



Turning Life Sciences Into Business

The Entrepreneurial Process on the
Pivot Park

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Abstract

This case study explores the entrepreneurial process on the Pivot Park in Oss. The entrepreneurs made the transition from researcher to entrepreneur after the closure of the R&D activity at MSD-Organon. This research explores both the supply-side (the entrepreneur) and demand-side (the cluster setting) of entrepreneurship. Emergence of this cluster does not fit in the existing literature on forms of cluster creation. The cluster is neither fully policy driven or spontaneously developed. Instead, it is a ‘circumstantial-necessity’ driven cluster in which the circumstance of the R&D closure interplayed with the availability of resources, leading to the emergence of the park. Based on the results of this exploratory case study a deeper understanding of the entrepreneurial process on the Pivot Park is gained. The entrepreneurs on the park discovered an opportunity in their role as researcher, and often this opportunity is in their field of expertise. To be able to exploit the opportunity, the entrepreneurs used their social network. It is utilized for assessing the opportunity, getting new connections, attracting resources or forming collaborations.

Keywords: Entrepreneurship, Pivot Park, Geographical clusters

Acknowledgements

During the process of writing my thesis I began to see parallels with an important aspect of this research's topic; entrepreneurship. Similar to an entrepreneurial life cycle, the thesis starts with the discovery of an opportunity, in the form of a research-subject. The second step in the entrepreneurial process is to determine how to exploit opportunities, translating it to the writing of my thesis, I completed a research proposal like an entrepreneur would write a business plan for his/her company. After that, like an entrepreneur, I started gathering the resources I needed in the form of theoretical insights and data.

When these early stages are completed, the managing aspect in a new company becomes the most important. In my thesis I had to manage my data, manage the process and still see the big picture of my research ('my company'). The final step in the entrepreneurial life cycle is harvesting value, which was gaining valuable insights from my collected data. In short, I followed all steps in the entrepreneurial process to arrive at the point where I am now, having completed my master thesis Sociology.

After going through this 'entrepreneurial life cycle', like an entrepreneur would be on his own company, I am proud on this research.

Contents

Acknowledgements	3
List of figures and tables	5
1. Introduction	6
1.1 History of MSD-Organon	7
1.2 Emergence of the Pivot Park	8
2. Research Question	9
3. Literature Review	14
3.1 Markets, Hierarchies, and Networks	14
3.1.1 Defining the network form of organization	16
3.2 Geographical clusters: regional hyper-networks	18
3.2.1 Cluster Emergence	20
3.2.2 Success and Failure of Clusters	20
3.3 Entrepreneurship	21
3.3.1 Network Approach to Entrepreneurship	22
3.3.2 Attributes of Entrepreneurs	24
4. Methodology	26
4.1 Operationalization	26
4.2 Case Selection	27
4.3 Methodological requirements	29
5. Results	30
5.1 Who have taken the step to become entrepreneur?	31
5.2 How did the transition from researcher at MSD-Organon to entrepreneur take place?	32
5.3 What kind of resources do entrepreneurs dispose of and how are resources acquired they do not possess themselves?	33
5.4 How are social networks utilized from the position of entrepreneur instead of researcher at MSD-Organon?	34
5.5 Why and in what form are collaborations used by the start-ups at the Pivot Park?	37
5.6 What are the main differences from the position of entrepreneur at the Pivot Park compared with the position of researcher at MSD-Organon?	38
6. Conclusion	40
Literature	45
Appendix I	48
Appendix II	49
Appendix III	50

List of figures and tables

Figures:

Figure 1 Entrepreneurial Process	p. 8
Figure 2: Three levels of Network analysis	p. 16

Tables:

Table 1 Comparison of Forms of Economic Organization	p. 14
Table 2 Previous Occupations at MSD-Organon	p. 25
Appendix I	
Table 1 Major Acquisitions in Pharmaceuticals 2005-2011	p. 44
Table 2 Composition Taskforce Pivot Park	p. 44
Appendix II	
Table 3 Codinglist Interviews	p.46

1. Introduction

Turning any idea into a business is surrounded by uncertainty and risk; an example capturing this initial uncertainty is the introduction of the personal computer for in-home use, on which Ken Olsen (CEO of Digital Equipment Corporation) commented back in 1977: “There is no reason for an individual to have a computer in his home”(Kets de Vries, 2006: 50). In the life-sciences industry, uncertainty is ever present, with an average of 12 years research and development (R&D) activity before an innovation reaches the market (Nefarma, 2012). This explorative case study focuses on entrepreneurs turning science into business by studying the Pivot Park (initially called Life Sciences Park Oss). The park was founded on January 2012 as an initiative to retain innovative life-science after the closure of nearly all R&D activities at MSD-Organon. Insights are gained in the social dynamics of the entrepreneurial process, exploring the aspects that are of influence.

The entrepreneurial process could be explained by a five stage model towards establishing a business; the entrepreneurial life cycle (Mullins, 2006). The journey begins with an opportunity, which follows from a discovery. Having established an opportunity, it needs to be assessed on viability. After these first two steps, the life cycle moves into the realization of the business, including planning and gathering resources. The final step is managing the growing business in order for survival in the first years. The neat five stage model presented here is of course only a model; the reality could be less ordered. The path to entrepreneurship in the life-sciences industry is difficult, as shown by statistics; only 10% of aspiring entrepreneurs turn their idea into business in 12 to 18 months. The remaining 90% either fails or realize their idea was only that, an idea instead of an opportunity (Mehta, 2004).

Although the benefits of geographical clusters have been mitigated by some (Breschi & Malerba, 2005), geographical clusters can encourage entrepreneurship, and the emergence of the Pivot Park is such a triggering event coupled with an entrepreneurial spark. The following quote by the former Nokia CEO, J.V. Nieminen captures the location advantages the Pivot Park as a cluster could grasp:

“When an inventor in Silicon Valley opens his garage door to show off his latest idea, he has 50% of the world market in front of him. When an inventor in Finland opens his garage door, he faces three feet of snow” (Sölvell & Porter, 2002)

This case study research focuses on entrepreneurship embedded in the geographical cluster of the Pivot Park. The clustering of related life-sciences start-ups with entrepreneurs who know each other from former employment is a unique feature of this case study. Explorative research will be combined with theoretical concepts related to the fields of entrepreneurship and geographical clusters. First, some background on the emergence of the park is provided after which the central research question guiding the research will be presented.

1.1 History of MSD-Organon

In 2010, pharmaceutical corporation Merck & Co (known as Merck Sharp & Dohme (MSD) outside US and Canada) announced to transfer most of its research and development (R&D) facilities at the MSD-Organon facility in Oss to the United States (MSD, 2010). This was the consequence of a broader strategic decision to relocate the R&D facilities to eight locations worldwide. This meant the near distinction of activity at the research site in Oss, which was founded in 1923. The pharmaceutical company Organon evolved from the activities at a slaughterhouse of owner Saal van Swanenburg that were focused on extraction of animal organs (explaining the name Organon) for the production of insulin (MSD-API, 2012). In the years after, Organon became one of the major pharmaceutical companies of the Netherlands (Roozendaal, 2010). They were pioneers in women's health and introduced the anti-conception pill in 1964, which became the most important product for Organon. Other important pharmaceutical fields were the psychological health division and anesthetic products (pain-prevention).

In 2007, Schering-Plough announced the acquisition of Organon's activities, and two years later, Schering-Plough merged with MSD. These developments are in line with the many mergers and acquisitions in the pharmaceutical industry of the last decade (Maggon, 2011, see also Table 1 Appendix I). Several factors that have driven these industry consolidations were: 1) due to expirations of company patents, acquisitions were necessary for strong portfolios with new products. 2) Reduction of inefficiency of research activities and 3) pursuit of economies of scale (Mittra, 2007). The merger of Schering-Plough and MSD finally led to the rescaling of R&D facilities worldwide (mainly to the United States) and the loss of 2175 jobs at the Organon facility in Oss.

For the region, the loss of almost 2175 employees at Organon was a 'bitter pill to swallow'¹. Besides losing employment, the loss of an important source of knowledge embedded in Organon meant a considerable loss for the Dutch knowledge society. In 2002, European leaders agreed to the 'Strategy of Lisbon' declaring that Europe had to become one of the most dynamic knowledge societies in the world. In response, the Dutch government initiated the "Innovation platform", to strengthen the innovation capabilities of the Netherlands ('innovatieplatform'). Reason for these developments is to stay ahead of international competition and ensure economic growth given an increasingly ageing population (Heilbron, 2011). In addition, Life Sciences & Health has been appointed as one of ten top sectors in business-policy of the government (Rijksoverheid, 2011). The Life Sciences & Health alone contributes 2.5% to the Dutch GDP, and 2.5% of the Dutch workforce are employed in the sector (Roland Berger Strategy Consultants, 2011) The closure of MSD-Organon was thus also subject to debate on the position of Netherlands as a knowledge society. MSD-Organon benefited financially from several governmental programs directed at supporting the pharmaceutical industry in the Netherlands. Some examples of these programs were the Top Institute-Pharma and the CTMM –program (Center for Translational Molecular Medicine) (Van der Hoeven, 2010). In reaction to the lay-offs, MSD came with a two-fold solution for both employees and the region (supported by (local) governments).

¹ Quoted from title of various press releases, 'bitter pill' became an often used metaphor to refer to the situation of Organon, and became a symbol for the protests held against the announced lay-offs at the facility in Oss.

First, a social plan was launched to support laid-off employees of the Organon facilities. Guided by the province of North-Brabant, a taskforce was set up to assist employees towards new employment. Second, the possibilities for re-development of the facilities for new business purposes were investigated. The goal was to retain both high-end employment in the region of Oss, as well as knowledge valuable for the Netherlands as a knowledge society. This finally led to the emergence of the Pivot Park in Oss. The social dynamics related to entrepreneurship on the park is the focus of this research.

1.2 Emergence of the Pivot Park

At the 20th of July 2010, immediately after the announced loss of jobs at MSD-Organon, a Taskforce Life Sciences Park Oss was established with the goal to investigate the possibilities of founding a life sciences campus on parts of the MSD location (MSD, 2010). The taskforce was composed of chairman Hans Kortlever (Senior vice president MSD and regional-director MSD mid-Europe), representatives of the ministries of Economic affairs and Social-health, Welfare and Sports, the province of North Brabant, the Brabant Development Society (Brabantse Ontwikkelingsmaatschappij), the municipality of Oss and strategy consultants (for complete composition see Table 2 Appendix I). The purpose of a Pivot Park was to provide a platform of innovative business opportunities (preferably) for ex-employees of MSD-Organon.

In response to a call for proposals, 89 business plans were submitted in the fourth quarter of 2010 which were evaluated by an approval commission for business viability (Commission of 'Wijzen'). On the first of July 2011, an intention declaration for the start of the Pivot Park was signed by the different representatives of the taskforce. The amount needed for the realization of the Pivot Park was 66 million Euros of which half was contributed by MSD, the municipality of Oss agreed to an investment of 4,6 million Euros and the province of North Brabant invested 10,8 million Euros. The remaining amount is contributed by the Brabant Development society, and the ministry of Economic Affairs and ministry of Health, Welfare and Sports (MSD, 2010). The park is an ecosystem with different lab-facilities and state-of-the art research-equipment, which can be used by all participants (www.pivotpark.nl). Three former research buildings were donated by MSD; the chemical building, the biology building and the 'kilo' building. According to the management, "the park will become an ignition point of open innovation". With open innovation, companies benefit from the knowledge and infrastructure of others in developing, producing and selling products and services (Chesbrough, 2003).

It is expected that the Pivot Park in Oss will provide employment opportunities for about 200 employees in 2012 with possible expansion to 400 jobs in the future (Personal communication B. Pauli, July 1st 2011). The first entrepreneurs on the park started in January 2012. The emergence of this science park fits with the new 'informational' economy that unfolds in the 21st century. As Castells and Hall (1994 in Carvalho, 2013) anticipated, economic and innovative hotspots will be gaining more and more importance for economic development in these decades. In fact, the total number of science parks in 2009 has already doubled in numbers to almost 375 science parks as opposed to ten years earlier (IASP, 2010). This research is thus also positioned in light of the increased importance given to clusters as knowledge locations.

