organizational cluster actor level, both formally appointed and informally developed and within centralized or decentralized structures, regardless the nature of the cluster stakeholder organization. In this context distributed leadership leads to a strong cluster governance structure and the medical cluster of Rotterdam and especially Medical Delta is providing the context for such a system.

According to van der Steen (p.c., 2015) this might be one of the reasons that the Medical Delta as a cluster organization works that well, because it is that easy for people from practice to talk to the people at the level of the directors counsel at the more strategic level. In that way the climate for an institutional learning process is provided in accordance of point E.2.d of the conceptual framework. Though, a top-town structure is to some extent needed in order to align a common vision and basic structures. One of the important aspects in that respect are supportive city councils of Rotterdam (Leiden and Delft) according to Anton Westerlaken (p.c., 2015), but that might sometimes be quite challenging regarding creating one strategy for the wider geographical cluster of Medical Delta in respect of overcoming institutional boundaries that hinder the development of a shared cluster identity. A challenge of the institutional learning and reaching strategic intelligence is to make actors with different agendas, cultures, motives, interests and obligations to work together, something MD faces as well.

### **6.3.3. Challenges regarding institutional learning**

A challenge of the institutional learning and reaching strategic knowledge is that it is quite difficult to make actors with different agendas, cultures, motives, interests and obligations to work together (point E.2.e of the conceptual framework) and this is also very much the case for the Medical Cluster of Rotterdam regarding the Medical Delta cooperation.

#### ***A shared cluster identity?***

In order to keep all cluster stakeholders attached to projects that contribute to the long term strategy is important to make sure there is something to gain by the individual participants and a common interests that binds them (Bieringa, p.c., 2015). InnovationQuarter has for instance invested in two e-health related companies who finally ended up at the bioscience park in Leiden. The municipality of Rotterdam is aware of the fact that, for their individual interest it would have been more interesting in case the companies where located in Rotterdam. Though, it does contribute to the overall cluster of Medical Delta, which is also important for Rotterdam. In that respect one also has to allow and support such things, by setting one’s own interest aside for some matters, in order to contribute to the overall common interest; to contribute to the development of the medical cluster also in the wider region (Perik, p.c., 2015).

In the Medical Delta the overall goal and identity is clear at the level of representatives of the involved institutes. Still, according to some respondents the different agenda setting of the three municipalities in the MD collaboration can on the other hand also be considered as an institutional

barrier preventing the cluster to be a consistent whole. The knowledge cluster in Eindhoven is a more consistent whole for the reason that they only have to deal with one regional government, while the incentives in the region of MD are driven by a different portfolio of each city with contradictory interests (Anonymous, p.c., 2015). Also for the reason that MD is at the level of the province of South-Holland, the city of The Hague also wants to join despite the lack of a real medical focus. For that reason the whole organization of MD faces some complications (argued by 5 respondents). Consequently, regarding institutional entrepreneurship some steps have to be made (point D.5 of conceptual framework). However, there are also respondents that contradict this idea and defend the notion that the different focus points of the involved MD municipalities also have common elements (Verweij, p.c., 2015). All the same, there needs to be a balance between the common interest and the individual interest in all cluster collaborations on all scales in the medical cluster of Rotterdam (Kamerling, p.c., 2015).

Though, sometimes it is hard for cluster stakeholders to focus on the common interest and long-term cluster strategy, because of for instance internal (financial) problems. In that case granting other cluster stakeholders projects or patients might be challenging; *'The core of the effectiveness of cluster governance are involved people both at the strategic and operational level who constantly balance out the tension between the common and individual interests and protect the common interest if needed'* (Westerlaken, p.c., 2015). *'True cluster collaboration can only come about if people acknowledge the fact that they should not only peruse their own interests but to keep in mind the common interest of the medical cluster as a whole'* (A. Visser, p.c., 2015).

It is important to commonly try to put a *'recognizable dot at the horizon'* to which everybody works towards. A commercial enterprise will in its journey to reach this common goal, walk down the path differently than an educational institution and that should be respected as long as people are aiming at the same objective (F. Visser, p.c., 2015).

Though, living up to the theoretical standards posed in point E.2.e.i of the conceptual framework regarding a shared cluster identity can still be quite a challenge for the medical cluster of Rotterdam for several reasons. First, as described in the previous part, the network is not very visible for many businesses for instance; *'It is absolutely not clear which parties are all part of the medical cluster Rotterdam, some of them do not even know it about themselves, that is really a point of improvement'* (Bieringa, p.c., 2015). Cluster members do not really know about the whole, let's stand contributing to it or being 'embedded' in the cluster network, as Point E.2.e.ii requires. Second, in times of crisis and financial challenges a lot of medical institutions, especially the regional hospitals, are in the 'survival mode'. Paying staff and bills then is priority and the overarching cluster strategy comes last. *'A change of attitude is needed, a cultural change (...) The hard thing is, in cluster governance you need intelligent people, but a lot of intelligent people are individualistic, still you need them'* (Verweij, p.c., 2015).

*'The common interest is out there, but before you know it all the cluster actors are organizing their own party and the same things are being organized alongside each other and can be more efficient.'*  
(Bieringa, p.c., 2015)

*'Progress has been made, but progress is not being made in a week or in a month. Progress is being made in terms of 6 months or years and asks time.'* (Anonymous, p.c., 2015)



### ***The importance of personal proximity***

In this whole cluster governance system and in all of the collaborations involved all of the 20 respondents emphasize and value the importance of a trusting relationship; *‘Collaboration is granting people something, is believing in each other and is undertaking actions together and making an effort’* (van den Bogaert, p.c., 2015). The cluster stakeholders in that way truly live up to the standard posed in point E.2.e.ii of the conceptual framework. The informal aspect is very important. It is very good to meet each other face to face in real life (de Jager, p.c., 2015). When parties are going to work together, which is a central element of cluster governance, trust is very important. Though, in order to create trust people need to get to know each other, which takes time (Perik, p.c., 2015; Kamerling, p.c., 2015; Veerkamp, p.c., 2015p, A. Visser, p.c., 2015; van der Steen, p.c., 2015). Therefore a cluster governance system needs time to develop and grow;

*‘Preferably partners like each other, but it is not necessary because even conflict situations can sometimes bring about great things. Though, these might not be sustainable partnerships in the long term’* (Anonymous, p.c., 2015)

*‘Beautiful things can develop in places where scientists and entrepreneurs meet, but they need to trust each other in order to exchange knowledge and information. For that reason innovation takes place there where people trust each other’* (Baas, p.c., 2015)

Also in matching entrepreneurs with scientists the TTO pays very much attention to the aspect of trust; *‘When there is no match regarding trust we could advise not to commit to the partnership’* (Drijfhout, p.c., 2015). Moreover, collaborating and working to reach the same objective also enhances trust. To invest in trustful relationships in the cluster network is important. Also at times when people do not fully stand behind the actions of their partners, for the long term strategy of the medical cluster it is important to maintain and support trustful relationship (Perik, p.c., 2015). Therefore, it is also very undesirable that there is so much variation in the representatives of the municipality, because a trustful relationship has to be built up all over repeatedly; *‘The likability factor? That is without doubt very important. In the medical sector one can truly dislike each other, but still be having a common interest. Still, when people see each other more often and come to like each other then they are more willing to support one another’* (Drijfhout, p.c., 2015)

## **6.4. Sub-conclusion**

This chapter focused on answering the third empirical sub-question; ***What is the local role and response of key players and leaders within the local cluster governance network in view of current challenges in the medical cluster of Rotterdam?*** The answers of the different parts of this sub-question have been discussed above under different paragraphs based on the theoretical standards regarding concepts D and E of the conceptual model regarding cluster governance concerning who is governing and what is being governed. Here a summary of this answer is provided.

Regarding collaborating initiatives involving the medical institutions in Rotterdam they work together on several projects in an attempt to overcome the challenge of properly guiding the patients true the health care chain and on overcoming institutional barriers between the medical institutions to work more efficient and effective. In the collaboration between medical and

knowledge institutions the Erasmus MC plays a central role and is therefore involved in several initiatives and activities regarding collaboration between different involved institutes that focus on bridging the gap between theory and practice. The collaborations above are primarily focused on the exchange of codified and tacit knowledge (point E.1 of the conceptual framework). Though, as far as could be identified with this research institutional entrepreneurship (point E.5 of the conceptual framework) regarding the overcoming existing institutional barriers (point D.5 of the conceptual framework) between different education programs could be pushed further.

When looked at the network as a whole, that also comprises actors such as business, not every cluster actor is naturally 'embedded' in the network of knowledge sharing by frequently visiting each other as of point E.iii of the conceptual framework actually argues to be needed. Therefore intermediary institutes such as InnovationQuarter, Rotterdam Partners, The TTO, the Municipality of Rotterdam, Medical Delta and VNO-NCW Rotterdam try to make more connections by facilitating several network events and projects. The knowledge exchange that is the consequence of these network events is primarily codified and tacit knowledge of the medical sector sometimes linked with entrepreneurial insights. Though, the knowledge that the intermediaries have by knowing that the network events will contribute to the overall strength of the medical cluster falls under the category of strategic intelligent knowledge flows that response to the question 'what are the strategic (policy) actions that start the cluster engine to run?' (point E.2a of the conceptual framework).

Within the cluster network there is not a real dominant player or sole leader. The municipality of Rotterdam lives up to the required role of the government in cluster governance described as 'facilitating' and overcomes the pitfall of governmental activism. In this respect she is trying to work towards horizontal coordination, manages to reach vertical coordination with the involvement in MD, but lacks political coordination (point D.3.i of the conceptual framework) due to the frequent variation in governmental representatives, which is very undesirable especially with regard to the valued role of trust and personal proximity in cluster governance. MD as an overarching cluster organization is also a very present cluster stakeholder and intermediary and does, both as all other cluster stakeholders, value the notion of distributed leadership. Especially in Rotterdam it is a common culture that people at the strategic level are relatively easily accessible for people from the work floor and value these people's ideas that might contribute to the strength of the medical cluster. Hereby opportunities are provided for civic entrepreneurs, the MD professors for instance, in accordance with the theoretical standards posed in point D.4.ii of the conceptual framework. This for the reason that they are not bounded by institutional barriers; the MD professors for instance work for different organizations in different job positions. And finally they are not only nominated by a top-down strategy. In this way civic entrepreneurs in the medical cluster of Rotterdam are provided a context where they are able to carry out all the power sources civic entrepreneurs can use. By acknowledging this the MD initiative shows that it possesses strategic intelligence regarding cluster governance of the Medical Cluster and in that way the climate for an institutional learning process is provided in accordance of point E.2.d of the conceptual framework.

A challenge of the institutional learning and reaching strategic intelligence is to make actors with different agendas, cultures, motives, interests and obligations to work together, something MD faces as well with the involvement of different municipalities and a wide range other stakeholders. Therefore, regarding institutional entrepreneurship some steps have to be made (point D.5 of the conceptual framework) and living up to the theoretical standards described by point E.2.e.i of the conceptual framework regarding a shared cluster identity can still be quite a challenge for the medical cluster of Rotterdam because right now cluster stakeholders do not share this one identity.

The intermediaries of the medical cluster should pay attention to making cluster stakeholders aware of the common interests and cluster identity in order to let them intrinsically carry out this identity and contribute to medical cluster as a whole.

This was the final empirical chapter and will be followed by the conclusion of this master thesis.

## 7. CONCLUSION

### 7.1. Introduction

This research examined how and by whom the medical cluster of Rotterdam is organized and governed in response to main cluster dilemmas and challenges on the global and local level. Following from the research framework the general goal of this thesis was to gain in-depth insight into how and by whom knowledge processes and cluster initiatives are organized and governed within the medical cluster in Rotterdam also in relation to how the cluster specializes itself within the worldwide knowledge dynamics of the health sector, in order to contribute to theory about cluster governance and to provide useful information that key players in the cluster might use for their cluster governance structure. Chapter 4, 5 and 6 showed the results of the empirical research that has been carried out in order to gather relevant data. How this data has been gathered has been outlined in Paragraph 2.4 and in Chapter 3 that provides the methodological framework. This final chapter starts with the conclusions that could be drawn from the research outcomes in answering the sub-questions. Finally, recommendations for praxis and a reflection on the research are the closing elements of this master thesis.

### 7.2. Research questions answered

Dear reader, here you reached the point where this whole research worked towards; the answer to the main question ***‘How and by whom are knowledge processes and clustering initiatives in the medical cluster of Rotterdam organized and governed in response to main cluster dilemmas and challenges on the global and local level?’*** is going to be provided.

Derived sub-questions from the main question are the three sub-questions below. Related relevant theoretical concepts that constituted the conceptual framework central in this thesis are the concepts of ‘Economic clusters’, ‘Global production networks’, which practically determine the research object. The concept ‘Strategic coupling’ explains the, for a good cluster governance system required, relation between the previous two concepts. And finally the ‘Cluster governance’ concept consisting out of ‘What is being governed’ and ‘Who is governing’ in cluster governance. Together these concepts and the relations between them determine ‘The nature of the cluster governance system’ and are reflected on in answering the sub-questions below.

Within the economic geographical academic debate the concept of clusters has been elaborated on extensively. Much theory has already been built on the notion of clustering concepts and their advantages (Asheim, Cooke, & Martin, 2006), which has led to the widespread interest in the topic of policy makers. All of the widespread known cluster advantages, that are easy to mention and recognize, but much harder to create, are only reflected in practice in a well-functioning cluster where all of the mentioned stakeholders work together to collectively respond to opportunities and treats. Authors that wrote about the topic of cluster governance argue that ‘cluster governance’ requires a co-production of a variety of cluster stakeholders (Cooke, 2002; Wolfe and Creutzberg, 2003; Lyall, 2007). This is however a challenging task involving different actors that have different and sometimes conflicting, aims and perspectives. Academically it was important to reflect on the development of the right form of cluster governance and co-production in existing clusters. This thesis therefore strived to develop further on these concepts of clusters in relation to cluster governance and the organization of cluster initiatives and knowledge flows and hereby aims to

deepen the related theories. Next to that it also wants to inform entrepreneurs, policy makers and other key figures in clusters about what measures they could take in order to enhance the organization of knowledge flows and innovation in the cluster. Furthermore, the involved organizations, firms and other key players might benefit from this thesis because the outcomes might help strengthen those organizations in the cluster in achieving the goal of being more innovative. Also more insight into the organizational structures in the cluster could help to recognize efficient and inefficient leadership and knowledge networks. The outcomes are discussed in what follows next.

The sub-questions below are derived from the main question above and the answers to the sub-questions together form the answer to the main question central in this master thesis. These answers together determine of *'The nature of the cluster governance system'*.

***Sub-question 1: What is the current position of the Rotterdam medical cluster in the global production network (GPN) of the health sector and which key GPN challenges are significant for future development?***

Regarding international challenges in the GPN of the medical sector several trends and challenges that are significant for future cluster development can be distinguished. Especially the on-going aging population and the general increase of the world population strongly increase the demand of healthcare. This caused the emergence of the question how society can keep health care affordable while safeguarding the high quality of the health care that is provided because more and more solutions are being found for more and more illnesses and diseases. This is also boosted by the fact that in the medical sector as well socio-economic and technical developments have had major consequences on the exchange of knowledge, skills and students in the (academic) medical field. Moreover, the process of developing medicines is a lengthy and expensive one and the valley of death is a challenge for all medicine and medical product development. In relation to the increasing costs for healthcare it is more and more important and a challenge for researchers and research groups to find partners in the international network of researchers and other cooperating organizations and to work together in consortia. However, this is one important way to collect funds. Furthermore, there are in particular increasing demands on e-health care services and smart technologies needed for frail elders with chronic diseases and also for those experiencing active aging' and the ICT and technical sector are developing really fast. This has its impact on the medical sector in the form of crossovers. Also the medical sector is transforming into an ecosystem where the patient is a central element and personalized medicine and related medical niches are upcoming. Related to this not only the medical products and patient data travel internationally, but also the patients travel towards the supply of good medical care and cure. Finally, at the local scale it is in the Netherlands a challenge to guide patients through the artificially created 'zorglijnen' and to make sure the patients gets the best health care at the right place.

Regarding the position of the medical cluster of Rotterdam in the GPN of the medical sector the development of the medical cluster in Rotterdam, which is a growing sector, has been and still is one of the main focus points/spearheads of the spatial-economic policies of the municipality of Rotterdam. Also the medical cluster in Rotterdam is part of a larger regional network called 'Medical Delta' stretching from the municipality of Rotterdam to the municipalities of Leiden and Delft. Therefore, Medical Delta is an important cluster stakeholder for the medical cluster of Rotterdam. Other important cluster stakeholders are the local businesses, VNO-NCW Regio Rotterdam,

development and acquisition organizations Rotterdam Partners and InnovationQuarter and all hospitals and medical institutions in the region of Rotterdam. Especially the Erasmus academic hospital (Erasmus MC), with the Erasmus University as the mother university and the TTO connected to it plays a central role. Other educational institutes such as the University of Applied Sciences of Rotterdam are also involved in the medical cluster.

According to the theoretically derived issues regarding the concept of 'Strategic coupling' of the conceptual framework a cluster should try to link up to global innovative networks expanding their localities in order to find both near and far learning partners to enhance the local cluster. An important aspect of strategic coupling is that the local cluster stakeholders know the local specialization and position in the global production network, which is called smart specialization. The medical cluster Rotterdam has all kinds of medical products and services to offer and responds to many current international GPN trends and challenges, though not all the stakeholders of the medical cluster of Rotterdam know its' local specialization and position in the medical GPN, for the reason that there are so many medical fields of focus. So despite the fact that many actors in the medical cluster of Rotterdam do have acquired a position in the GPN of the health sector the medical cluster of Rotterdam does not have a real clear smart specialization; something that could be seen as undesirable.

***Sub-question 2: How are local cluster activities governed and organized in the medical cluster of Rotterdam in response to current GPN challenges?***

The medical cluster of Rotterdam is able to contribute to the, according to theory required, clear positioning strategy by a well-functioning collaboration between the local acquisition agencies Rotterdam Partners and InnovationQuarter. They overcome the pitfall of top-down oriented acquisition by incorporating the local specializations of firms in the propositions and also overcome the pitfall of an exaggerated local focus by their international orientation. Though, for the reason that the smart specialization of the region is not that clear the positioning isn't clearly being carried out by all of the cluster stakeholders. On the other hand the medical cluster of Rotterdam and especially Medical Delta are aware of the importance of a clear positioning strategy and are successful in profiling the cluster in both the structures of consortia such as in respect of the EIT health and Horizon 2020 and by individual acts such as in the case of promoting academic output and educational facilities by academics and students. Also the successful alignment in above-local consortia with all kind of (competitive) partners related to the medical sector the medical cluster of Rotterdam helps overcome the pitfall of considering externalities as competitions instead of valuable completions.

Regarding cluster-branding activities of the medical cluster of Rotterdam and Medical Delta there are some challenges to point out. It is possible to build a strong brand name, for instance 'Medical Delta', but that is only going to work when the cluster stakeholders feel connected to that brand, which is not the case for all involved parties in the medical cluster of Rotterdam. For the larger organizations such as the Erasmus MC it would not be contributively to break down this strong brand they've built in order to align it under the name of MD. People will not feel connected to that and be afraid to lose their identity. That will lead to pitfall of empty cluster branding and that is something that the medical cluster Rotterdam is very sensitive for.

Especially academics in the medical cluster of Rotterdam act as each others' and as firms' ambassadors in international networks in accordance to the theoretical standards for good cluster governance. By letting the individual scientists do what they think is good for the medical cluster the

medical cluster of Rotterdam is providing space for civic entrepreneurs and their strategic intelligence, which these academics might be and have, such as the Medical Delta professors for instance. Regarding the international networks of firms there is the opportunity for businesses to make use of each-others international networks. Unfortunately, it cannot be said that (representatives of) firms are acting as each others' ambassadors in international networks when we compare the situation of Rotterdam with the theoretical standards regarding this matter. Representatives of firms are especially not using the strategic intelligence of civic entrepreneurs in international networks. Here steps are to be made, because (international) networks of local firms do exist already, but they are not fully exploited for the good of the medical cluster of Rotterdam and its international position yet. Though, with medical Delta as an intermediary aiming at making the connections in these potential networks at least opportunities are out there.