2. Research Question

The acquisition of Shering-Plough by MSD, had far-reaching consequences for the R&D employees at the Oss facility (former Organon). The integration of the R&D activities mainly to the United States meant that valuable knowledge and collaborations within research teams were lost². In the pharmaceutical industry, R&D of new medicines or incremental improvements of medicines takes on average twelve years, this uncertainty is countered by companies partnering to make the R&D process more efficient (Buurma et al., 1996 in Van de Valk, 2004). Also, only 16% of drugs completes clinical testing and obtains approval (TCDD, 2010). The pharmaceutical industry is only part of the broader concept of the life sciences industry. In this research, the following definition of the life sciences industry will be used: ‘businesses whose work helps to improve the quality of human life through research, development, and application of biological processes, tools and advanced medical treatments’ (AEG, 2009).

In life sciences the R&D of pharmaceuticals passes through four phases (Nefarma, 2012). The research phase consists of the discovery (Phase 0) and exploratory development (Phase 1) of a medicine. In the early discovery phase, possible working connections of substances are pursued. Successful connections go into the exploratory development (Phase 1). The development process consists of the further development on patients (Phase 2) after which long-term clinical development takes place (Phase 3). Finally after registration and marketing, the medicines are tested in practice on long-term effects and efficiency (Phase 4). Within Organon there was a strong organization culture in which exploration of innovation was stimulated (in phase 0), an example is the free experimentation space which allowed the employees to collaborate with colleagues on informal projects. Organon and the employees were thus very much research focused. This research is concerned with the aftermath of the decision to abandon the R&D at the Oss facility. The focus is on the Pivot Park and the main differences for research employees who decided to engage in entrepreneurial activity at the park.

The working definition of entrepreneurship for this study is provided by Jarillo and Stevenson (1990): ‘entrepreneurship is a process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control’ (Swedberg, 2000: 9). The pursuit of opportunities in the role of entrepreneur is a new situation compared with the occupation as researcher at MSD-Organon. The entrepreneurial process consists of six steps (Mullins, 2006); first an opportunity is discovered; the second step is the assessment of an opportunity, whether it can be exploited; third, business planning in order to start with gathering resources for the company (step four). The fifth and sixth steps are managing the established business and harvesting value from it (see figure 1)

Figure 1
Entrepreneurial Process



(Source: Mullins, 2006)

² Personal communication Marina Brinkman

Founding a firm can be classified in a supply-side perspective and a demand-side perspective (Thornton, 1999). The supply-side of entrepreneurship looks at the individual entrepreneur, thus the supply of entrepreneurs.

The demand-side perspective looks at the context that determines what and how many entrepreneurial roles must be filled. The demand-side captures the infrastructure needed for entrepreneurship. Both perspectives are integrated in this research, besides the individual social network, the context of the geographic cluster in which the entrepreneurial activity takes place is of influence. The context is of influence on the start-ups at the Pivot Park: open innovation, in which collaborations (between firms on the park) are actively sought, is an important aspect of the Pivot Park (www.pivotpark.nl).

The research question central to this research is exploratory and the purpose of this research is to increase understanding of the entrepreneurial process on the Pivot Park, which aims to increase entrepreneurial opportunities for individuals with innovative ideas. The question is formulated:

How and why have former MSD-Organon researchers become entrepreneurs on the Pivot Park?

The research question is articulated to guide data collection and analysis. Different aspects of the new dynamics as entrepreneur will be explored using supporting questions, the first two questions involve the transition from researcher into entrepreneur; what type of entrepreneurs are involved in the Pivot Park and how did the transition take place. In the first two phases of the entrepreneurial process, the discovery and exploitation of opportunities is central. Insights in this transition will be explained by the following questions:

Who have taken the step to become entrepreneur?

How did the transition from researcher at MSD-Organon to entrepreneur take place?

After the discovery of opportunities, they will have to be exploited using different types of resources. The three forms of capital by Bourdieu (1986) can be used for this research to categorize the resources needed for entrepreneurs. Bourdieu identified three types of capital; economic capital, cultural capital and social capital. Economic capital are financial resources needed to start up a company, cultural capital are the knowledge and skills with which an opportunity can be exploited. Social capital is the connections that can be used to establish collaborations or acquire resources. The entrepreneur pursues opportunities in combining resources. These resources could be previously owned, such as labour and knowledge from the previous period as researcher or newly acquired. This leads to the following question:

What kind of resources do entrepreneurs dispose of and how are resources acquired they do not possess themselves?

The fourth question is about utilization of networks in the role of entrepreneur compared with the occupation of researcher. It is useful for this further research to grasp upon the basic terminology of networks. A network is a set of actors (called 'nodes') and connections between nodes. The actors in a network can either be persons, organizations, teams or concepts (Walker, 1988 in Witt, 2004). In network perspectives, the environment consists of a set of organizations

that are directly or indirectly connected and exchange resources. In the social sciences, the network perspective consists of transactions between actors in social systems.

This social network approach is a combination of the following network research (Kenis & Oerlemans, 2007): 1) the structuralistic network approach (Wellman & Berkowitz, 1988), 2) the embeddedness approach (Granovetter, 1985), and 3) the social capital approach (Burt, 2005).

Structuralism stresses the structures underlying human behavior. The point Granovetter (1985) makes is that almost all economic transactions between persons are embedded into social relations and are strongly influenced by them. Embeddedness of relations influences interactions; actors in networks prefer interactions with direct relations instead of unknown or indirect relations. Burt (2005) found the importance of the location of an actor in social networks; information advantages could be obtained through connections with actors.

In short, the social network approach states that relations and network positions could provide strong explanations for the behavior of actors and related outcomes (Oerlemans & Kenis, 2007). Linking social networks to the situation of the Pivot Park, it can be expected that networks are of influence on entrepreneurial activity. Since the life sciences industry is characterized by uncertainty and innovation, networks could be used to reduce uncertainty and increase opportunities for developing and delivering products or services to the market. The clustering of related firms on the Pivot Park is the context in which these collaborations and knowledge spillovers could be mediated. Since the park started in response to downsizing of MSD R&D facility in Oss, existing networks in the industry could have influenced the decision to start a business on the park. The employees at MSD-Organon possessed a network which enabled them to gain new knowledge from their ties. In their new occupation as entrepreneur on the Pivot Park, they retain their social network, but the use of resources and networks might be different.

How are networks utilized from the position of entrepreneur instead of researcher at MSD-Organon?

Collaborations can be important in the entrepreneurial process. Forming collaborations are related to both acquisition of resources (combining forces) as well as the network utilization, from which they could form. The fifth question explores for what purposes collaborations are formed and why they are formed. Looking for an explanation could clarify the importance of social networks even further; some entrepreneurs might be able to form collaborations which become very important for gathering resources. Collaborations among entrepreneurs on the park may also be formed due to their proximity and be used as tactic for survival in the difficult early years of a start-up. Insights in these aspects are provided by the following question:

Why and in what form are collaborations used by the start-ups at the Pivot Park?

Besides the possible differences in resource acquisition and social networks, there could be other differences between the positions of entrepreneur and researcher. Before they started their company, the entrepreneurs were always employed in a large organization and for a long consecutive period. Their new company can be based on a continuation of operations or a new idea. Furthermore, entrepreneurs may be confronted with many new aspects they never had to encounter in the previous situation as researcher. The final question explores the aspects that have changed in their new occupation as entrepreneurs.

What are the main differences between the operations of entrepreneur on the Pivot Park compared with the previous situation as researcher at MSD-Organon?

These guiding questions help to explore the differences throughout the entrepreneurial process between the role of entrepreneur and previous occupation as researcher. A case study research is the best method to answer the question at hand since the dynamic nature of the approach provides rich data and valuable details on the entrepreneurial process.

Since this research focuses on entrepreneurs and the dynamics of the (considerable) difference in occupation, studying the case of the Pivot Park in a natural setting is necessary for explanatory purposes; the Pivot Park is a critical contextual factor on the entrepreneurial process of turning science into business.

Relevance of this research

This research provides more insights in the entrepreneurial process at the Pivot Park, which includes the recognition of opportunities, the allocation of resources (cultural, economic and social capital) and exploitation of opportunities. The entrepreneurial spark was triggered by the decision of MSD to abandon the R&D facilities in Oss, which meant the dismissal of all high technology activities. Case study research in the field of entrepreneurship is very uncommon; there is a publication rate of only 3% using the case study method the last six years (Duxbury, 2012). This present research contributes in building case study evidence on entrepreneurship, which includes rich data and valuable details for both academics as well as actionable advice for entrepreneurs (Duxbury, 2012). This research also contributes in opening the 'black box' of entrepreneurship in the literature. Entrepreneurship is regarded by classic theories (e.g. Schumpeter, Knight, Mises and Kirzner) as an ingredient to understand how a market economy works (Klein & Bullock, 2006). According to Klein and Bullock (2006, 436), 'this resulted in *instrumentalist* concepts of entrepreneurship in which entrepreneurship itself is a black box'. This research thus focuses on that black box by looking at the entrepreneurial process.

Second, this research takes into account the dynamics of the social network in relation to entrepreneurship in a geographic cluster. In recent years, a lot of research has been conducted on the network approach as presented in Borgatti and Foster (2003). This research focuses on the social network perspective and its relation to the motivation to engage in entrepreneurial activity. Although a variety of network research has been done in relation to the success of start-ups measured in performance (Aldrich & Zimmer 1986, Brüderl & Preisendörfer 1998, Johannisson 1996, Jarillo 1989, Lechner & Dowling 2003, Ostgaard & Birley 1996). The motivation to engage in entrepreneurship in the first place, however has not been researched in relation to social networks. The emergence of the Pivot Park is a unique case of entrepreneurial activity since the start-ups are either just beginning or are still in the development phase of business formation. Furthermore, since it involves businesses in the life sciences industry which is characterized by a high degree of innovation and uncertainty (Mittra, 2007), the dynamics of the entrepreneurial process of exploiting opportunities and acquiring the right resources (financial, cultural and social capital) is of critical importance for the entrepreneur.

Finally, this research contributes to the debate on geographical clusters. Current literature describes that clusters can emerge either spontaneous or be driven from policy (Chiaroni & Chiesa, 2006). For the Pivot Park to be formed, a diverse set of actors, including the local and national governments, investment funds and MSD have supported the process to create the cluster. Although the perceived benefits for society are clear; economic development, science parks could also turn into “high-tech fantasies” (Massey et al., 1992). In these situations, parks are not developed in response to entrepreneurial drift, but have significant public funding and never really prosper. Evidence of successful parks (in terms of growth and/or interaction among entrepreneurs) shows that it is a fit between the location’s design and the spatial context in which the park is situated (Carvalho, 2013). This means that it is not necessarily the presence of only dynamic or urban regions including universities and other supportive institutions that makes a science park prosper (Tamasy, 2007). In the global and knowledge based economy, it is a challenge to create and sustain wealth, and the Pivot Park is a typical example to both retain and commercialize on knowledge in the region.

3. Literature Review

The theoretical concepts and literature used in this research were collected based on a grounded theory approach. The grounded theory approach was developed by Glaser & Strauss (1967) and in short is the ‘discovery of theory from data’ (1967: 1). The research approach is not a static process of first the literature review followed by the data collection. Instead it is a mixed deductive and inductive approach with a constant revision of literature based on empirical findings. Theoretical concepts are used to provide understanding of and explanations for the collected data. Using this approach, the research maintained an open character and data collection was not determined by the (possible) boundaries of previous theory. First, the dynamics of the geographical cluster as a network form are embedded in the literature, after which specific theoretical concepts related to entrepreneurship and the entrepreneurial process are presented.

3.1 Markets, Hierarchies, and Networks

“Where once there were pyramids, bosses, departments, troops, now there are webs, nodes, clusters, flocks. In companies whose wealth is intellectual capital, networks, rather than hierarchies are the right organizational design” (Stewart, 1997; 182)

The economist Coase (1937) formulated the question why organizations exist in a specialized exchange economy that (at least) the Western world is in. Barnard identified that organizations arise when conditions require more capacities than an individual can possess (1968 in Ouchi, 1980). These organizations need to negotiate for resources in order to meet the required conditions (the products and services). Coase pointed out the following:

In order to carry out a market transaction, it is necessary to discover who it is that one wishes to deal with (...) These operations are often extremely costly, sufficiently costly to prevent many transactions that would be carried out in a world in which the pricing system worked without any cost (Coase, 1960: 15)

Transaction Cost Economics (TCE) regards adaptation as the central problem of economic organization (Williamson, 1995). The transaction cost approach is initiated by Williamson in 1975 out of the earlier work by Coase (1937, 1960). It argues that organizations exist because they can mediate economic transactions between actors with lower costs than the market in particular situations. Within TCE, efficiency plays a crucial role; it determines the basis for existence of an organization. If an organization (regardless of the form) cannot mediate transactions at the lowest cost anymore, it will not survive (Williamson, 1995).

In Williamson’s theory (1975) two main characteristics of members in society are central: bounded rationality and opportunism. Bounded rationality is a concept by March and Simon (1958 in Scott, 2001) in which they recognize the cognitive limits of individuals; the information they have is only limited and this influences their decision-making. Opportunism is visible in taking advantage of a situation.

These characteristics determine the uncertainty and frequency of transactions and with it their costs: 1) due to bounded rationality of people it is uncertain whether all future contingencies are visible in a contract, “it makes it very costly to (...) describe the complete decision tree (Williamson, 1975: 23). 2) Opportunism puts limits on trust in the number of contracts. Two mechanisms for mediating transactions are identified by Williamson (1975): markets and hierarchies.

Markets

On markets, prices contain all the necessary information about a transaction. Market transactions are relationships characterized by a contractual relation. There is a transaction between two parties and this transaction is valued by a price. There are three types of contractual relations: the spot or sales contract, the contingent claims contract, and sequential spot contracting. The spot or sales contract is the simplest for contract; all obligations are fulfilled on the spot; thus something of value (e.g. a product or service) is exchanged for something of value (e.g. money) in return. Often both parties demand a contract which is also valid in the future; the contingent claims contract. However due to the uncertainty of the future, not everything of the contract can be specified or anticipated. The alternative for this problem is to have a series of contracts for short periods called sequential spot contracting. In market transactions one has to constantly take into consideration the bounded rational and opportunistic nature of human beings. Williamson (1975) regards contracting between organizations as a rational mechanism to counter these characteristics.

Hierarchies

To diminish the costs of contractual protections in markets, formal organizations can be created. In these situations organizations own both parties, thus for example ‘it makes little sense for one unit of General Motors to overcharge another’ (Scott, 2007: 227). Vertical integration does not have to be implemented throughout the value chain; relatively standardized parts can be brought in from outside the boundary of the organization (for example wheels and tires for General Motors). Between the extremes of the market and hierarchy lie some alternatives, such as hierarchical contracting and joint operating agreements. There are two principal advantages of the hierarchic organization over the market relationship. First, through the employment relations, the organization has a contract in which it can overcome the problem of dealing with the future by directing work activities day by day. Also by monitoring the employees’ performance, the problem of opportunism is minimized. The second advantage is that through an atmosphere of trust and commonality of purpose in the organization opportunistic tendencies are reduced. A hierarchical structure is well-suited for production and distribution; the clear departmental boundaries, authority and formal decision making processes are most effective in these lines of work.

Networks

Besides the two mechanisms identified (markets and hierarchies) there could be more mechanisms to explain the mediation of transactions as suggested by Ouchi (1980). He identifies a third mechanism, the clan form, in which there is the belief of shared interests. Through social mechanisms (interactions, relations) differences between individual and collective goals are reduced.

Besides the clan form, there is another distinctive form of organization. In his article *Neither Market nor Hierarchy: Network Forms of Organization*, Powell (1990) defines the network as a “distinctive form of coordinating economic activity” (Powell, 1990: 295). Table 1 presents a summary of the key differences between the forms markets, hierarchies and networks. In a network, some of the ‘goods or services’ exchanged possess qualities that are difficult to measure, for example knowledge. Furthermore the developed relations between parties are often long term, thus it is difficult to distinguish the parties as separate entities, as in a market transaction. These features make it problematic to regard this as market exchanges. In network forms, the transactions are indefinite and follow a pattern of interaction: individuals are engaged in reciprocal and mutually supportive actions. While in hierarchies the employment contract is important to communicate information, in networks relationships are important for exchange. Prices, used for communication in the market, cannot capture the exchange and transfer of learning and technological know-how (Powell, 1990).

One of the basic assumptions of network relationships is “that one party is dependent on resources controlled by another, and that there are gains to be had by the pooling of resources” (Powell, 1990: 318). Also, the value of commodities exchanged is often unclear in networks, for example know-how a particular style of production, or a spirit of innovation. These could not be traded on the market, nor communicated through a hierarchy. Examples of network firms are film and recording industries, craft industries and geographical clusters.

Table 1 Comparison of Forms of Economic Organization

<i>Key features</i>	<i>Forms</i>			
	<i>Market</i>	<i>Hierarchy</i>	<i>Network</i>	
Normative basis	Contract – Property rights	Employment relationship	Complementary strengths	
Means of communication	Prices	Routines	Relational	
Method of conflict resolution	Haggling	Administrative	Norm of reciprocity	
Degree of flexibility	High	Low	Medium	
Commitment among the parties	Low	Medium to high	Medium to high	
Tone or Climate	Precision and/or suspicion	Formal, bureaucratic	Open-ended, mutual benefits	
Actor preferences or choices	Independent	Dependent	Interdependent	

Source: Adapted from Powell (1990: 317)

3.1.1 Defining the network form of organization

Networks can be defined as a specific type of relation linking a defined set of persons, objects, or events (Knoke, 1982). The network form is a mechanism describing the mediation of transactions on an organizational level. If looked at the three forms from a structural perspective, the threefold typology is a false one (Podolny & Page, 1998). Markets and hierarchies can be regarded as two pure types of organization, which can be presented by the network analytical tools of nodes and ties. With these tools, a spot market can be looked at as a population of isolates in which every actor is a node without any ties.

A hierarchy can be viewed as a centralized network in which ties are connected to and from one particular node (the bureaucratic organization) (Podolny & Page, 1998). However, in this research, the forms are looked at in terms of governance.

Following Podolny & Page, the definition for the network form is:

“Any collection of actors ($N \geq 2$) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange.” (1998: 59)

The definition presented here includes joint ventures, alliances, and outsourcing agreements, but also business groups and geographical clusters. Now that the network form has been defined and distinguished from the two other types for economic organization it is useful to look at the different levels on which networks can be analyzed. This allows focusing on a level of analysis for the present research and draws boundaries to exclude irrelevant concepts.

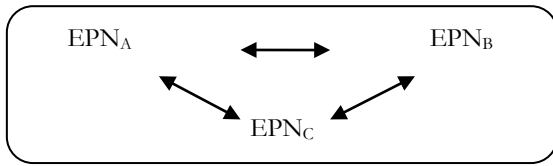
Levels of Organizational Networks

Networks can be studied in different ways; here the three levels of analysis are presented according to the theory of logical types (Copi, 1971 in Biggiero, 1999) (Figure 1). All three levels represent different collections of actors involved and different exchange relations are prevalent in the network levels. The first network level is concerned with single organizations (firms). At this level exchanges between workers (W) and Entrepreneurs (E) are analyzed. The exchange relations taking place are for example, labor in return for money, and information exchange. The second level views the organizations as elements instead of the individuals. Visible here are the inter-organizational relations and firm networks. All relations together comprise the entrepreneurial personal network (EPN). The final level concerns the firm networks as elements: Different networks of firms are connected to each other.

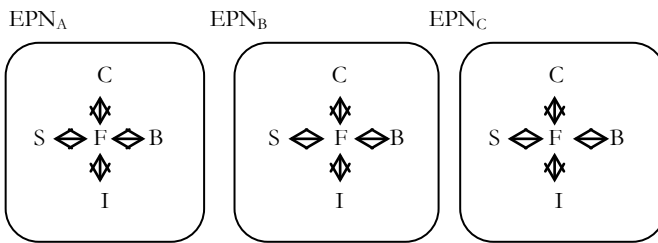
In this research the focus is on the entrepreneur and his or her inter-organizational network. By looking at the entrepreneur's network, the characteristics of the entrepreneur - the central node in this network - are relevant to provide insights in the decision to engage in entrepreneurial activity on the geographical cluster, the Pivot Park. In addition, the entrepreneur's network in connection with other entrepreneurial networks could provide insights in the motivations driving entrepreneurs towards new business venturing. Now that the boundary of the research has been established the entrepreneur and the network in which the entrepreneur is located is of importance. First, literature on geographical clusters as hyper-networks will be presented, including the conditions for failure and success. Second, entrepreneurship will be viewed from the sociological perspective. Finally, the dynamics of entrepreneurship in geographic proximity combines the literature on entrepreneurship and networks.

Figure 2: Three levels of Network analysis

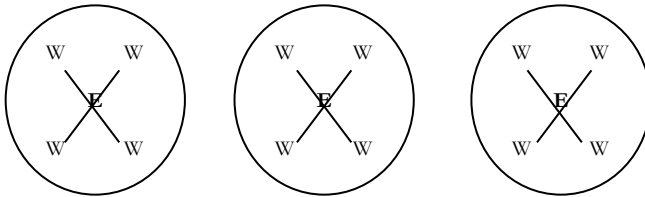
Level 3: Hyper Network



Level 2: Inter-organizational network



Level 1: Intra-organizational network



W = Workers, E = Entrepreneurs, S = Sellers, B = Buyers,
 C = Competitors, F = Firms, I = Investors
 EPN = Entrepreneur Personal Network.

Source: Adapted from Biggiero (1999: 74)

3.2 Geographical clusters: regional hyper-networks

Regional industrial cluster development has gained popularity as a form of economic development for regions, with Silicon Valley as a well-known example (Saxenian 1991, 1996). Research increased after Porter's book *The Competitive Advantage of Nations* (1990), in which regional clusters were found to play an important role in national economies around the world (Tan, 2006). There are three dimensions in any cluster: geographical proximity, networks between companies and networks with organizations and institutions. The underlying logic of these clusters is that through proximity of firms, spillover effects of knowledge and other resources will take place in addition to a network of different actors. First, the major theories of geographical clustering are outlined, after which the failure and success conditions of clusters will be presented.

Reasons why firms cluster can be explained by three main types of clusters identified by Gordon and McCann (2000): The first cluster type is labeled *pure agglomeration*. Second, the *industrial complex* model could be identified, and the third type of cluster is the *social network*, based on reduced transaction costs of cooperation. As concluded by Gordon and McCann, neither of these types can explain all observable clusters and the types may be combined in regions.

Agglomeration Theory

Marshall was among the first to identify that productivity of firms increases with location and proximity (1890; 1920 in Hofe & Chen, 2006). Three sources of advantages for industrial clusters were identified: knowledge spillovers between firms in geographic proximity; labor market pooling; and cost advantages by sharing of industry specific non-traded inputs. These advantages are only gained if firms belong to the same industry sector. However although clusters such as the Pivot Park gain from these three advantages, Gordon and McCann (2000) note: “Clusters differ from the agglomeration model in that clusters reflect not simply economic responses to the pattern of available opportunities and complementarities, but also exhibit an unusual level of embeddedness and social integration” (2000: 520). More on embeddedness and social integration will be discussed in the third cluster type, the social network model.

Industrial Complex

This second type of cluster model comes from the insights of Weber’s theory of the location of industries (1909 in Gordon & McCann, 2000). Weber focused on achieving economies of scale in manufacturing geography. The early literature focused on the transportation costs in relation to the location as only spatial transaction costs. Following this approach, the only reason why there are industrial complexes of firms is because it minimizes costs related to production. The complex can be regarded as a ‘closed club’, which makes recreation difficult due to the lack of necessary information on technology, innovation and markets. Examples of these complexes are oil refining, or in automotive engineering the Japanese Just-In-Time (JIT) complexes, for example Toyota City (Gordon & McCann, 2000).

Social Network Model

The social network model was a critique on the neo-classical economic approach of institutions. Williamson regarded the hierarchical organizations and institutions a “rational response to the transactions-costs problems” (Gordon & McCann, 2000; 520). As argued earlier, these problems evolved from the bounded rationality and opportunism of members in market transactions. Granovetter (1985) criticizes the economic models and argues for more importance of interactions between firms and that social transactions are embedded in economic behavior. . In contrast to the more general social structure of direct and indirect relations of the structural approach, the embeddedness approach focuses only on direct relations between two actors to gain information and transact resources. Granovetter states: “purposive actions are instead embedded in concrete, ongoing systems of social relations” (1985: 487).