***Sub-question 3: What is the role and response of key players and leaders within the cluster governance network in view of the current challenges in the medical cluster of Rotterdam?***

Concerning collaborating initiatives involving the medical institutions in Rotterdam these institutions work together on several projects. This in an attempt to overcome the challenge of properly guiding the patients through the health care chain and to overcome institutional barriers between the medical institutions in order to work more efficient and effective. In the collaboration between medical and knowledge institutions the Erasmus MC plays a central role and is therefore involved in many initiatives and activities regarding collaboration between different involved institutes that focus on bridging the gap between theory and practice. The collaborations above are primarily focused on the exchange of codified and tacit knowledge. Though, as far as could be identified with this research institutional entrepreneurship regarding the overcoming existing institutional barriers between different education programs could be pushed further.

When looked at the cluster governance network as a whole, that also comprises actors such as business, not every cluster actor is naturally 'embedded' in the network of knowledge sharing by frequently visiting each other as the theoretical standards argue to be needed. Therefore intermediary institutes such as InnovationQuarter, Rotterdam Partners, the TTO, the Municipality of Rotterdam, Medical Delta and VNO-NCW Regio Rotterdam try to make more connections in the cluster governance network by facilitating numerous network events and projects. The knowledge exchange that is the consequence of these network events is primarily codified and tacit knowledge of the medical sector, sometimes linked with entrepreneurial insights. Though, the knowledge that these intermediaries have by knowing that the network events will contribute to the overall strength of the medical cluster falls under the category of strategic intelligent knowledge flows that response to the question 'what are the strategic (policy) actions that start the cluster engine to run?' In this respect these intermediaries are important carriers of strategic knowledge and also try to exchange these ideas with each other.

Within the cluster network there is not a real dominant player or sole leader. The municipality of Rotterdam lives up to the required role of the government in cluster governance described as 'facilitating' and overcomes the pitfall of governmental activism. In this respect she is trying to work towards horizontal coordination, manages to reach vertical coordination with the involvement in MD, but lacks political coordination due to the frequent variation in governmental representatives, which is very undesirable especially with regard to the valued role of trust and personal proximity in cluster governance. MD as an overarching cluster organization is also a very present cluster stakeholder and intermediary and does, both as all other cluster stakeholders, value

the notion of distributed leadership. Especially in Rotterdam it is a common culture that people at the strategic level are relatively easily accessible for people from the work floor and value these people's ideas that might contribute to the strength of the medical cluster. Hereby opportunities are provided for civic entrepreneurs, the MD professors for instance, in accordance with the theoretical standards. This for the reason that they are not bounded by institutional barriers; the MD professors for instance work for different organizations in different positions. They thereby are able to make connections between these organizations, gather an overview of the medical cluster and where its strengths and weaknesses are to be found and how to address them. And finally they are not only nominated by a top-down strategy. In this way civic entrepreneurs in the medical cluster of Rotterdam are provided a context where they are able to carry out all the power sources civic entrepreneurs can use. By acknowledging this especially the MD initiative shows that it possesses strategic intelligence regarding cluster governance of the medical cluster and in that way the climate for a institutional learning process is provided in accordance to the theoretical standards regarding cluster governance.

A challenge of the institutional learning and reaching strategic intelligence is to make actors with different agendas, cultures, motives, interests and obligations to work together. A challenge MD faces as well with the involvement of different municipalities, its' varying representatives and a wide range of other stakeholders. Therefore, regarding institutional entrepreneurship some steps have to be made and living up to the theoretical standards. On the subject of the need for a shared cluster identity this can still be quite a challenge for the medical cluster of Rotterdam because right now cluster stakeholders do absolutely not share this one identity (yet). The intermediaries of the medical cluster should pay attention to making cluster stakeholders aware of the common interests and cluster identity in order to let them intrinsically carry out this identity and contribute to medical cluster as a whole. Something the intermediaries of the medical cluster of Rotterdam aim at doing but are not reaching results in yet. Not all of the strategic intelligence regarding this matter is spread and put to practice.

### **7.3. Recommendations and reflection**

#### ***Recommendations for further research and praxis***

Hopefully this thesis about cluster governance has inspired the reader. However, the concept of cluster governance is far but complete and here the concept has only been applied to one case study; the medical cluster of Rotterdam. Some general lessons can be drawn from the case study while other elements might only be applicable to this specific case. The research outcomes outlined above about cluster governance might be for Rotterdam a quite different story when looked at a different cluster case as for instance the petro gene cluster in the harbor of Rotterdam or when is looked at the medical cluster of Leiden, which has a strong bio-medical specialization. Still, the importance of the right people and civic entrepreneurs in the cluster governance system is something that could be generalized in respect of theories of cluster governance systems and the same goes for the required facilitating role of the government, because in this case that turned out to be important aspects and the respondents viewed these aspects as not specific for the medical cluster. Though, the latter has a political aspect to take into account as well of course for the reason that it concerns questions about how the government should behave itself.



Also the importance of increasing the visibility of a cluster network can be generalized for the reason that it would contribute to all clusters, because cluster stakeholders can then work more efficient, get the opportunity to engage in networks of sharing both tacit and strategic intelligence knowledge flows and can find both near and far learning partners more easily. However, the respect for bottom-up initiatives, distributed leadership and civic entrepreneurs must not be overestimated, as the theory sometimes tends to do. This for the reason that for this case study it turned out also to be important to have some guiding structure and the right balance between strategic organization and bottom-up initiatives in order to make all the cluster stakeholders aware to be part of the overarching cluster and the common interests, because this cluster was relatively shredded and knows many different cluster actors.

By carrying out this research new questions have popped-up and other questions remain partly unanswered. For this case, the question about the specialization of Rotterdam (part of sub-question 1) was hard to answer, because there are so many strengths in the medical cluster of Rotterdam that it is hard to point out the clear specialization of the cluster. For that reason further research could focus on that and try to bring the cluster members of those sub-sectors together. Also, some respondents pointed out that institutional barriers are a hindering factor for instance between the knowledge institutions both on the local and on the global level and the different administrations aligned in the MD. Further research, could focus on how to overcome these in order to solve overcome local cluster challenges and to reach true institutional entrepreneurship. Moreover, the importance of civic entrepreneurs has been strongly emphasized and acknowledged in the medical cluster of Rotterdam, though they might not always be spotted or rewarded as such. Further research could focus on strategies on how to easier spot the intrinsically motivated civic entrepreneurs and give them more space to use that motivation in order to stimulate the cluster development of the medical cluster. Further research should also focus on how to spread a common cluster identity, which is now for instance not present in the medical cluster of Rotterdam, that all cluster stakeholders can identify with and carry out. That would contribute to theory about cluster governance. Finally, further research could focus on how to properly guide the process of frequent variation of cluster stakeholder representatives (often of the government), which seems to have quite an impact on the strength of the network for the reason that the persons and their personality seemed to be very important. This in relation to the time it takes to build up a strong network is quite challenging.

This thesis aimed at informing the cluster stakeholders about their cluster governance structure. Hopefully, this research made the cluster stakeholders think about their role and activities within the cluster in a different way. The importance of the balance between top-down approaches, individual and common interests and the importance of trust and personal proximity that followed from this research might, when fully applied, lead to alternative ways to follow for the cluster stakeholders. Though, in Rotterdam many cluster stakeholders and especially MD is aware of these notions. Still, the visibility of the cluster network is not so good and my recommendation is that the intermediaries, that all try to make the connections that are not being made in the network, come together more often and talk about their activities, because many initiatives happen alongside each other which is not efficient and leading to a coherent whole. Also the cluster stakeholders should try to assign representatives that remain in their position for a longer period of time in order to establish a stable and trustable position in the cluster governance network. In addition, intermediaries should make cluster members aware of the fact that they are part of a larger whole and should show the

cluster members what benefits there are if they would commit to that larger whole, while respecting the own identities of all cluster members; a challenging task.

Furthermore, the medical cluster of Rotterdam does not have a clear (medical) theme of focus, it rather offers a wide range of medical products and services. This can of course also be seen as strength, though it makes it hard to brand internationally. Perhaps, more choices have to be made about which specializations the cluster of Rotterdam should focus on or at least should put in the spotlights. InnovationQuarter already does this by choosing a medical theme of focus a year and other cluster stakeholders could follow this example. Naturally, while doing this in good strategic collaboration with stakeholders participating in comparable activities. Furthermore, regarding the network events it is quite promising that there are that many initiatives, which are also visited by enthusiastic participants. Though, these events are in most cases consuming free time of the participants for the reason that they do this next to their regular work-related obligations. In that respect it is important that not too many meetings are organized and that the themes vary in content. Otherwise there is the risk that the potential partners that could be matched feel overwhelmed and unhook. This also demands frequent consultation from and between the initiators. What's more is that it became clear that it is very challenging and both promising to link academics to entrepreneurs. Cluster stakeholders in the medical cluster of Rotterdam are already aware of this, but should go on spreading awareness about this and trying to guide these matchmakings with great care and with regard of personal connections.

From the process of writing this thesis I learned a lot. One of the most important things I learned was that things will never go exactly as planned in advance, but that that is not necessarily a bad thing when you respond to it in a flexible way it can even provide interesting opportunities. Despite the pursuit of perfection this thesis is also characterized by some shortcomings. For instance the question on what specialization the cluster of Rotterdam has is not that sharply answered, partly for the reason that the cluster has such a wide perspective. Still this could have been more sharply put. In collecting the data, it was quite challenging to seem to find the right respondents at the start, because I was still trying to find the right focus of the research. Though, by the 'snow-balling' effect I believe I managed to speak to the right persons. This was confirmed to me in the end when the final respondents started referring to other important cluster stakeholders I should talk to, which I already interviewed. Still, only 20 respondents have been interviewed and this could have been expanded to a 100 or even more respondents to increase both the validity and liability of this thesis. Unfortunately not the time and the resources were available to carry this out.