3.2.1 Cluster Emergence

Besides the classification into types of clusters, one can also look at the reason for creation of a cluster. In this respect, clusters can be divided into policy driven clusters and spontaneous clusters (Chiaroni & Chiesa, 2006). With policy driven clusters, there is a commitment of several actors (governments, investment funds) whom create the conditions for a cluster to foster.

Spontaneous clusters, on the other hand, develop due to the spontaneous concentration of key factors (e.g. resources, supporting firms, or favorable legal framework) in a region. An example of a policy driven cluster is Uppsala in Sweden, which was created in response to the planned closure of the R&D centre of Pharmacia in 1996. Pharmacia was located in the Uppsala region since 1950, but merged with Upjohn which, at first, meant the transfer of all company research out of Sweden. In the end the transfer did not follow through, but by then there was already a foundation initiated for coordinating initiatives. In 2006, the Uppsala cluster consisted of 100 companies employing around 1500 people.

A second similar policy driven cluster is BioValley on the border of France, Germany and Switzerland. The cluster emerged due to the restructuring of Novartis in 1996 which led to the dismissal of 3000 highly qualified people. A BioValley 'Promotion Team' was set up by local governments, development agencies, private companies and universities. This support led to 150 companies in the region. A case of a spontaneous cluster was the Cambridge area, in which the cluster was formed in a high-tech environment of existing computer and electronics industry. The initial companies started on a Cambridge Science Park which had no vision of specifically attracting life sciences and biotech companies. Now however, the location is considered a biotech cluster and the region employs around 10.000 people in the 196 companies.

The case of the Pivot Park cannot easily be regarded as either a policy driven cluster or spontaneous cluster. The emergence was partly driven by policy in response to the restructuring of Organon by MSD. In this sense, the emergence is similar to Uppsala cluster and BioValley, where the region was also confronted with highly qualified unemployment. As with both policy driven clusters, the creation of the Pivot Park was also the result of collaborating actors, with participation of the Brabant Development Agency (BOM), the governments and private company MSD. On the other hand, the park also corresponds with aspects of a spontaneous cluster, with spontaneous concentration of key factors in the region. The most important factor, human capital (to start a company), became widely available after the dismissal of the high-knowledge employees. What comes forward in this case study is that the emergence of the Pivot Park is a unique case which cannot be categorized in either the purely policy-driven type or the spontaneous type. Deeper understanding on this particular cluster emergence is presented in the results section.

3.2.2 Success and Failure of Clusters

Expectations of the start-up of a cluster (e.g. a science park) are typically that it will contribute to re-industrialization or act as 'development catalysts' (Bigliardi et al., 2006). However, as shown by Massey et al. (1992) a cluster could also turn into a 'high-tech fantasy', in which there is no better performance of science park based firms compared to off-park firms (in terms of job creation, R&D investments or financial results) (Carvalho, 2013).

Before looking at factors influencing the failure of clusters, the conditions to form a cluster are laid out. Steinle and Schiele (2001) have identified necessary and sufficiency conditions based on the available literature. The necessary conditions for a cluster to emerge are the divisibility of processes and transportability of the product. Division of processes allows for specialization, these specialized tasks can be performed by coordination with other firms. If the firm is not bound to the location for their consumers it can group together in a cluster. The additional sufficient conditions foster the presence of clusters. The longer the value chain of a company, the more it depends on complementary actors (e.g. Toyota City with all automobile component suppliers clustered). Also, the more diverse the competencies needed, the more dependent a company is on coordination with other firms. Innovation is also a factor fostering clusters through knowledge pooling. Finally the volatility of the market could reward flexible adaptation in a network form of organization.

Geographical clusters do not necessarily become successful in retaining and creating wealth in a region. Breschi and Malerba (2005) also identify disadvantages of clustering in a region. First, a cluster might emerge not because of efficiency or knowledge spillovers but due to the constraint of the entrepreneurs' social networks. The networks determine what type of industry they enter and in what location, while a different location would better fit the business operations. Second, a cluster attracts a high number of similar firms in a region whom all have to compete for the same resources; this lowers the performance of the individual firms.

To conclude on the geographical cluster as hyper-network of interacting Entrepreneurial Personal Networks (EPNs), it is important to highlight again that when applying these three models on existent or developing geographical clusters, often a combination of the three types is applicable for clusters. The focus here will be on the third type (social network) prevalent on the Pivot Park, taking into account that elements of the other types also play a role in the cluster. Given the social network model and subsequent importance for social capital, the entrepreneur is crucial in an emerging geographical cluster. Clusters add three important mechanisms for boosting enterprises: 1) relationships, 2) legitimacy and 3) complementary relationships (Stam, 2006). These three mechanisms increase the perception of opportunities, and through relationships transaction costs are reduced which facilitates transference of resources. When focusing on the role of clusters in new business formation, the entrepreneur is the key figure in this process. Next, entrepreneurship from the social science view will be presented. After that, entrepreneurship will be positioned in a context of clusters and social networks. Finally the focus will be on the attributes an entrepreneur possesses which could be of influence in the business start-up process.

3.3 Entrepreneurship

After having distinguished the network as a distinctive organizational form, and the geographical cluster as a type of network, here theoretical viewpoints on the dynamics of entrepreneurship are presented. The working definition of entrepreneurship for this study is provided by Jarillo and Stevenson (1990): "entrepreneurship is a process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control" (in Swedberg, 2000: 9). A fruitful perspective of studying entrepreneurship is through social networks, acknowledging that economic behavior is embedded in social structure (Granovetter, 1985). Entrepreneurship in academic management literature however is often associated with psychological attributes (Klein & Bullock, 2006); it is regarded as an activity in

which some individuals are more successful than others. Before elaborating on those two perspectives, there are three phases a start-up goes through: 1) idea development; 2) organizing the founding of a firm; and 3) operations of the newly established firm (Greve, 1995). In the first phase the business idea is developed and social support is sought, in the second phase the entrepreneur takes practical steps. For establishment, they need capital, labor (competence) and distribution channels.

The third phase starts when the business is in operation. Interesting for this research is an observation made by Aldrich and Zimmer (1986): the position of an entrepreneur in social networks may determine the outcome of the founding process. These different phases all need different resources and different social requirements of the entrepreneur. Entrepreneurial attributes could be of influence for acquiring the needed resources. The resources and knowledge the entrepreneur is lacking, the complementary assets, have to be accessed using their social connections (Greve, 1995). In this case study, the entrepreneurs are science based entrepreneurs since they were all previous researchers working in the high-technology life sciences industry. This dynamic is relevant for the entrepreneurial process since these entrepreneurs have a tendency to overemphasize the scientific and purely technologic side (the ‘push’ of science), ‘thereby neglecting other key issues such as demands (‘pull’) of the marketplace’ (Renko et al., 2005; 252). Scientific discoveries are pushed on the market as potential product, while the market demands (‘pulls’) discoveries in other fields. In short, this overemphasis with the scientific side in the entrepreneurial process might prevail among the entrepreneurs on the Pivot Park since they were mainly involved in the very early research phase in their occupation at MSD-Organon.

3.3.1 Network Approach to Entrepreneurship

The network approach to entrepreneurship, initiated by Aldrich and Zimmer (1986), has become one of the most popular theoretical perspectives in the debate about self-employment, entrepreneurship and small business formation (Brüderl & Preisendörfer, 1998). This approach uses the social network perspective instead of the organizational network perspective. The social network perspective is constructed of different research conducted on 1) structuralistic arguments of networks (Wellmann & Berkowitz, 1988), 2) the embeddedness of social relations (Granovetter, 1973, 1985), and 3) the influence of social capital in networks (Burt, 2005).

Structuralistic Arguments

The structuralistic network approach argues that structural analysis should work *from* social structure instead *toward* social structure. Structuralism stresses the structures underlying human behavior. The goal is to study social structure and its consequences instead of gaining understanding. (Wellman & Berkowitz, 1988). The writers were among the first to propose that social structures can be represented as networks. This approach studies relations as the basic units of social structure instead of *attributes* of groups or individuals. The structuralistic network approach is thus a distinctive new form of structuralism. The approach could be regarded as one of the first “moves away from individualistic, essentialist and atomic explanations” (Borgatti & Foster, 2003).

Embeddedness of Social Relations

In his paper 'Economic Action and Social Structure: The problem of Embeddedness' (1985), Granovetter introduces social embeddedness in understanding economic behavior. According to the embeddedness approach, all economic transactions are embedded in relations. In contrast to the more general social structure of direct and indirect relations of the structural approach, the embeddedness approach focuses only on direct relations between two actors to gain information and transact resources. Granovetter states: "purposive actions are instead embedded in concrete, ongoing systems of social relations" (1985: 487).

Granovetter criticizes the transaction cost approach of Williamson (1975), as it is subject to two main limitations: 1) it under-socializes the actors involved in transactions, 2) the backward explanation of the economic purpose organizations 'must serve' is not sufficient to explain the need for contracts and transaction costs. Williamson overestimates "the efficacy of hierarchical power within organizations" (1985: 499). Granovetter gives the following striking (although highly simplified) example that is a metaphor for social relations:

Consider why individuals in a burning theater panic and stampede to the door, leading to desperate results... the situation is essentially an n-person Prisoner's Dilemma: each stampede is actually being quite rational given the absence of a guarantee that anyone will walk out calmly, even though all would be better off if everyone did so.

Note, however that in the case of the burning houses featured on the 11:00 P.M. news, we never hear that everyone stampeded out and that family members trampled one another. In the family, there is no Prisoner's Dilemma because each is confident that the others can be counted on (1985: 490).

To summarize, embedding in terms of Granovetter means: 1) Actors prefer interaction with direct relations instead of unknown actors, 2) Economic relations are part of a broader set of social relations, and 3) Existing relations are of influence on the establishment of new relations (Kenis & Oerlemans, 2007: 38).

Influence of Social Capital

Burt defines social capital as "the advantage created by a person's location in a structure of relationships" (Burt, 2005: 4). It can be used to explain how people obtain advantages because they are connected with other people. Burt regards social capital as an asset for people and places it in relation to network. Burt introduced the concept of structural holes in a network: Structural holes are "holes in the structure of information flow" (2005: 16). These holes present value-potential in that they are buffers for non-redundant sources of information in other parts of the network structure. If the network consists of many structural holes, then an individual can access many different actors whom are not connected with each other. This leads to different information flows from which an individual in a network could benefit. In the founding process, social networks stimulate entrepreneurship in their different functions of 1) providing access to information (through weak ties and structural holes), 2) giving access to customers and suppliers and 3) open the possibility for financial capital (Brüderl and Preisendörfer, 1998). In their research, Brüderl and Preisendörfer positively tested the 'network success hypothesis'. This holds that the social networks contribute to the success of newly founded businesses in the three ways stated here.

Translating these theoretical concepts to the context of the Pivot Park in Oss could mean that extensive network relationships are of influence on entrepreneurial activity. According to Granovetter (1985) “firms are embedded in networks of social and institutional relationships that shape and are shaped by their strategies and structures”. The logic behind this might be that because of the region’s geographical clustering of new firms, entrepreneurship and experimentation might be encouraged (Saxenian, 1996).

In line with the potential value of structural holes, Granovetter found the indirect or weak ties to be valuable in a network as well: “weak ties are assumed to provide valuable information, because it comes from distant parts of the social system” (Granovetter, 1974, 1983 in Brüderl and Preisendörfer, 1998).

3.3.2 Attributes of Entrepreneurs

After having discussed the social network approach of entrepreneurship it becomes apparent that the entrepreneur and his or her accompanying network is of importance in new business formation. The impact of Small and Medium Enterprises (SMEs) in western economies is significant. In the OECD countries, 95% of all firms are SMEs, which comprises of 60-70% of total employment. (OECD, 2005). This is a positive effect but small businesses are fragile which shows in the high failure rate: 40% in the first year and 90% over 10 years (Shepherd et al., 2000 in Peña, 2004).

The entrepreneur is the node with several connections, direct or indirect, which can be utilized throughout the founding process. In the network perspectives, however the attributes of the ‘node’ are neglected. As noted above, the social network perspective is developed out of the structuralistic network approach by Wellman and Berkowitz (1988).

The approach focuses on the units of the social structure instead of the attributes of groups or individuals. While the entrepreneur is presupposed to have a social network on which he or she can rely, the characteristics of the individual are neglected. For example the network perspectives based on embeddedness (Granovetter 1973; 1985) and social capital (Burt, 2005) only focuses on the dynamics of the network in the form of connections between nodes and their (lack of) ties.

A business start-up is a combination of human, organizational and relational capital elements (Peña, 2002). The relational capital of an entrepreneur is discussed above in the social network perspective of entrepreneurship. Organizational capital is concerned with the strategic decision making and market adaptation of the business. Here, the human capital elements are elaborated on. Human capital is an important intangible component in new firm survival and growth (Peña, 2004). It can be defined as the “personal attributes (i.e. knowledge, abilities, personality, health etc.) that allow human beings to function” (Peña, 2002; 184). Among the attributes, the critical success factors identified in the study of start-ups in the Basque country region were talent, experience and motivation (Peña, 2004). Talent, through knowledge by formal education level, is found to have a positive influence on profitability (Honig, 2001); it enriches the entrepreneurs’ human capital. Experience, through previous business ownership or management function is the second success factor. Through experience, situations could be recognized and handled efficiently through the learning capacity of the entrepreneur. Knowledge gained from education is enriched with business experiences.

Experiences that could have stimulated entrepreneurs to engage in entrepreneurial activity are a management position in a former company or previous entrepreneurial activity. Connection with people close to the entrepreneur, such as relatives or friends who have also gone through the process of starting a company could also be of influence for new entrepreneurs (Peña, 2002). An additional source of experience, relevant for the Pivot Park, is that entrepreneurs have the experience with the industry in which they start their new business. They already have knowledge about customers, suppliers and subsidies for example. The last factor, motivation is also a human capital element. A strong motivation is helpful to overcome the difficulties of the initial years. Motivation could be measured through hours invested in the business per week and from what position the entrepreneur has started. It could be because he/she could not find other employment or an entrepreneur could have chosen to quit from a job to engage in entrepreneurial activity, which indicates higher motivation.

In addition to the three attributes mentioned above, more psychological characteristics could be shared among entrepreneurs. In Begley and Boyd (1987) the following are identified for entrepreneurs: need for achievement, locus of control, risk-taking propensity, and tolerance of ambiguity. A need for achievement is visible through setting challenging goals and continuously wanting to improve their performance. Locus of control could be measured from internal to external; it indicates whether people perceive the ability to influence their lives (high internal) or that it depends on other contingencies (high external). Entrepreneurs have been found to possess a high internal locus of control, especially in combination with a high need for achievement (Rotter, 1966 in Begley and Boyd, 1987). Entrepreneurs also tend to exhibit certain risk-taking in their behavior; e.g. the founding of a new firm with high uncertainty is such a risk. The final psychological characteristic of entrepreneurs is a tolerance of ambiguity; they want to explore the novel and complex and they do not regard these situations as threatening (Begley and Boyd, 1987).

Relating these human capital elements and to the Pivot Park, it is interesting to see whether talent, experience and motivation prevail with entrepreneurs on the park and whether they have influenced the decision to engage in entrepreneurial activity. Besides human capital, social capital in the form of existing networks used for starting up a business could be identified by the entrepreneurs an important factor in the start-up process.

This literature review highlights the concepts relevant for entrepreneurial activity on the Pivot Park: the environment of a geographical cluster; the social capital in the form of the social network an entrepreneur possesses, and the personal background and attributes of entrepreneurs on the park. The literature review will be used in this explorative research to evaluate the differences between the role of entrepreneur and the previous situation as researcher. In the next section the method of data collection will be explained after which the data can be analyzed using the presented literature.

4. Methodology

4.1 Operationalization

The research presented here is based on a case study. The main purpose is to test the framework presented above based on the research questions. To find case study evidence, interviews are an essential source because this case study is about behavioral events (Yin, 2009: 108). In addition to interviews, company documents were used as a source of data. Documents were helpful in gaining understanding of the process of take-overs and the creation of the Pivot Park. This understanding proved very useful in the data collection through interviews with the entrepreneurs. In addition to documents and interviews, other sources of evidence were collected; newspaper articles addressing the changing role from researcher to entrepreneur and a radio interview about the emergence of the Pivot Park.

The type of interviews used as a source of data is the *focused* interview³(Yin, 2009), which are open ended interviews which were structured using a list of grouped questions in five categories (see appendix II). The categories are the background and experience at Organon, how and when entrepreneurship became relevant for the interviewees, the realization of the company, the interviewees vision on the Pivot Park and expectations for the future both of the company and for the industry.

Background and experience at Organon

The questions related to this topic serve to provide an understanding of the position and duties at Organon. From the literature it follows that previous management positions could be of influence on entrepreneurship; through experience situations are recognized and handled more efficiently (Peña, 2004).

Management experience could also make the transition from researcher to entrepreneur more natural, since through this experience people are already used to think strategically and be more comfortable in showing leadership. This topic also gives insights whether interviewees had an outlook on another job after their dismissal.

Becoming an entrepreneur

Questions on this topic give information on how entrepreneurship became relevant after the dismissal. The presence of the Pivot Park could be of critical importance since it makes the step to become an entrepreneur more easily. Also, the social capital of the interviewee could be of importance to be able to discover and exploit opportunities, which are the first steps in the entrepreneurial process (Mullins, 2006).

Questions in this topic also clarify whether collaborations with either ex-colleagues or other (known) parties are already relevant. The process of collaborations could follow the logic of Granovetter (1985), who states that purposive economic actions are socially embedded. Given the fact that the interviewees all come from the same organization in which there was a strong shared organization culture, these ties could still be relevant.

³ The interviews were conducted and coded in Dutch to keep the nuance of the meanings. In the analysis key passages are translated ,approximating the original text as close as possible.

The resources and knowledge the entrepreneur is lacking, the complementary assets, have to be accessed using their social connections (Greve, 1995). Questions are also targeted on what aspects the interviewees attract the most in their role of entrepreneur instead of researcher.

Realization of the company

Questions regarding this topic are a continuation of the entrepreneurial process. The focus is on the idea for the company; and its relation to their (former) position as researcher. Cultural capital, the knowledge for the firm is especially important for high-technology start-ups. In addition financial resources are needed, which is presumably a new aspect in the role of entrepreneur. Social capital could be a facilitating factor in acquiring both cultural capital (ex-colleagues as employees) and financial capital (having access into funding).

Vision on Pivot Park and outlook on future

These topics serve to gain information how entrepreneurs see their environment and their own company. Given the insecurity of the role of entrepreneur they could be skeptical about their environment, both the Pivot Park on which they are located as well as the life sciences industry which is characterized by uncertainty with only 16% of drugs completing clinical testing (TCDD, 2010).

Coding of all data was used to promote consistency in analyzing the interviews. The coding was performed using a computer assisted analysis tool (nVivo Edition 7). The procedure started with 'open' coding of the data to distinguish the different concepts in the data. After the rough data was coded, concepts of different abstraction were distinguished; using basic-level concepts and higher-level concepts (categories). The lower-level concepts provide details and relate to the higher-level concepts (Corbin & Strauss, 2008). The concepts guiding the coding of interviews can be found in appendix II.

4.2 Case Selection

The interviewees were selected based on the company list of the Pivot Park. At the time of selection of entrepreneurs, there were 17 companies physically present on the Pivot Park (company list provided in appendix III). From these companies eight companies were engaged in high-technology life sciences, while the other nine companies were service providers (Regulatory services, consultancy, accountancy and IT-support). From the eight life sciences companies, five were (co-)owned by previous employees of MSD-Organon. From the service companies, one IT-support company is co-owned by former MSD-Organon employees and one regulatory company is owned by a former MSD-Organon employee.

Criteria for selecting the interviewees were that, 1) they should be previously employed by MSD-Organon before their dismissal, 2) they should be entrepreneur in a life sciences industry, and 3) the firms should be located on the Pivot Park. These three criteria are formed on the basis of the guiding research question of this research. This led to five interviews with entrepreneurs on the Pivot Park. All five interviewees are already operational on the Pivot Park, one of which is involved in two companies (regulatory and life-sciences). The five entrepreneurs on the park are in different phases of the entrepreneurial process, which provides rich data for this exploratory research.

Finally, one of the interviewees is already registered as co-owner at the chamber of commerce but is having problems with obtaining the rights on their business idea from MSD-Organon, which was at the time of interview still very uncertain. The data collection process was done up until the point where sufficient data was acquired and I had accounted for most of variation in the concepts ('conceptual saturation') (Corbin & Strauss, 2008).

In addition to the interviews involving the Pivot Park, two supporting interviews were conducted. One with an entrepreneur who did not choose for the Pivot Park to start his company and one interview with the Licensing Director who was involved in the creation phase of the Pivot Park and provides an helicopter view on all initiatives that were submitted to start on the park, which were around 130 initiatives of which 54 business plans were accepted. This person was suggested by one of the interviewees. The interview data is supported with documentation in the form of two national newspaper articles, involving two of the interviewees and a recorded interview for the radio with one of the interviewees. These additional sources of data are included since it both provides richer data on the subjects, which positively influences the validity of this research. More on the validity standards in the methodological requirements below.

Table 2 Previous Occupations at MSD-Organon

Unit	Background MSD-Organon	Previous occupations
Entrepreneur A	1993 – 2011	Team leader different departments, executive director target discovery, site lead inflammation
Entrepreneur B	1990 – 2011	Bio-Organic Chemist (University of Leiden), senior research fellow
Entrepreneur C	1994 – 2011	Medical Information officer, Regulatory affairs officer, director global research strategy, head global labeling
Entrepreneur D	2002 – 2011	Research scientist, senior scientist, section head immunology, team leader
Entrepreneur E	1994 – 2011	Senior research scientist, research fellow
Entrepreneur F (not located on Pivot Park)	1998 – 2011	Senior research scientist, director research, assistant professor (University of Nijmegen)
Employee MSD	1990 – Present	Senior scientist, department head licensing director/integrator

4.3 Methodological requirements

There are no commonly agreed upon quality standards in case study research (Duxbury, 2012; Corbin & Strauss, 2008). For judging the quality of this research, I follow Yin (2009) in applying three of four tests of empirical social research: construct validity, external validity and reliability. The fourth test, internal validity, which looks at establishing true causal relationships is only relevant for explanatory or causal studies and not for exploratory or descriptive research.

Validity

Construct validity is established if the correct operational measures for concepts are identified. Critics on case study research often have the argument that subjective judgments are used to collect the data. For example with interviews there could be the problems of bias, poor recall and inaccurate articulation (Yin, 2009). Using a good structure in questioning can prevent a biased interview and ensures the interviewer gets the right data (see interview question list in appendix III). The second approach is to combine interview data with information from other sources. This triangulation of data makes study findings likely to be more accurate if based on different sources of information (Yin, 2009: 116). In this research, for three of the six interviews multiple sources of data were used to ensure construct validity. This data consisted of newspaper articles with interviewees about the changing role of entrepreneur compared with researcher and radio interviews on the emergence of the Pivot Park. Apart from the method of qualitative research, a literature research is conducted to present all relevant theory regarding the case study. The use of literature enables to relate the findings to a theoretical context.

The second type of validity relevant for this exploratory case study is external validity. This quality measure defines whether the study's findings can be generalized. Cases must be viewed as generalizable to theoretical propositions rather than populations (Duxbury, 2012) Furthermore, these generalizations are analytic rather than statistical in this qualitative research. The case study as presented here could be replicated in other contexts of entrepreneurship in geographical clusters. Other examples of policy driven clusters in the life sciences industry have been provided above (See literature review section 3.2, p.16). However it should be noted that the specific dynamics of the Pivot Park is an essential part of this research which cannot be replicated as such.

Reliability

The reliability measure is important in any research, especially in qualitative research because the goal is to "minimize the errors and biases in a study" (Yin, 2009: 45). Reliability of a research has the objective of allowing for repeatability with the same results. With the use of a similar interview question list for all interviews in addition to the use of computer assisted analysis reliability of data collection is increased. By providing the data coding scheme in combination with the interview question list (appendix II), which ensures the same procedures could be followed in other research. This demonstration of operations increases the reliability of this case study research.