Also for the reason that the main question is rather broad, many initiatives are now described and the research could have been more focused perhaps. The qualitative method that has been chosen for this research is the best way to find answers on the questions put in this research. Quantitative research could only be of providing background when a large-scale survey was held on the level of practice in the cluster about the opinion of those people. Regarding the qualitative approach, next to the semi-structured interviews held in this research, maybe also a focus group could have been held with the strategic leaders together. Also in gathering data it should be held in account that the representatives of the organizations might have been a little more positive about their organization and efforts, for the understandable reason that they spoke more about their ambitions than of practice or something in between. However, I think I managed to see through that. The interview guide was the main structure for the semi-structured interviews, but I think I responded quite well to the answers of the respondents by applying the 'doorvraag' technique and in

that way collected interesting information that led to this master thesis that represents the completion of my study Human Geography with the specialization of Economic Geography at the Radboud University Nijmegen.

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## 9. Appendices

### 9.1. Appendix 1: Factsheet medical cluster Rotterdam 2013

**Gemeente Rotterdam**



## Factsheet

## Medisch Cluster

**De kerngegevens van de Rotterdamse medisch en zorg economie (2013)**

2123 vestigingen  
50.673 banen  
8 medisch en zorg instellingen bij top 20 grootste werkgevers in de regio  
10 ziekenhuizen, 13 zorginstellingen  
€ 2.500.000.000 omzet per jaar

**Netwerken**

Rotterdam Science Tower Netwerk, 3 maal per jaar netwerk gericht op kennisdelen ontmoeten en samenwerken  
Netwerkbijlt zorginnovatie, gericht op het stimuleren van Zorginnovaties  
Platformzorg, motor voor strategische regionale samenwerking tussen zorginstellingen en ziekenhuizen, UWV, onderwijsinstellingen, Calibris en de gemeente Rotterdam gericht op de arbeidsmarkt.

**Medical Delta**

Onderzoeksgedreven life-science en medische technologie cluster in de regio Leiden, Delft, Rotterdam met een hoge concentratie life science onderwijs, onderzoek en innovatie en een van de best opgeleide arbeidsmarkten in Europa. Partner in de Innovation Quarter (Regionale Ontwikkelingsmaatschappij)  
Samen met Rotterdam Partners wordt gewerkt aan de acquisitie van buitenlandse bedrijven

**Kerngegevens Medical Delta**

- 600 bedrijven
- 18.000 banen in de biomedical industrie
- Omzet € 5.000.000.000 per jaar
- 3 Universiteiten en 2 universitair medische centra (UMC's)
- 40 starts up in de incubators in Leiden, Delft en Rotterdam

**Rotterdam Science Tower**

Innovatiecentrum voor hoogwaardig medische bedrijven, medische innovaties en starters, met een lab hotel, met flexibele labruimten voor medische ondernemers  
En starters, een start-up campus met de business incubator van de Erasmus Universiteit Rotterdam op het gebied van life-science, gezondheidszorg en ICT en het ROC Zadkine met de opleiding laboratoriumtechniek

Initiatiefnemers:

**Gemeente Rotterdam**

## 9.2. Appendix 2: List of respondents

Below Table 2 provides an overview of the respondents that where part of the research material for this master thesis

**Table 2, Overview of respondents**

Interview number	Date of the interview	Name respondent	Organization and job position respondent is connected to
- <b><i>Orientating conversation on the topic</i></b>	16-01-2015	Miranda Ebbekink	PhD Radboud university
1.	9-03-2015	Roel Kamerling	<b>Medical Delta</b> Cluster coordinator at Medical Delta
2.	9-03-2015	Pieter van Rijn	<b>Municipality of Rotterdam</b> Former program manager 'Medisch en zorg'
3.	16-03-2015	Renate Veerkamp	<b>Municipality of Rotterdam</b> Account manager program 'Medisch en Zorg'
4.	16-03-2014	Duko Drijfhout	<b>Erasmus MC Holding</b> <b>Technology Transfer Office (TTO)</b> Manager Erasmus MC Incubator/ Business Development Manager
5.	25-03-2015	Frans de Jager	<b>Municipality of Rotterdam</b> Former programmanager 'Medisch en zorg'
6 + 7	1-04-2015	Martijn Schol + Lonneke Baas	<b>InnovationQuarter</b> Account Manager Life Sciences & Health + Program manager, life sciences & Health
8.	9-04-2015	Prof.dr. Huib Pols	<b>Erasmus University</b> Rector Magnificus
9	10-04-2015	Ton van der Steen	'Medical Delta professor' Connected to: <b>Erasmus MC</b> - Biomedical Engineering, Transducers and intravascular techniques Afdelingsvoorzitter and <b>TU Delft</b> – 'Faculteit Technische Natuurwetenschappen'
10	14-04-2015	Marleen Goumans	<b>University of Applied Sciences of Rotterdam</b> Program director 'zorginnovatie'
11	17-04-2015	Annemarie Weggelaar	<b>Erasmus Universiteit</b> Professor 'beleid & management gezondheidszorg'
12	20-4-2015	Guido van den Bogaert	<b>Rijndam Revalidatie centrum</b> <b>Samenwerkende Rijnmond Ziekenhuizen</b>

			Chair of DB SRZ + Member board of directors Rijndam Revalidatiecentrum
<b>13</b>	30-04-2015	Anton Westerlaken	<b>Maasstad Ziekenhuis</b> Member board of directors
<b>14 + 15</b>	1-05-2015	Aernout Visser        + Florian Visser	<b>Director, Breederode Instituut voor opleidingen in Zorg &amp; Welzijn</b> Former functions: Innovatiemakelaar Zorg Rotterdam (Living Lab / Zorgportaal Rijnmond / Gemeente Rotterdam) 2011 – June 2013 (2 years)  + Project leader <b>Zorgportaal Rijnmond</b> , Managing partner at Avisco Advies, Member of coordinating team C2 European Commission
<b>16</b>	1-05-2015	Jaap Verweij	<b>Erasmus MC</b> Dean board of directors
<b>17</b>	1-05-2015	Julia Oomens Meer	<b>Rotterdam Partners</b> Manager International Trade & Investment.
<b>18</b>	7-05-2015	Ellen Perik	<b>Municipality of Rotterdam</b> Program manager ‘Medisch en zorg’
<b>19</b>	12-05-2015	Tessa Vreeken	<b>Municipality of Rotterdam</b> Project manager ‘Stadsontwikkeling Medisch en zorg’
<b>20</b>	29-05-2015	Catharina Bieringa	<b>VNO_NCW Rotterdam</b> Region manager VNO-NCW Regio Rotterdam and Business Development Manager VNO-NCW West

### 9.3. Appendix 3: Interview Guide

Radboud Universiteit Nijmegen- Roos van der Werf (s4118251)

#### Introductie

Mijn naam is Roos van der Werf en ik volg op dit moment de masteropleiding Economische Geografie (Specialisatie van de studie Sociale Geografie) aan de Radboud Universiteit Nijmegen. Ik ben op dit moment onder begeleiding van prof. Arnoud Lagendijk vanuit de Radboud Universiteit en in het kader van mijn afstudeerstage bij adviesbureau Public Result in Den Haag bezig met mijn masterscriptie.

Het onderzoek richt zich op het onderwerp 'Cluster governance in het medisch cluster Rotterdam'. Centraal staat de vraag hoe en door wie het medisch cluster Rotterdam wordt georganiseerd en bestuurd, inspelend op globale en lokale cluster dilemma's voor de medische sector in Rotterdam. Mijn scriptie gaat uit van de cluster theorie van Porter die stelt dat het fysiek en geografisch bij elkaar brengen van bedrijven uit een bepaalde sector allerlei schaalvoordelen en kennis spill-overs (uiteindelijk innovatie) teweeg brengt. De 'cluster governance' theorie stelt echter dat alleen nabijheid niet genoeg is en dat er actief gestuurd moet worden op samenwerking tussen allerlei stakeholders in een cluster vanuit de markt, onderwijsinstellingen en de overheid om op die manier meer samenhang in een cluster te creëren en om in te kunnen spelen op allerlei internationale en lokale uitdagingen. Nu onderzoek ik als casestudy hoe dat voor het medisch cluster Rotterdam wordt gedaan; inspelend op de internationale dynamiek van de medische sector, de uitdaging voor het cluster om zich internationaal gezien op de kaart te zetten en in te spelen op lokale uitdagingen wat betreft samenwerking om het cluster te versterken.

In mijn ogen bent u één van de sleutelfiguren in dit proces.

Allereerst alvast hartelijk dank voor uw medewerking. Voordat we beginnen wil ik u vragen of u toestemming geeft om het interview op te nemen. Deze audio opname wordt alleen door mijzelf gebruikt om de data te analyseren en indien u het wenst kunt u eventueel anoniem blijven.

De volgende onderwerpen zullen gedurende het interview aan bod komen:

1. Algemeen: Introductie van de respondent
2. Internationale uitdagingen voor het medisch cluster en lokale specialisatie
3. Lokale Samenwerking
4. Stellingen met betrekking tot 'cluster governance'

Een aantal keer zal ik een concrete vraag stellen en een aantal keer zal ik u een stelling voorleggen waarover ik graag uw mening zou horen.

## 1. Algemeen

- Zou u uzelf kort voor willen stellen en vertellen;
  - o Wat uw naam is;
  - o Voor welke organisatie u werkt;
  - o Wat uw functie (of voormalige functie) inhoudt;
  - o En hoe lang u deze functie al bekleedt.

## 2. Internationale uitdagingen voor het Medisch Cluster Rotterdam

- Welke trends en uitdagingen voor de medische sector in het algemeen liggen er (internationaal gezien)?
- Hoe specialiseert het medisch cluster Rotterdam en/of Medical Delta zich in het globale productie netwerk van de medische sector?
  - a. Wat is de specialisatie/ wat heeft Rotterdam te bieden op het gebied van productie, kennis, coördinatie, financiën (Indien het mogelijk is dit te onderscheiden)
- Met andere woorden, hoe speelt het medisch cluster Rotterdam in op deze internationale uitdagingen en hoe probeert het cluster zich op de kaart te zetten?

## 3. De lokale samenwerking tussen sleutelfiguren in het medisch cluster Rotterdam

- Met wie bespreekt u (deze) cluster uitdagingen, door wie raakt u geïnspireerd?
- Hoe ziet de samenwerking met andere cluster stakeholders er uit?
- Wat is de rol van en relatie tussen bedrijfsleven, overheid, kennis en intermediairs?
- Waar liggen er volgens u op het lokale niveau uitdagingen m.b.t. de organisatie en samenwerking ten behoeve van het aanjagen van het medisch cluster?
- Hoe zou de samenwerking kunnen worden verbeterd en of veranderd ten gunste van het medisch cluster Rotterdam?

## 4. Stellingen (optioneel) (focus of visie en strategie) gevolgd door discussie

- *Officiële leiders kunnen de juiste visie beschikken over wat goed is voor het cluster en hoe dit te bereiken, maar de juiste ideeën kunnen ook bottom-up komen*
- *Oprechte cluster samenwerking kan alleen tot stand komen als stakeholders inzien dat ze niet alleen naar hun eigen belangen moeten kijken, maar voornamelijk wat goed is voor de cluster als geheel en de ontwikkeling op langer termijn*
- *Cluster samenwerkingen wordt beïnvloed door vertrouwen en persoonlijke nabijheid*
- *Een gemeenschappelijke cluster identiteit hebben en uitdragen is belangrijk/en mogelijk*

## 5. Afronding

Heeft de respondent zelf nog dingen toe te voegen of vragen richting de interviewer?

#### **9.4. Appendix 4: EIT Health Consortium**

The European institute for innovation and technology (EIT) organizes KIC's, which are European partnerships between knowledge institutions and businesses focused on addressing societal challenges. In order to foster a quick start in the first year of the partnerships the EIT provides a grant of 5 million Euros. EIT has several focus points and one of them is EIT health; 'EIT Health was designated as an EIT Knowledge and Innovation Community (KIC) by the EIT Governing Board on 09 December 2014.' (EIT, n.d.). The winner of the EIT Health call is the consortium called 'Innolife'; a European consortium consisting out of more than 140 partners from business, research organizations and universities from the 14 EU member states. The goal of the consortium is to encourage entrepreneurship and innovation in the field of healthy living and active aging. Therefore products, new concepts and services are going to be developed. Part of that are also new educational programs that stimulate talent in order to educate the entrepreneurs of the future. The goal EIT Health has set for itself is to create by 2018 90 new products a year, 70 new start-ups and to let 1 million students participate in online educational programs. The general goal of EIT health is to diminish the fragmentation of the different health care systems in Europe, to provide companies access to European markets and to reduce the time span that it takes to bring medical and health care products on the market (Goumans, p.c., 2015; Perik, p.c., 2015; Veerkamp, p.c., 2015; Pols, p.c., 2015).

The Netherlands are fairly well represented the Innolife consortium. For Rotterdam it is TNO and the Erasmus MC. Next to that the medical centre of the University of Groningen, Leiden, Maastricht and the technical university of Eindhoven are involved. On the business side, Achmea health care insurance, Philips, Medtronic Inc. are participating (European Institute of Technology, n.d.).

## 9.5. Appendix 5: Partnerships medical institutions

The city of Rotterdam has 11 hospitals in total (Zorgkaart Nederland, n.d.) and even more hospitals that Rotterdam is connected to in the wider region. The health care institutions in the region of Rotterdam can roughly be divided into a northern part, a southern part and a centre part. At the Southern Part of Rotterdam the Ikazia Hospital, the Maasstad Hospital, the Ruwaard van Putten Hospital in Spijkenisse and the former Ruwaard van Putten hospital in Rotterdam. In the northern part the Franciscus Guesthouse hospital and in the wider region Guido includes also the Alblasserwaard Hospital, the IJssland Hospital. These Northern hospitals are the hospitals that currently are intensively cooperating. By external pressure and the challenges in terms of funding, they should coordinate with each other and accommodate

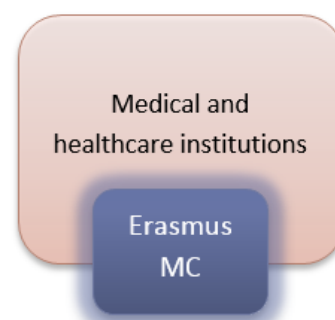


Figure 12, Medical and healthcare institutions

how they can give shape to the best way of providing health care at the north bank of Rotterdam.

Next to that the specialized hospitals are more or less independent units, consisting of the Oogziekenhuis, partly the Haven hospital and for instance the Rijndam revalidation centre. The specialized hospitals do not have one very strong connection with a medical institution but have multiple connections with regular hospitals and also with the Erasmus MC, because patients that enter the Erasmus MC and can't be treated there are being referred to specialized hospital (den Bogaert, p.c., 2015). Also specialized hospitals can be connected to national organizations. The Rijndam Revalidation centre is for instance connected to 'Revalidatie Nederland', a specialized network of revalidation centres in the Netherlands. And you actually see that most hospitals do have a specialism and therefore they care for patients from a wider area than their own setting, and this is especially true of course for the specialized hospitals (van den Bogaert, p.c., 2015)

The several divisions of the Erasmus MC, the academic hospital, are literally and figuratively speaking the centre in the overview of hospitals and has connections to all parties of health care providers in the region (See Figure 12). Moreover, the Erasmus MC also is the centre, because it has the strongest focus on the wider perspective related to, sub-regional, national and international connections (See Chapter 5).

Rotterdam has relatively many hospitals per square kilometer that leads to a situation where *'competition and cooperation always go along together'*. According to Jaap Verweij (p.c., 2015) the collaboration of the Erasmus MC with the regional hospitals can be quite difficult, because hospitals are basically each others' competitors. Within the medical cluster of Rotterdam the health care institutions are big players that have external links with other kind of institutions but also cooperate with and among each other in several ways. In respect of the challenges posed in Chapter 4 about the question how to guide the patients in a better way through the 'health care chain' and providing the best health care possible, several agreements and collaborations have been initiated and given shape in Rotterdam.

### SRZ

The foundation SRZ (Cooperating Rijnmond Hospitals) is the partnership between the ten hospitals in the Rijnmond region. According to the statutes SRZ is the goal of the organization is to 'improve the quality of the healthcare in the region Rijnmond in the field of institutional transcending matters all related to this (van den Bogaert, p.c., 2015). Leading in the development of this abstract goal set for



the SRZ board members, is always improving the quality of the (hospital) care and increasing efficiency for the patients in the Rijnmond region. The hospital boards determine together where collaboration adds value when it comes to promoting the quality of health care. The board members do see each other every six weeks. But there are always ongoing workgroups and project groups working at attaining the goal stated above. Also the SRZ focus on questions about unemployment and the labour market of Rotterdam.

The SRZ are also involved in region-wide activities where collaboration with health care suppliers is initiated. Examples of such activities are;

- *The Rotterdamse Zorg.nl*; a project focuses on labour market dilemma's and promotes good quality and quantities related to the staffing in health care in the region Rijnmond
- *RijnmondNet*; SRZ uses together with the majority of other healthcare institutes in the Rijnmond the infrastructure of the RijnmondNet.
- *Dementia Chain*: cooperation in the supply chain to achieve optimal care and support for people with dementia and their caretakers
- *ROAZ* (Regionaal overleg acute zorg): the national network for immediate health care.
- *Samenwerking ziekenhuizen/GHOR*: in this contract the agreements between the hospitals and the GHOR are recorded (van den Bogaert, p.c., 2015) (Stichting SRZ, n.d.)

### *Beter Keten*

One of the, rather young, partnerships that exists in the medical cluster of Rotterdam is called 'Beter Keten' initiated by the Franciscus Hospital and the Erasmus MC in 2011 (Beterketen, n.d.). The Beter Keten is a networking partnership between health care providers in the region of Rotterdam. In the Beter Keten partners work together to ensure that the patient receives the best care at the best place in the chain. And that means that patient care oriented, high quality and efficient is where the care that is provided is. The actively involved organizations are the Erasmus MC, the Franciscus Hospital, the 'Haven ziekenhuis', which is a subsidiary of the Erasmus MC and the Maastad hospital.

According to Huib Pols (p.c., 2015) this initiative is inspired by the cluster theory of Porter and several representatives of the involved institutes where send to Harvard and spoke to Porter about his ideas, followed classes and how to implement this in the health care chain of Rotterdam. The Better Chain is therefore not exclusive to the four initiating partners. The thought of the Beter Keten is extended regionally. Other hospitals and healthcare providers participate in projects based on relevant content. Within the context "Cooperating Rijnmond Hospitals (SRZ) 'all hospitals are informed about the Better Chain projects and the possibilities in (further) participation explored. The focus of the Beter Keten is on cooperation between (some) regional hospitals. Here are many challenges and opportunities. Where relevant and possible, options will be evaluated about possibilities to expand projects for healthcare providers from the first line (1e lijnszorg).

In this respect, some choices have to be made. If hospitals only focus on their specializations, the patient can have the highest quality of health care compared to when all hospitals try to offer a wider range of health care as possible (Westerlaken, p.c., 2015; van den Bogaert, p.c., 2015). Though it is hard to make agreements about specialization, because there are several rules (AMC and MXA provisions) and regulations that prevent total collaboration, because that would lead to unfair competition, which would reduce the amount of options patients can choose from regarding healthcare (Westerlaken, p.c., 2015). Though, it is possible to form corporations with the motivation that that is done in order to improve the quality of health care. Several hospitals in the Southern Part

of Rotterdam have made such cooperation with links to the wider region (Westerlaken, p.c., 2015; van den Bogaert, p.c., 2015).

In that respect, the Maasstad Hospital works together with the hospital in Dirksland, the Ikazia Hospital, and the hospital in Spijkenisse. This collaboration has made a lot of activities that encourage quality and efficiency possible. The medical departments agreed about the importance to look at the wider region. This is now being carried out by exchanging OK staff (Westerlaken, p.c., 2015), where doctors and surgeons of the one hospital sometimes work in different hospitals, where there are better technical devices available, but the local expertise is lacking, or in order to be able to serve patients closer to home. In that way Anton Westerlaken thinks we can provide the best health care for 750.000 to a million people in this Southern Cooperation.