5. Results

Cluster Emergence

In their article, Chiaresi and Chiesa (2006) identified two forms of cluster creation: there are either spontaneous clusters or policy driven clusters. Spontaneous clusters are characterized by the presence of key conditions out of which the cluster emerges. These conditions are nearby supporting firms, favorable legal framework and different resources. Policy driven clusters are fostered by the commitment of supporting actors (institutions, governments). The Pivot Park was initiated as a necessity by the different institutions involved, with two different incentives. The governmental bodies (BOM, ministries, North Brabant and Oss) support the park in an effort to retain and commercialize the valuable knowledge for both the region and for the Netherlands as the 'knowledge-society' they strive to be. MSD on the other hand, supported the park as a part of a two-fold lay-off plan (including social support to all other laid-off employees). They provided support to the park in the form of (unused) buildings, equipment and a financial contribution. The term '*circumstantial-necessity driven*' would describe the emergence of this cluster more accurately. The park was created in response to an event which triggered the participating actors to initiate the park as solution for the region. The laid-off employees, with specialized knowledge were a necessary factor to create entrepreneurial activity on the park. The resources needed for a cluster to emerge spontaneously are utilized by the entrepreneurs *only* in response to the policy driven conditions in which this activity was stimulated. With this case study there is thus interplay between policy driven conditions and spontaneous factors already present which led to the circumstantial necessity driven cluster to emerge. Given these unique aspects, this case study contributes to the existing cluster literature.

Entrepreneurial Process

The findings on the entrepreneurial process are presented in an objective narrative form in which quotations are balanced with conceptual explanations (Corbin & Strauss, 2008). The collected data will be related to theoretical concepts to explore the differences between the role of entrepreneur and researcher. The process of becoming an entrepreneur is captured in the research question guiding this study:

How and why have former MSD-Organon researchers become entrepreneurs on the Pivot Park Oss?

The Pivot Park emerged out of collaboration between the MSD, the municipality of Oss, the province of Brabant. Other contributors were the Brabant Development Agency (BOM) and the ministries of Economic Affairs and Health Welfare and Sports. Three former buildings were donated by MSD which are located on the MSD-campus, which is still open mainly as a production facility. The purpose of the Pivot Park is to provide a platform of innovative business opportunities. The selection of entrepreneurs consisted of all entrepreneurs who were already operational on the park, excluding entrepreneur E who was still in the uncertain of acquiring the intellectual property (see also section 4.2 Case Selection).

This chapter is divided in six sections of the different supporting questions of this research. The first two sections focus on the first phase of the entrepreneurial process, in which the transition between researcher towards entrepreneur is made. In the second section the allocation of the resources in the role of entrepreneur is focused on. Followed by two sections which explore the role of social capital and collaborations in the entrepreneurial process. Finally, in the sixth section the focus is on main differences of the positions.

5.1 Who have taken the step to become entrepreneur?

The relocation of nearly all R&D facilities from the MSD-Organon location to the United States meant the unemployment of around 2175 high technology knowledge workers. With the emergence of the Pivot Park, the employees had an opportunity to utilize their knowledge in a start-up. Engaging in entrepreneurship starts with the discovery of an opportunity, which requires a different mindset since opportunities are pursued without controlling the resources needed for exploiting the opportunities (Jarillo & Stevenson, 1990 in Swedberg, 2000) The entrepreneurs that decided to start a company after the dismissal at MSD-Organon have occupied different positions at MSD-Organon.

Most of the entrepreneurs were employed in the very early stages of research on pharmaceuticals and in this position they were only thinking as researchers. As an entrepreneur however, a market focus is needed in addition to the idea or technology. This is the second step in the life cycle; opportunities need to be exploited, otherwise they just remain what they are, ideas. This challenge for science based entrepreneurs is described by Renko et al. (2005), who states that these entrepreneurs tend focus on technology, they ‘push’ it to the market, thereby neglecting the needs, the ‘pull’ of the marketplace. This difficulty can also be found among at least one of the entrepreneurs on the park:

“I am not a born entrepreneur, I am researcher. Through the BOM⁴ I came in contact with someone who does know business. (...) Yes and if you combine that with someone who does have the knowledge about business, that helps a lot. He is also more convincing to investors. If you just come there as researcher, they are not very willing to believe you, that you... You do not have a track record. We are just trained in spending money!”

“(...) He [my business partner] might become CEO, because I do not have that ambition.”
(Entrepreneur B)

Another entrepreneur, who is a co-founder in a team of three, mentions this division of tasks as well. Entrepreneur D thinks of himself more as the practical ‘realizer’ of the idea, thus more on the technology side. The other two partners, he acknowledges are more the entrepreneur types. On this division of tasks he said: “That makes us a well balanced team”. These two examples show the competences that are needed to move from the discovery of the opportunity towards the exploitation of it.

According to the licensing director of MSD, who was involved with the early initiatives to start on the Pivot Park, the type of person was an important factor in who did become entrepreneur. The initiatives that developed into a start-up all possessed the combination of a good idea (an

⁴ Brabant Ontwikkelings Maatschappij, the Brabant Development Agency

opportunity) *and* the right people. Thus exploiting an opportunity required the right type of people; apart from the knowledge these people possess, they are important in attracting financial resources. Attracting the right resources proved to be a critical factor for all start ups (see section 5.3). On the entrepreneurs who had started on the park he commented:

“Sometimes you know it will work, within Merck we also see they are the experts, good guys. They have the knowledge and are outgoing”.

“These are all people who would have made a career within the company as well. If they would have needed a team leader at Organon, they would also pick these guys”.

The MSD-employee also confirms the market focus versus technology focus of the entrepreneurs. He argued that a market focus was needed for entrepreneurs to assess whether the opportunities could be exploited. This market focus was needed both for Merck to license out their intellectual property as well as attracting venture capitalists. Financial resources can only be obtained if there is a market for the opportunity, since these venture capitalists are familiar with the industry and know the uncertainty involved in the drug development process.

5.2 How did the transition from researcher at MSD-Organon to entrepreneur take place?

In this section the first steps in the entrepreneurial process on the Pivot Park are illustrated by the data. The transition from researcher to entrepreneur follows the path of the entrepreneurial life cycle; every company starts with the discovery of an opportunity. This transition to become entrepreneur is experienced differently by the interviewed entrepreneurs; on the one hand there is the typical researcher (Entrepreneur B) who has difficulties in adapting to his new role, and on the other hand there are the employees who were already in managing positions at MSD Organon (Entrepreneur A, C, E and F). For this group the transition appeared to be easier, from the statements below this difference is neatly articulated:

“(…) there are moments you think ‘I am thinking too much as a researcher, I should work more as an entrepreneur’. But time will tell. But hey, we are just trained to invent difficult things, but not so much to make money with something that is, well, more easy to realize.”
(Entrepreneur B)

“But I have not made that turn-around yet to think like that; to see opportunities in things. I am used to working on the long term. Off course, when it is going well it is a very lucrative business, then you can make hundreds of millions with it. But the chance to make it is very small”. (Entrepreneur B)

On the other hand there are the entrepreneurs with previous management positions at MSD-Organon:

“I had it [starting a company] in my mind for about ten years already; I just want to try it”
(Entrepreneur A)

“I always had a lot of ideas which were always embraced, although they were not always realizable within the organization. But I did have the feeling that I was an entrepreneur within a large company.”

“Two days after the announcement they were going to close up shop I already made a blueprint of what I was planning on doing and sent it to the United States.” (Entrepreneur C)

“On the one hand it is a pity that it is over; on the other hand you can just see this as an opportunity.” (Entrepreneur E)

“But I think that I already had those typical entrepreneurial skills for the most part, only now I can use them in full” (Entrepreneur F)

Entrepreneurs A, C and E were already in the process of opportunity discovery during their occupation as researcher/research director. The closure of the R&D facilities served as the entrepreneurial spark needed to start, further facilitated by the emergence of the Pivot Park. The experience of business ownership or management functions has been shown to have a positive influence on profitability (Peña, 2004). Through experience situations could be recognized and handled more efficiently.

These data from the entrepreneurs show there are different perceptions between ‘pure’ researchers (Entrepreneur B) and researchers with a background in management (See table II, p 24).

In the phase of assessing and exploiting the opportunity, social networks and collaborations gain importance for several reasons, these will be explored in the next two questions. Acquiring information and form partnerships can be important for the entrepreneurs on the Pivot Park.

5.3 What kind of resources do entrepreneurs dispose of and how are resources acquired they do not possess themselves?

After the discovery of an opportunity, gathering of resources is the next step in the entrepreneurial process. This supporting question addresses how resources are obtained. Since the entrepreneurs on the Pivot Park continue in the life sciences industry, a continuation of operations could be expected because of the field experience and they already dispose of required resources or have the connections to obtain them. On the other hand, insights can be obtained from the decision to exploit a completely different opportunity; this means they have to acquire new resources, such as cultural capital. Entrepreneur A decided to exploit a new opportunity:

“At first I was planning on developing new medicines, however there is no market for it. You only talk about a bunch that actually get the disease, however if you can prevent people to become ill, there are a lot of people who are potentially at risk. Then you are talking about diagnostics instead of medicines.” (Entrepreneur A)

This statement again reflects the issue of technology based entrepreneurs versus market based entrepreneurs. Contrary to entrepreneur B, who took his technologic knowledge as a starting point, entrepreneur A decided to look at the market (‘pull’) to decide on an opportunity for the company.

Attracting resources, especially financially, proved to be a challenge for all entrepreneurs on the park. The entrepreneurs have to rely mainly on investors, such as venture capital since normal banks are not suited for life sciences start ups. As entrepreneur A puts it:

“Then they say at a bank ‘we are thinking 50.000 euro’. That is a nice gesture but not enough, then I am back in two months or so.”

With dependence on venture capital to attract financial resources, collaborations and social networks become important. Entrepreneur E was able to attract investments through contacts with someone in the venture capital world, while two other entrepreneurs form a consortium of five companies to attract subsidies (more on these aspects in section 5.4 and 5.5).

The underlying logic of a cluster like the Pivot Park is that through the proximity of firms, spillover effects of knowledge and other resources will take place. Cultural capital, in this process in the form of knowledge and labor was attracted mainly through hiring ex-colleagues. Sometimes ex-MSD personnel were simply irreplaceable and critical for the success of the company:

“We use a particular technology and we have someone who masters that technology; he just had to be part of the company. There was no other option” (Entrepreneur D)

“My value is definitely in the people I select and which we will train on the job. That is my capital” (Entrepreneur C)

Social capital is important in attracting both economic capital as well as cultural capital. Both types of resources are acquired using social connections; (1) The entrepreneurs had the opportunity to retain the knowledge from MSD-Organon in their company by hiring former colleagues and (2) investments were acquired forming collaborations or using social capital. The following two sections will focus on the role of social networks and collaborations in the entrepreneurial process.

5.4 How are social networks utilized from the position of entrepreneur instead of researcher at MSD-Organon?

A recurring theme in the data was the acknowledgement of social networks as an important aspect in the entrepreneurial process. This takes the form of the network serving as just feedback in the business planning step or the network can be utilized for more strategic decisions. One of the interviewed entrepreneurs even regarded their network of crucial importance: “the key to our success is that we had a large network which paid itself off” (Entrepreneur D). Findings are related with theoretical concepts of the network approach on entrepreneurship.

The social network model on geographical clusters emphasizes the social transactions and interactions between firms. Based on this argument, combined with the shared background on the Pivot Park of being ex-colleagues, social interactions between entrepreneurs on the Pivot Park can be expected, perhaps even utilized to gain mutual benefits. One of the key features of the network form of organization is a climate of mutual benefits through a pattern of interaction. The collected data provides contrasting statements. On the one hand, social interactions among the entrepreneurs on the park are happening:

“I do gain insights from colleagues like ‘this might benefit you’ and how to do this and that.” (Entrepreneur B)

“I like the fact that I am working with my old colleagues. I also assume that when I need some advice or have some quality issues that I can go to my ex-colleagues.” (Entrepreneur A)

Also all six entrepreneurs are either currently hiring ex-employees of MSD-Organon or are planning on hiring them. This is because they know them from their MSD-Organon period and have specialized knowledge. However the transition to entrepreneurship did change the nature of the interactions on the Pivot Park:

“People walk in, with whom you exchange some thoughts, but on the other hand the world did change.” (Entrepreneur D)

“We are still very much focused on ‘let us get our own thing on the rails first’. But I am confident it will happen in the future.” (Entrepreneur A)

Reasons for this inward focus could be that all companies are still in the very early development, or the type of firm might not require collaboration with other firms on the park. This is a surprising insight based on the literature which assumes social support is sought in the first phase of the founding process (Greve, 1995).

An additional reason for this inward focus is the necessity to think as a business owner that needs to survive the first initial years. This urge for survival replaces ‘pursuing enduring exchange relations’, a characteristic of the network form of organization (Podolny & Page, 1998; 58). This argument is expressed by entrepreneur C:

“Well, if things are equal to each other than we will definitely work together with our colleagues here. However, if they are not we are... I mean we regard it as any commercial activity.”

Social embeddedness in transactions, defined by Granovetter (1985) as preferring interaction with direct relations instead of unknown actors, is not of critical importance for this entrepreneur.

These social interactions on the park aside, the social network is of importance in the entrepreneurial process. Greve’s (1995) argument that resources and knowledge the entrepreneur is lacking are accessed using social connections is confirmed in this case. This takes the form of hiring ex-colleagues, attracting business development specialists, legal support and other forms of support. These connections can either be direct ties or indirect ties, and the interviewees recognize that as an entrepreneur the social network changes. Thus the value-potential of the network increases by acquiring new information:

“Your network is definitely increasing, although I had a pretty decent network. It increases very fast and into different fields which were not relevant before. I meet people from my high-school and my time at university, with whom I have not had contact for a long time. And now I get something out of it.” (Entrepreneur A)

“(…) There are a lot of people who have a very large network. And if you just talk openly with these people, you simply get to new connections.” (Entrepreneur E)

“(…) Now you are confronted with so many new aspects; investors, different partnerships, and other institutions. So your network gets composed in a different way.” (Entrepreneur B)

What these statements show is that entrepreneurs extend their existing social network. Burt (2002) defines social capital ‘the advantage created by a person’s location in a structure of relationships’, from this position, the interviewees obtain new information and connections, they would not have needed in their position as researcher for example. This is an important finding and indicates the composition of the social network has changed. They accessed new information through their connections, which had not been reached before. This could indicate the presence of structural holes in the entrepreneurs’ networks. These structural holes serve as buffers of non-redundant sources of information in the network structure (Burt, 2005). In the role of entrepreneur new information was needed and accessed through their social network. A related point is that the entrepreneurs are also aware of their social network and the benefits they might get out of it. However they were not aware of the redundant sources of information they were able to access.

In addition to acquisition of new connections and information, social capital of entrepreneurs on the park is also used for more strategic purposes. Financial resources are of importance in the early stages of a company, and the following entrepreneur was able to open doors to investors by using his social capital:

“It was easy to get in contact with my ex-colleagues who are in this venture capital world. Using their experience they could see whether particular parties would be interested. Let me say it like this, it just helps as a first start. After that, doors open reasonably easy because these people also know that it is a serious party who facilitates the contact.” (Entrepreneur E)

To complete the analysis on social networks in the Pivot Park cluster, one should also take into account the argument made in Breschi & Malerba (2005), who show that clusters can have negative aspects as well. They argue that clusters might exist not because of the obvious advantages they bring (e.g. knowledge spillovers), but rather that social networks constrain where entrepreneurs start their firm and what industry they start their firm in. Applying this argument to the Pivot Park, this would mean the interviewed entrepreneurs would have explicitly chosen the park due to their network. This however does not show from the collected data; in fact their social network was not a decisive factor for location. The arguments in favor of choosing for the park ranged from financial reasons, pragmatic reasons of having (lab-) facilities available, as well as emotional reasons:

“We are independent from the park; we are solely approached on the basis of our personal reputation and our business. The only advantage of being here is purely financial; we could start with very low initial costs.” (Entrepreneur D)

“It is basically turn-key here, you can start immediately. You cannot find that anywhere in the Netherlands” (Entrepreneur B)

“Two reasons, emotionally it was difficult seeing the site vacant, I had a feeling of ‘we need to bring it to life here’. On the other hand, a very opportunistic reason; we can use all equipment and all reagents are preserved (...) that saves you two- or three hundred thousand start-up costs” (Entrepreneur A)

“But we are located here because we want to support the Pivot Park; we might get something out of it or maybe not.” (Entrepreneur C)

“There was no reason for me to be located on the park, I already have that network”
(Entrepreneur F)

Thus although social capital is important to acquire resources the entrepreneurs are lacking, it did not constrain them in their location choice. They explicitly chose the Pivot Park because it was the best choice due to (1) financial advantages of low initial costs and the fact that it is ‘turn-key’. (2) emotional reasons of recovering the worksite where they have spent many years working. or (3) pragmatic reasons of using old equipment and reagents needed for research activities. These, as well as the changing composition of the social networks, are important findings from the data. The changing composition of the social network confirms the theoretical concept of structural holes for this case (Burt, 2002; 2005).

The findings also indicate that social networks have not constrained the location choice for the entrepreneurs in this case study. It should be noted that personal and pragmatic reasons for choosing Pivot Park compared to other life sciences clusters (e.g. Leiden Bio Science Park, Utrecht Science Park) were a factor as well.

5.5 Why and in what form are collaborations used by the start-ups at the Pivot Park?

The underlying logic of a cluster like the Pivot Park is that through the proximity of firms, spillover effects of knowledge and other resources will take place. Acquisition of financial resources was the most important reason among the start-ups to form collaborations:

“You cannot do that with venture capital from investors, you will have to do it through collaborations with firm X, Y, Z.” (Entrepreneur E)

“You will not succeed on your own. Often you need to have a consortium to get a change for a particular subsidy. And if you go at it on your own, you can forget it.” (Entrepreneur C)

A consortium like discussed above is already formed between entrepreneurs on the park, in which five companies including the companies of entrepreneurs A and F have been granted a subsidy to collectively do research on infection diseases. Collaborations with old colleagues for support activities are also formed on the park. The entrepreneur (A) knows the owners of the IT-support from Organon and acknowledges that it is easier to collaborate because they know each other. This is an example from which proximity of firms (connected through the social network) could lead to mutual benefits.

For a science park it is important to have partners such as universities, medical centers or other institutions, to participate in the R&D process. Looking at other geographical clusters, Stanford University was of critical importance for Silicon Valley (Saxenian, 1996) and the University of Cambridge played a similar role in the biotechnology cluster in the region, where the initial companies started on the Cambridge Science Park (owned by the University of Cambridge) (Chiaroni & Chiesi, 2006). Partnerships are also important in the out-licensing of projects, in which small pharmaceutical companies are forced to license out their idea for clinical

development. This third phase of R&D is very expensive and requires a considerable logistic infrastructure to test the medicines on several thousands of patients⁵.

Different entrepreneurs acknowledge that the lack of such institutions in the region Oss could be problematic for the Pivot Park as a life-sciences cluster. Although the distance to Nijmegen (University of Nijmegen and University Medical Center) and 's Hertogenbosch (Jeroen Bosch Hospital) is small, there seems to be a barrier to form collaborations. In contrast, the entrepreneur who is located at the University of Nijmegen instead of the park was already involved with the university as part-time professor. They had a 'very close relationship', which was the basis for his company:

“We had a conversation (...) ‘we are getting more and more requests from the pharmaceutical industry to test substances, but we are not familiar with that’. Well, that is what I did for the last twelve years, so I am an expert on that.” (Entrepreneur F)

Another collaboration, which is continued in the start-up, is with entrepreneur D:

“In the USA we had a particular collaboration with Top Institute Pharma and we continued that here” (Entrepreneur D)

Social capital used for strategic purposes can also be seen in collaborations and partnerships. In the role of entrepreneur, nature of contacts changes. Collaborations are more focused on their company, instead a broader focus in their period at MSD-Organon.

“Now everything what you do in terms of collaborations should be related to your work. Back in the days it was more like ‘you know what, this is just a connection to that academic group, with whom we like to build a relation’.” (Entrepreneur D)

This changing perception is another aspect of the transition from researcher into entrepreneur. In conclusion, reasons for forming collaborations by entrepreneurs are for the acquisition of resources and for more strategic purposes, like the partnering of an entrepreneur (B) with someone more affiliated with the business side of entrepreneurial activity. But also the changing focus of contacts indicates a more strategic view on collaborations. For entrepreneur E, the collaboration as part-time professor even developed into the basis of the company.

Besides the allocation of resources and changing composition of networks, the formation of collaborations is the third aspect that is shown to be different in the role of entrepreneur. The final supporting question will focus more on the main differences between researcher and entrepreneur.

5.6 What are the main differences from the position of entrepreneur at the Pivot Park compared with the position of researcher at MSD-Organon?

This final question focuses on the type of operations of the new start-ups at the park; what the differences are in the *position* of entrepreneur compared to researcher. This question also focuses on the transition from a large organization with a strong 'Organon-culture' into self-employment.

⁵ Personal communication MSD-employee

The data shows that five of the six entrepreneurs continue part of their operations in their new company. For example entrepreneur D and E continue with projects they were working on as researcher at MSD-Organon. For the interviewed entrepreneurs their experience at Organon is still a fresh memory, either as emotional reason to start on the park, 'to bring it (the site) back to life' (Entrepreneur A), or in their role as entrepreneur:

"Now I realize how special it was; what we did was really *something*" (Entrepreneur F)

"I have to say, the way of working has not changed much. There are only a lot of new aspects, more responsibilities. But the way of doing research does not change." (Entrepreneur D)

Within the company of entrepreneur D they really want to break with the traditional Organon-culture by hiring people without a past at Organon. Entrepreneur A also acknowledges this:

"My colleague and I came back from vacation and both were motivated to go back to our business; but we entered the site and became depressed with what you see here." (Entrepreneur D)

"If you only work with old colleagues, you have the risk of people saying 'this is the way we always did it'. With a mix you have both the knowledge and experience of the old colleagues as well as new people whom can be trained." (Entrepreneur A)

New tasks and responsibilities are what all entrepreneurs see as a new dynamic of having an own company. The freedom and versatility as an entrepreneur are new aspects and the most positive differences. The difference of having decision power is a positive aspect compared to functioning in a large organisation. Different entrepreneurs experienced bureaucracy and inability to think outside of the box at MSD-Organon, which is in contrast with their position as entrepreneur. Negative differences are the uncertainty and (financial) risk of having an own company, more personal arguments prevail here:

"What financial risk do I allow, it will be a real disappointment if it fails, but if it fails you cannot end up on the streets. I still want my children be able to study." (Entrepreneur A)

"We need an investment of years, with the risk that you end up with nothing in the end." (Entrepreneur B)

"Like I already said, savings are not endless, and I also have a family that needs to be taken care of." (Entrepreneur E)

Starting a company has thus brought positive aspects of versatility in tasks, decision power and the feeling of really having 'something of your own'. The other side of entrepreneurship is uncertainty and risk, which is also felt by the interviewees. The entrepreneurs acknowledge these risks and take into account their personal situation. Also still present is the period at MSD-Organon; either in a continuation of operations or in the desire to explicitly break with the organization culture in their new company.

6. Conclusion

The entrepreneurs at the Pivot Park turned science into business; that is, they made the transition from researcher to entrepreneur after the closure of the R&D activity at MSD-Organon. This research explores both the supply-side (the entrepreneur) and demand-side (the cluster setting) of entrepreneurship. Based on the results of this exploratory case study a deeper understanding in the entrepreneurial process on the Pivot Park is gained. In this conclusion the research question will be answered:

How and why have former MSD-Organon researchers become entrepreneurs on the Pivot Park?

The emergence of the Pivot Park as a cluster is analyzed given the existing literature on cluster formation. Proposed in this research is an additional form of cluster creation which is applicable on this particular case study. Whereas spontaneous clusters emerge out of already present conditions such as resources and supporting firms and institutions (e.g. a university or medical center), policy driven clusters rely on critical support by supporting actors. The particular case of the Pivot Park is a hybrid of both presence of the right conditions as well as the policy driven activity. The Pivot Park is a unique case which can be termed a ‘circumstantial-necessity’ driven cluster. There is an interplay between different factors in response to a particular circumstance; the closure of R&D at MSD-Organon. This circumstance together with the stimulating policies resulted in the emergence of the Pivot Park. The supply-side of entrepreneurship, the unique context in which it emerged, will be of influence in the coming developing years. The park will have to gain a ‘critical mass’ to be able to survive in this globalizing landscape, which also means the dispersion of knowledge (Bartholomew, 1997).