Though, a very important condition related to providing health care in the southern part of Rotterdam with the regional hospitals, is to have a very intensive and close relation with the academic hospital, in this case the Erasmus MC. When this kind of links are also flowing out from the Erasmus MC to the Northern part of Rotterdam and maybe even to Dordrecht or Breda, a wide network is being created about serving around 5 million people (Westerlaken, p.c., 2015).

## 9.6. Appendix 6: Partnerships medical institutions and educational institutions

In the collaboration between medical and knowledge institutions the Erasmus Medical Centre plays a central role, for the reason that it fulfils tasks as an educational institution and as a health care provider and is therefore involved in several initiatives and activities regarding collaboration between these different institutes described below (see Figure 13).

For the Erasmus Medical Centre, as a top clinical hospital, it is important to for an academic centre to have good connections with STZ (stitching top clinical hospitals). In America these would be called teaching hospitals, in order to link the knowledge and expertise that is present at the Erasmus MC to the knowledge and expertise in other top clinical hospitals. Those are partly the teaching hospitals in the Netherlands (Westerlaken, p.c., 2015). Related to that at a more local level, several hospitals around the Erasmus Medical centre are joined in the OOR. That is the 'onderwijs en opleidings regio' where 18 hospitals in Southwest region of the Netherlands work together (Verweij, p.c., 2015).

According to Anton Westerlaken, connecting through educational and training programs is one of the most sustainable ways of connecting and laying out a sustainable network where people know each other and know where to find each other. The corporation of the hospitals in the Southern part of Rotterdam (See previous section) do respect that notion and are trying to align the several separate training facilities and capacities of the regional hospitals under one control while involving the Collage Education institutes (Hbo) and the ROC's. Marleen Goumans emphasized the importance of the collaboration between the University of Applied Sciences of Rotterdam and medical and healthcare institutes. The educational programs should be teaching content that is in accordance with the reality in the healthcare institutions. And by supporting strong connections between the knowledge institutions and health care institutions and health care institutions among each other, students can be prepared for reality in the best way (Westerlaken, p.c., 2015).

Therefore it is important that the knowledge institutions constantly keep asking themselves and the medical institutions; 'does it work?, what do you need?, what problems need to be solved by studies? How can we solve these problems? Communication between theory and practice is very important in that respect and that is something that the University of Applied Sciences of Rotterdam is focusing on (Goumans, p.c., 2015).

Related to the educational function of the Erasmus MC is the connection between the Erasmus MC and the Erasmus University, its mother university. According to Jaap Verweij and Huib Pols (p.c., 2015) the collaboration between the university and the Erasmus medical centre and other hospitals that are linked to the university runs quite good also in relation to finding (internship) places for our students and co-assistants. Though, there might always be some hick-ups in respect to financial issues. The collaboration between University of Applied Sciences and the Erasmus MC runs quite smooth for the reason that they have very different kind of tasks and there is no competition in

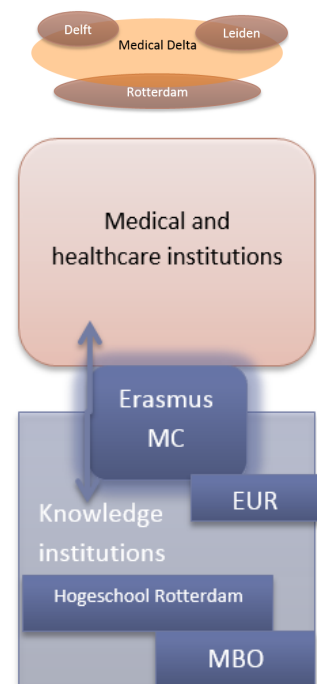


Figure 13, collaboration between medical and knowledge institutions

respect of students or studies, because that is in a different category at the institutes (Verweij, p.c., 2015) Though, for the reason that the Erasmus MC is such a large organization it is not always clear who is working together on projects with whom (Goumans, p.c., 2015). For that reason the knowledge centre of the University of Applied Sciences of Rotterdam has written down for the boards of the University of Applied Sciences of Rotterdam and the Erasmus MC what projects are going on who is involved.

In addition, there is the academic education program 'policy and management in medical care' at the Erasmus University. This is not a medical education as such, but is focusing more on the policy aspects of the healthcare sector. However, more and more connections with Erasmus MC are being made also in this field of education of the Erasmus University (Drijfhout, p.c., 2015).

This expansion of connections between knowledge institutions and medical institutions can be seen as something positive according to Julia Oomens Meer. Though, it should be expanded even more (Oomens Meer, p.c., 2015). This related to issues that many of the respondents indicate; the connection between researchers and scientists and what is needed at the market and the connection between that is not working as is could or should be. Julia Oomens Meer suggest, in an attempt to bridge the gap, that educational programs of the EUR or University of Applied Sciences of Rotterdam focusing on entrepreneurship, marketing and business should also be linked to medical institutions. In that way new research outcomes might be easier linked to spin-offs in the future (Oomens Meer, p.c., 2015).

More about linking research outcomes to practice in the next part regarding the Valorisation program of the TTO of the Erasmus MC.

#### *Valorisation program*

TTO (See Chapter 3), the technology transfer office of the Erasmus MC is involved in all innovations inventions made by Erasmus MC researchers and clinicians; discoveries and new developments that can lead to, for example, new drugs and medicines, new ways to make health care more efficient the care, or new medical techniques. TTO assists in bringing these new developments available for society. Together with the TTO from the Erasmus Medical centre the University of Applied Sciences of Rotterdam the ROC Zadkine College, the Erasmus University and another external party are participating in the valorisation programme. The goal is to learn from each other by making a clear task division but still cooperate in order to make each other stronger (Drijfhout, p.c., 2015). For instance, some people (such as the University of Applied Sciences of Rotterdam and the Zadkine College) are providing educational programs in valorisation and then connect to the TTO in order to collect interesting speakers for their lectures.

In that collaboration some people from the medical institutes or knowledge institutions turn to the TTO when they have questions about how to patent a course guide or something like that. In the collaboration someone from every institute out of practice is involved both as someone from the board of every institute, in that way the connection between daily practice and decisiveness is made in order to reach better results. The TTO is very much focusing on innovation and in the medical sector 'we speak very often within the context of Leiden, Delft and Rotterdam; Medical Delta of challenges' (Drijfhout, p.c., 2015).

#### *Medical Delta*

Paragraph 3.2 introduces the cluster organization Medical Delta where knowledge institutions and the Academic Medical Centres work together very closely. Medical Delta aims to function as an institute that provides frameworks and increase the visibility of networks in the Medical Sector. Where for instance doctors of the Erasmus MC can easier get in contact with technical staff from the TU Delft in order to solve problems and increase innovation. Such a framework is for instance created by Medical Delta in the field of imaging; an insightful website of the Medical Delta imaging institute might make it easier for parties to find and connect. Medical Delta also has assigned a number of 'Medical Delta professors', which all have a double position/function both in a medical environment as in a technical environment. They are for instance working at the TU of Delft and at the LUMC or at the TU Delft and the Erasmus MC or at the trade union of mathematics and physics of Leiden and the Erasmus MC. In that way, the Medical Delta coalition tries to connect its different partners. And the collaboration between the academic medical centres runs smooth, also for the reason of distance and task division. Moreover, these professors have, in the first place even because they are willing to be connected to different institutied, are open to new ideas and are also willing to carry these out. In that way Medical Delta's cluster ambassadors are created (Kamerling, p.c., 2015; Weggelaar, p.c., 2015).

The University of Applied Sciences of Rotterdam was not initially involved in the Medical Delta cooperation, although about a possible accession has been part of discussion for years without results. However, now phase has arrived in which several parties realize that applied sciences may also be interesting in the Medical Delta cluster context. The awareness is growing that applied sciences nevertheless interesting in focusing on what exactly the practical questions related to innovations and health care are. Moreover, the University of Applied Sciences of Rotterdam also has the contacts with practical workplaces. Therefore, the Universities if Applied Sciences of Delft, The Hague and Rotterdam surely will join Medical Delta in the near future (Goumans, p.c., 2015, Perik, p.c., 2015).

### 9.7. Appendix 7: Partnerships knowledge institutions

The collaboration between knowledge institutions (see Figure 12) has already been partly addressed in the previous section that describes the connection between knowledge institutions and medical and healthcare institutions. Though, some links between the different education programs are negatively influenced by institutional barriers, which are also related to the general labour market issues the municipality of Rotterdam has to deal with. The first problem related to this is that the work for the people who have completed lowest level of education in the field of Medical and health care sector, is more and more being automated, which causes the jobs to disappear. The work of LBO-educated lab staff is for instance being computerized, which causes a fading of available jobs (Weggelaar, p.c., 2015). Challenges for the local medical cluster of Rotterdam are to encourage students to continue studying and reach higher levels of education. Though, in case the medical educational programs do not fit together providing smooth transitions from graduating from one institute and continue studying by starting a new program subsequently, fixing problems on the local labour market is becoming quite a challenge (Weggelaar, p.c., 2015; Goumans, p.c., 2015).

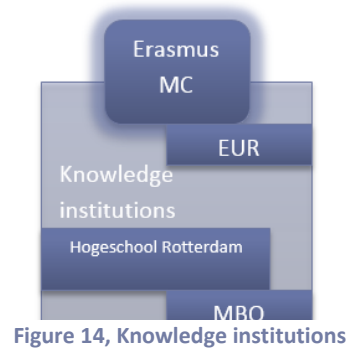


Figure 14, Knowledge institutions

## 9.8. Appendix 8: Partnerships business and other stakeholders

As has been outlined in Chapter 5, large companies have their own network and their own connections, though Rotterdam lacks these large companies when focusing on the health sector. For that reason, many of the respondents argue that the businesses in the medical and health sector of Rotterdam do not independently have strong connections with each other or an overview of who is active in the region and doing what activities. It is needed to make connections between different entrepreneurs and institutes because there are so many small companies and start-ups in the region of Rotterdam that are all coming up with beautiful and interesting ideas, but the same is that they do not know about the thought process and activities of related companies in the region (Bieringa, p.c., 2015; Oomens Meer, p.c., 2015). For that reason, in bringing together local businesses in the health sector of Rotterdam, many other institutes are involved (see Figure 15).



Figure 15, Businesses

In relation to linking local businesses to GPNs this has been discussed in Chapter 4. Though, also at the local level institutes are involved in connecting businesses. These intermediary institutes are needed, because you need entrepreneurs to do where they are good at; commercialize knowledge and products (A. Visser, p.c., 2015; Baas, p.c., 2015). And therefore it is important not to distract them from that, but still emphasize that they have to be aware of the interests of the medical cluster as a whole, because it is important that they are aware they are part of a larger whole and who else are part of that in order to create opportunities for them to respond to chances and challenges. That is the task of intermediary institutes such as InnovationQuarter, Rotterdam Partners, the Municipality of Rotterdam, Medical Delta or VNO-NCW Regio Rotterdam (all introduced in Chapter 4).

VNO-NCW Regio Rotterdam has the goal to let businesses participate in the on-going thought process in health care (Bieringa, p.c., 2015). VNO-NCW region Rotterdam is the regional network organization for entrepreneurs and organizes 7 meetings a year for entrepreneurs in a wide range of sectors. VNO-NCW West promotes cooperation and knowledge sharing between parties throughout the healthcare sector (Bieringa, p.c., 2015). Related to this VNO-NCW VNO-NCW Regio Rotterdam has initiated also meetings based on a specific content, given shape by entrepreneurs from that sector itself. For the health care sector of Rotterdam this network initiative is called Zorgpower. In this network chairmen and directors of healthcare institutions and meet companies together. Each of them are people with great decision-making powers and extensive knowledge and experience in the field of management in healthcare. Members are employed by: Hospitals, Care centres, Nursing homes, Home care, Psychiatric care, Pharmaceutical industry Health insurance, and suppliers or customers of these organizations. Zorgpower offers a network in which:

1. dilemmas are shared,
2. contacts between businesses and institutions are made,
3. market opportunities are identified,
4. Knowledge and experience is shared.

Meetings of the Zorgpower initiative are organized in Rotterdam and Rijnland three times a year. The initiative also has a council board that for instance involves board members of the SRZ (Stichting Samenwerkende Rijnmond ziekenhuizen) (Bieringa, p.c., 2015; Bogaert; p.c., 2015).

Among others by this initiative also the connection between businesses and the medical and healthcare institutions is being made (See Figure 16).

Medical Delta and the Municipality are also trying to work together with VNO-NCW Regio Rotterdam (Bieringa, p.c., 2015), this for the reason that Medical Delta is also initiating and encouraging to make linkages between entrepreneurs and medical and health care institutions both as knowledge institutions. Since Medical Delta consists of both of these representatives, they have initiated some network events in order to stimulate the visibility of the network. These meetings are called the

'Medical Delta Science Café's, organized since 2009, where academics and entrepreneurs meet each other. The goal is to create a context where connections can be made in order to encourage innovation in health care (Kamerling, p.c., 2015; Bieringa, p.c., 2015). The events last for 1,5 hours, where several speakers perform at first followed by the opportunity to walk around and talk to possible partners. This is important in order to let the voices of the entrepreneurs be heard about what is required and needed in practice and on the market, because entrepreneurs are the ones who are working with it and know best what is needed and how to commercialize this knowledge in the best way (Baas, p.c., 2015; Kamerling, p.c., 2015; Goumans, p.c., 2015; van den Bogaert, p.c., 2015).

Moreover, it is related to that important to think about how to deal with scientific knowledge in a business model (Veerkamp, p.c., 2015). In that respect Huib Pols states that a distinction has to be made between the larger companies, who are eager to absorb intellectual property from the universities. And the SME's on the other hand, who are more struggling with the question on how to translate knowledge and gained or developed intellectual property, alone or with the help of the university into a viable SME of spin-off (Pols, p.c., 2015). The valley of death that plays a role in that is very crucial and as described before the TTO, Rotterdam Partners, VNO-NCW and InnovationQuarter are willing to support that process and often try to connect researchers with entrepreneurs in order to reach the best results. See for more about the Valorisation programme of the TTO in the previous part.

Also the University of Applied Sciences of Rotterdam is very much focused on the local connection between their knowledge institution and local SME's (see Figure 17). As a knowledge institution the University of Applied Sciences of Rotterdam tries to present itself, not in the field of development of new things, but on the applicability of it in practical business environment. For that reason the University of Applied Sciences of Rotterdam has connections with SME's and let them test new things in practice. For instance, at the school itself an

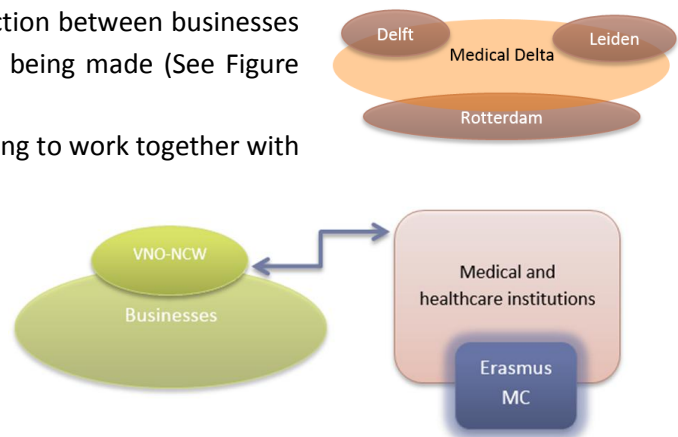


Figure 16, Collaboration between businesses and medical institutions

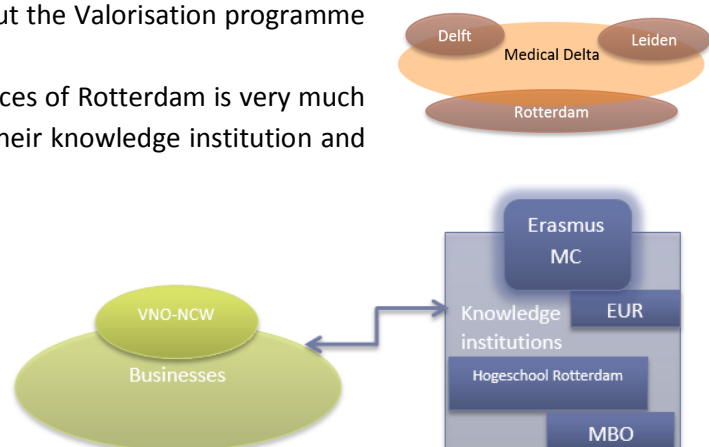


Figure 17, Collaboration between businesses and knowledge institutions



'innovation square' has been introduced where students, businesses and employees related to health care are working together on projects. Also the University of Applied Sciences of Rotterdam is participating and visiting network events initiated by other key players in the cluster, such as the medical delta science café's but also the other network events described below (Goumans, p.c., 2015).

Not only the University of Applied Sciences but also the academic medical institutions aim at valorising their knowledge. A very important aspect of linking scientific property to the market is the connection and collaboration between scientists and entrepreneurs. The TTO is one of the key players focusing on that process. Though, besides from the difficulties regarding investments and funding in relation to developing a product, the collaboration between entrepreneurs and scientists can be challenging according to almost all respondents. This for the reason that it can be very different persons and look at the commercialization of knowledge in different ways and scientists are not really used to collaborate at that level. The connection is needed for the reason that scientists can be very good at their specialization, but do not have any knowledge about how to bring a product on the market and how to sell that (Drijfhout, p.c., 2015).

The TTO is trying to do that by giving shape to the introduction between entrepreneurs and scientists in some kind of 'job interview' format. Here there is looked at the background of the entrepreneur; has he been successful previously and is there some link to the topic of the scientist to be found? These are important questions to pose, not in the last place because these people have to cooperate for at least several years and therefore it is important that there is trust and some kind connection that helps them to relate to each other (Drijfhout, p.c., 2015).

Not only connections between medical and healthcare institutions and businesses in the health sector benefit the overall working of the medical cluster. Also connections between medical and healthcare institutions with business of other sectors are giving shape to the cluster network. The development of the area surrounding the Maasstad Hospital is a good example. A local business park had to come to deal with all kind of consequences that the redevelopment of the Maasstad Hospital brought about. For instance an increase in the parking rate. The hospital then tried to make interesting connections with the local firms present there, which led to interesting collaborations. The local bakery is now a supplier for the hospital, the local paper processing company made a deal with the hospital to deal with their old paper. Therefore they had to make investments, but are not profiting very much from this collaboration. This has been encouraged by the Maasstad Hospital by organizing speed dates between the involved parties ranging from entrepreneurs to hospital employees at the time (Weggelaar, p.c., 2015).

## **9.9. Appendix 9; The municipality and links of collaboration**

### *Focus of the municipality of Rotterdam*

The municipality of Rotterdam tries to overlook what is happening in the cluster as a whole and of course has the goal to increase the strength of the cluster. For that reason the Municipality connections with many key players in the medical cluster of Rotterdam and is therefore places very central in the network overview of Figure 18. Within the economic department several sectors of focus have been chosen for the city of Rotterdam by the municipality, partly because of the fact they had to economize. One of them is Medical and Healthcare cluster. This section has a program manager, account manager and three project managers, who are all supported by a secretary and assistants. (Perik, p.c., 2015; Veerkamp, p.c., 2015; Vreeken, p.c., 2015).

In terms of the medical cluster, the municipality sees its role as facilitator. The municipality should respond to the questions from the business community and pave a path for them to develop. The community can help in terms of licensing, providing information and bring the parties together around the table. Furthermore, the motto of the municipality that it does not need to interfere too much with the market. Though, there is one exception. Because the municipality has invested a lot in the science tower, continues to still supports this area, because next to partnerships and the possibility to meet at network events, some businesses and other medical and healthcare (knowledge) institutions are geographically connected by a building; The Rotterdam Science Tower. 'The Rotterdam Science Tower is a representative facility for organizations in the medical cluster and is an integral part of the Medical Delta. It is a multifunctional, multi company building; a mix of laboratory space, offices pace and facilities for medical education. The facility satisfies all national and international standards and requirements that apply to the establishment of laboratories, including ML-II,BSL-II and FDA. The tenant on the 20th floor has even been granted a ML-III permit.' (Deloitte, 2014. P.6). Within the science tower there is a Lab Hotel, which offers researchers and companies readily available laboratory facilities for short or long periods of time. The laboratories are Microbiologic Laboratory class II (ML-II) ready and provided with all permits required (Deloitte, 2014. P.6).

In the science tower several organizations that are related to the medical sector are gathered. So there is stimulating the ECE (Erasmus Centre for Entrepreneurship) mandate spin-offs, Viroclinics is located in the science tower and the Zadkine has a division related to health care education programs has establishment there. There is established a lab hotel. In this context, there is established a covenant that all these parties are committed to the development of this area and the medical cluster. There is more space available in the Science Tower so the municipality is trying to encourage this further (Vreeken, p.c., 2015).

### *Position and role in the network of the municipality*

Companies and academics have a different role and focus. Yet these parties must be brought together, but they have to keep doing what they are good at. In this the municipality can play a leading role by keeping eyes and ears open to which companies can be linked together and what questions from the health businesses the municipality can respond (Vreeken, p.c., 2015). For the municipality it is also important to maintain good relations with all of their partners and the important institutions in the municipality. For that reason the Municipality has many links going out to key players in the medical and health cluster of Rotterdam to which the municipality is related (see figure 18).

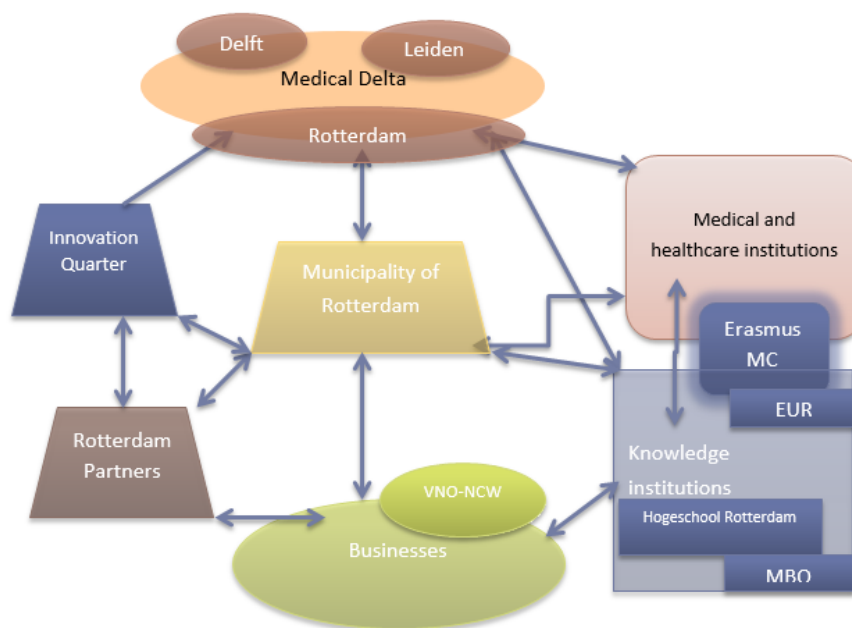


Figure 18, Cluster governance network

Despite the many linkages, which causes the municipality to be in a central position of in the network, the municipality is not considered to be a leading player in de medical and health cluster of Rotterdam. By both other players in the cluster and by representatives the municipality itself, the role of the municipality is convincingly described as facilitating and to creating the right conditions for the cluster to flourish by responding to questions from other cluster players (18 out of 20 respondents). In facilitating one important and possible input of the municipality provided by aligning the spatial planning in accordance to the stimulation of economic growth of the health cluster, providing support in the appliance of the right permits for cluster players, which they need to develop, to also license these permits, and to link cluster stakeholders to each other (van Rijn, p.c., 2015; Drijfhout, p.c., 2015). Therefore the municipality should present herself as an open interlocutor. She should know the cluster network and should be able to make the right referrals when asked. That is both the expectation from other cluster stakeholders and the internal objective of the municipality itself.

For instance regarding the international aspect of cluster governance, the municipality acknowledges her facilitating role both as the responsibility to encourage the development of the cluster. Therefore, the municipality has close relations with the executive institutions in this field such as InnovationQuarter and Rotterdam Partners, which was originally even part of the municipality structure. Once every 6 weeks the program managers, so also the program manager of the Medical and Health cluster of program managers of the Medical Delta, meet with representatives of InnovationQuarter to talk about the strategy and focus of their acquisitioning activities. The municipality brings up local issues and then a strategy is discussed on how to address these issues and who is going to do that. Also the Municipality is involved in several meetings of the SRZ (see previous parts) once or twice a year where the aldermen of the municipality are present or participates in sub-projects of that cooperation (van den Bogaert, p.c., 2015).

In respect of the medical Delta cooperation the municipality is one of the partners as described in previous chapters. In the collaboration between the province, the three municipalities and universities it is important to frequently meet to discuss the focus and strategy of the Medical

Delta as a cluster and this involves a lot of tuning. *'It is important to agree about the goals and focus, because if all players involved do want different things the cluster in its totality is a weak whole'* (Perik, p.c., 2015). Therefore, the key players need to constantly deliberate and communicate about the larger objective, though every municipality can have its own local application and remain their own identity and specialization (Perik, p.c., 2015).

In relation to Medical Delta, but basically in relation to the whole network of the Medical cluster of Rotterdam the municipality thinks the government should be focusing on an active attitude within the network, on trying to get to know the network and who is involved, and trying to make the connections that have not been made yet, but could be interesting. This means that the municipality should be in contact with their environment and local context (Perik, p.c., 2015; Veerkamp, p.c., 2015).

#### *Clustering activities and initiatives of the municipality*

The municipality is contributing to the network by organizing and supporting several initiatives. One of these examples that is quite successful and well known in the Medical cluster of Rotterdam (all of the respondents know about it) is the network event 'Zorgontbijt' a network event to support innovation (all of the respondents, p.c., 2015). The Municipality is strongly encouraging this and organizes this by bringing together people from the whole production chain; scientists, the social field, and entrepreneurs. The network breakfast health care innovation is held 4 times a year in café restaurant de Machinist at Coolhaven. The schedule of the meetings is always the same; 7.15-8.00→ people enter and have coffee, tea and breakfast; 8.00-8.05→ the host (which is often a representative of the municipality) opens the meeting. Between 8.00-9.00 there are three speakers who talk for about 15 minutes about dilemmas or trends in health care related to the topic of the meeting. Then also some start-ups are given the opportunity to pitch their company and products. And then from 9.00-10.30 there is the opportunity for people to walk around and speak with each other ('netwerken'). This event takes place about 2 or 3 times a year. The network event health care innovation has been pretty successful according to a majority of the respondents, because due to its popularity about 120-150 people (van den Bogaert, p.c., 2015; Veerkamp, p.c., 2015) are visiting the events, of which some standard visitors but always new visitors as well, some new collaborations emerge and the visibility of the network in the Medical cluster of Rotterdam is enhanced. The municipality tries to participate as an active connector by introducing people to each other who might have common interests.

Another initiative is the Health Challenge, related to the challenge of creating real innovation in the medical and healthcare sector related to SME's, where a lot of innovations do not reach the market. The municipality of Rotterdam works in this respect together with the ECE (Erasmus centre of Entrepreneurship) of the Erasmus University, which is located in the Science Tower, and they gave the ECE the task to organize a health challenge. Also the municipality asked the cooperation of VNO-NCW Regio Rotterdam in this trajectory to link it to their Zorgpower initiative (as described above). They are willing to cooperate under the condition that VNO-NCW Regio Rotterdam's ideas are also concerned in the development of the content of economic programs (in the medical sector) of the municipality (Bieringa, p.c., 2015).

Together with Rotterdam Partners and Innovation Quarter the municipality also organizes sector meetings, where players from the field were asked to come and tell about the activities that go on in the field in order to create more visibility. According to Julia Oomens Meer the sector

meeting of the medical sector was most promising, for the reason that there was a lot of interaction between the representatives.

In order to fulfill its role properly the municipality has hired an agency that thought the account managers of the municipality, who are responsible for the contact and network of the participants in the field, to teach them the proper way to 'network' and how to actively connect the right cluster players. Also the account managers of the different divisions of the municipality, so not only the account manager of the medical cluster, visit all sort of network events in order to connect to the wider perspective of what Rotterdam has to offer, while looking at interesting players who could be linked to other players. When a common interest on the business side is missing, the municipality then tries to find another common interest such as sports or hobbies that might connect people, the informal connection does also play a role (Veerkamp, p.c., 2015).

## 9.10. Appendix 10: Internship

This research is linked to an internship. Therefore, it is also necessary to indicate how the research relates to the internship organization.

At the 28<sup>th</sup> of November 2014 I signed an internship agreement with the organization Public Result located in Den Haag. The internship will be for the period of 5 months starting at the 1<sup>st</sup> of March 2015 and ending on the 31<sup>st</sup> of July 2015. Public Result is an agency that supports organizations with management in realizing their results for society. In 2001 the organization started off as an agency for urban development called 'stadsnetwerk'. They now have grown into an agency that focuses on a range of subjects, such as economy, education, safety and health care. Within these sectors they primarily focus on how key figures in the field could optimize their collaboration and come to results together. Public Result has also worked on projects about regional development in relation to cluster development. Therefore, this thesis could be of interest for them. It is a small organization with 11 permanent employees and they often work together with other organizations.

Director of the organization Kees Stob is the thesis supervisor at the internship organization. I have been at the office of Public Result four days a week. Thereby, one day a week remained free to attend classes and meetings of the final course of the master specialization and to attend other obligations at the Radboud University Nijmegen on Tuesdays. The four days I was present at the office of Public Result I was doing general work for Public Result to support the on-going projects of the organization. The other three days remained to work on my master thesis research.

Website: [www.publicresult.nl](http://www.publicresult.nl)