Below the four main differences between the role as entrepreneur compared to researcher will be summarized. After which some directions for further research will be suggested based on this exploration into entrepreneurship in a cluster setting.

Transition into entrepreneurship

The first steps in the entrepreneurial process are the discovery and assessment of an opportunity. At least two findings proved to be important in these first two steps of the process. Being able to exploit a discovery (irrelevant of industry), depends on the demand for a product or service. Science based entrepreneurs have a tendency to focus solely on their technology as opportunity and thereby neglecting the market for their technology (Renko et al., 2005). This technology-push versus market-pull is also a struggle for the entrepreneurs on the park. Some entrepreneurs explicitly looked at the market and exploited an opportunity based on market demand (e.g. entrepreneur A). While other entrepreneurs are still thinking as researchers, and perceive it as difficult to be able to harvest value from their business.

Besides the technology focus versus market focus previous experience in management positions was a factor of influence in the transition. The findings showed that entrepreneurs who had occupied management positions saw the emergence of the Pivot Park as an opportunity and indicated they already felt an entrepreneur in their positions at MSD-Organon. In addition, some

entrepreneurs were already in the process of opportunity discovery (step 1) during their occupation as researcher.

Allocation of resources

Gathering resources is the next step in the entrepreneurial process, these resources needed are classified following Bourdieu (1986): economic capital, social capital, and cultural capital. Attracting economic capital proved to be a challenge for all entrepreneurs on the park. The start-ups all need considerable investments and they have to rely on investments such as venture capital, commercial investors and subsidies. Cultural capital is an important aspect for the innovative start-ups on the park, since knowledge is specialized and highly-educated labor is needed. On the park, five of the six entrepreneurs continue at least part of their operations. This could either be a continuation of projects they were working on as researchers at MSD-Organon or entrepreneurs continue in the same field of expertise.

The knowledge they did not dispose of was attracted mainly through hiring ex-colleagues. These are in some companies even critical for the success of the company but on the other hand the old 'Organon-culture' is seen as a threat for creativity. The Pivot Park clearly marked a new beginning for the entrepreneurs, and they realize the 'Organon days' are over. Instead of introducing fresh perspectives in the start-up, there is the threat of continuing along old patterns. For one entrepreneur, being located in their former work environment was even somewhat 'depressing'⁶. In innovative start-ups, exactly those new inputs can be valuable as stated by some entrepreneurs (entrepreneurs A and D). Some companies respond to this threat by hiring a mix of ex-MSD-Organon and new employees.

This research showed that despite of a discovery the transition to becoming a business or attracting resources is still dependent on the type of person. This was both acknowledged by the observations of the licensing director at MSD as well as from the entrepreneurs who used their network to provide them with critical connections for the company. Especially in attracting financial resources, the reputation of entrepreneurs could be a decisive factor according to the licensing director.

Changing composition of networks

Social capital is an important factor for the start-ups on the Pivot Park, although interactions on the park itself are still marginal. Social networks are utilized for acquiring resources and knowledge the entrepreneur is lacking, for example legal support, hiring ex-colleagues or mediation with investors. The entrepreneurs state their social network changed in the role of entrepreneur. They accessed new information through their connections, which had not been reached before. This indicates there are buffers of non-redundant sources of information in the network structure; structural *holes* (Burt, 2005). Only in the role of entrepreneur these sources of information are needed and accessed through their social network. Social embeddedness in economic behavior, as introduced by Granovetter (1973, 1985) could reasonably be expected among the entrepreneurs on the park. All entrepreneurs are former colleagues of each other and some were even in the same project teams. However, this type of interaction was not visible on

⁶ Full statement by entrepreneur D: "My colleague and I came back from vacation and both were motivated to go back to our business; but we entered the site and became depressed with what you see here."

the park; from interviews it showed a more 'hardened' business mentality of reflected in statements as "the world did change" and "let us get our own thing on track first". An explanation for this lack of embeddedness, apart from different operations, could be the very early development phase in which the park and the companies are in. The entrepreneurs were still very much inward focused and the 'open innovation' character of the park is not yet the case (see Further Research below).

Social networks can also constrain the location choice of entrepreneurs, which is a negative aspect of a geographical cluster (Breschi & Malerba, 2005). The networks of entrepreneurs could limit location choices, leading to a sub-optimal cluster in which similar firms have to compete for the same resources, in the end resulting in lower performance. On the Pivot Park however, the social network itself was not an important factor for locating in Oss. Reasons among the entrepreneurs were financial reasons, pragmatic reasons of having facilities available as well as emotional reasons of recovering the old worksite.

In conclusion, social capital proved important in all steps of the entrepreneurial process. It is a linking factor which facilitated partly the allocation of cultural capital and financial capital. Utilizing their social network, the entrepreneurs attracted old-colleagues, were connected with investment opportunities and for one entrepreneur a connection was even the basis for the company (entrepreneur F).

Forming collaborations

A recurring theme from the interviews was the acquisition of resources. Collaborations are important for both resource acquisition as well as knowledge pooling. A consortium is established including two start-ups on the park to receive a research subsidy. In addition, at least two entrepreneurs continue their collaboration in their new company (entrepreneur F with University of Nijmegen and entrepreneur D with Top Institute Pharma).

The formation of collaborations will continue to be important for the Pivot Park. Entrepreneurs acknowledge partnerships will have to be formed with universities, medical centers and other institutions (including large pharmaceutical companies) for knowledge and cost pooling in the R&D process. Geographical distance, however small, is a mental barrier where institutions tend to focus on themselves. An important task for both the park management as well as the entrepreneurs is to establish the park as a mature potential partner in the future. It should be noted that a cluster's transition into the maturation phase often takes a long time (Stam, 2009). Both the Uppsala cluster and the BioValley cluster passed through difficult initial years before they gained a critical mass and became an established life sciences cluster.

This research explored how entrepreneurs on the Pivot Park turned science into business in response to the closure of (nearly) all R&D activities at MSD-Organon. The research question contains both a descriptive part and an explanatory part. Above the description of the entrepreneurial process was provided. The findings provide insights into the different aspects in the role of entrepreneur at the Pivot Park; these aspects are found to be the allocation of resources, changing composition of networks and the formation of collaborations.

Conclusions on the reasons for entrepreneurship are provided based on the entrepreneurial process. The decision to engage in entrepreneurial activity is related to the ability of allocating resources, utilizing social capital and forming collaborations. The entrepreneurs on the park discovered an opportunity in their role as researcher, and often this opportunity is in their field of expertise. To be able to exploit the opportunity, the entrepreneurs used their social network. It is utilized for assessing the opportunity, getting new connections, attracting resources or forming collaborations.

The Pivot Park as a geographical cluster

The Pivot Park in Oss as a cluster of open innovation is now on an important point in time. As can be concluded from this case study, a reason why the park has not yet bloomed as an ignition point of innovation is attributable to the very early phase the start-ups are in. The data showed collaborations are an important factor in the entrepreneurial process in the life sciences industry in general, although they are not as much formed on the Pivot Park itself as might be expected for a cluster. On the Pivot Park the companies are related and the entrepreneurs know each other, however a ‘park culture’ of interaction among the entrepreneurs is not yet established. After the entrepreneurs turned science into business, the task awaits of developing their company and the Pivot Park into maturity and harvesting value. This case study thus contributes to the existing cluster literature by focusing on the early phase of a cluster; it enriches the discussion on geographical clusters by sketching a picture of challenging initial years for the entrepreneurs. In this early phase their main focus is not so much on ‘creating the next Silicon Valley’, but on surviving as a start-up in the life sciences industry; with or without the help of others and through with or without ‘socially embedded transactions’.

Directions for further Research

This exploratory research allows for further research into the four main differences of the transition into entrepreneurship, both in a more quantitative way or in other contextual settings. Theoretically, two findings are interesting for gaining more understanding in the entrepreneurial process. First, a key finding is that despite of an opportunity discovery it depends on the type of person whether science actually turn into business. More research on the demand side of entrepreneurship (other industries other contextual situations) is needed to test this finding in other contexts. This case study is very specific in that another context might influence the opportunities for entrepreneurship more positively (more cluster advantages) or negatively. On the supply side, the connections and backgrounds of entrepreneurs could be related to the opportunities they are able to pursue. As this research showed, both in the industry and on the entrepreneurial level networks play a role. Social capital connected entrepreneurs with crucial financial resources and knowledge; utterly important factors in the life sciences industry. A direction for further research could be to zoom in on the motivation of an entrepreneur (apart from the opportunity); it could be influenced by their background (entrepreneurs among family and friends), or other decisive events (e.g. conversations, simple luck).

In addition, this line of research could focus more on the psychological attributes of *who* is the entrepreneur, as briefly introduced in section 3.3.2. The network approach of entrepreneurship is a very structuralistic approach focusing on the relations as units of social structure instead of attributes. Research into the type of person engaging in entrepreneurship can therefore provide novel insights and contributes in opening up the ‘black box’ of entrepreneurship.

A second suggestion for further research is on social networks relating to entrepreneurship. This research showed that social networks were critical in the entrepreneurial process however they are not of importance (yet) in facilitating interaction on the park. Although social support is sought in the first phase of the founding process (Greve, 1995), interactions between entrepreneurs on the Pivot Park are not utilized to gain mutual benefits. In a later stadium of the Pivot Park (assuming growth) more quantitative social network analysis⁷ could be conducted to expose patterns of interactions. Such analysis is also interesting to see whether a ‘park culture’ mentioned above did emerge. More generally, testing social embeddedness in transactions in the very early stages of a firm could provide new insights in Granovetter’s work. As stated by Granovetter, his ‘embeddedness argument is a rather proximate one’ (1985: 506); applying his approach in early development stages of firms might give different outcomes.

⁷ For more quantitative measurements of social networks see: Brüderl and Preisendörfer (1998) (strengths of ties in a network) or Johannisson (1996) (assessment of primary network)

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Appendix I

Table 1: Major Acquisitions in Pharmaceuticals 2005-2011

Company	Target company	\$ billion	Technology/product
Pfizer	Wyeth	68	Prevnar, Enbrel Pharmaceuticals
Merck	Schering Plough	41	Pharmaceuticals
Bayer	Schering	19.7	Pharmaceuticals
Schering Plough	Organon	14.5	Pharmaceuticals
Takeda	Nycomed	13.6	Pentaprazole, Daxas/Daliresp
Gilead	Pharmasset	11	Hepatitis C

(Source: Adapted from M&A Review, 2011)

Table 2: Composition Taskforce Pivot Park

Hans Kortlever	Senior Vice President en Regionaal Directeur Midden Europa MSD
Benno van Dongen	Partner Roland Berger Strategy Consultants
Guido Landheer	Directeur Ondernemen Ministerie van Economische Zaken
Hugo Hurts	Directeur Geneesmiddelen en Medische Technologie Ministerie van Volksgezondheid, Welzijn en Sport
Jan Pelle	Directeur Brabantse Ontwikkelingsmaatschappij
Lily Jacobs	Gedeputeerde Economie, Duurzaamheid en Arbeidsmarktbeleid Provincie Noord Brabant
Jan van Loon	Wethouder Economische Zaken Gemeente Oss

Appendix II

Table 3 Codinglist Interviews

Category	Basic-level concepts
Business Idea	Business idea development
	Doubts about idea
	Idea explanation
Entrepreneurship	Entrepreneurial background
	Entrepreneurship process
	Motivation for entrepreneurship
	Personal reasons for Pivot Park
Industry	Industry history
	Industry trend
	Sceptism on industry
	Sceptism on trends
Motivation	Motivation for entrepreneurship
	Personal challenge
	Personal Characteristics
Network and Collaborations	Collaborations
	Entrepreneur Network
	Personal contact with MSD employees
Organon Period	Opinion on take-overs
	Organon experience
	Organon mindset
	Period of take-overs
	Position and duties at Organon
Period of Unemployment	Perspective on new employment
	Unemployment workforce
Position differences and continuations	Continuation of duties
	Differences
Pro's and Con's of Pivot Park	Con's Pivot Park
	Critique on distance
	Opinion Pivot Park
	Opportunities Pivot Park
	Other locations
	Pro's of Pivot Park
Resource Allocation	Cultural capital, resources
	Financial resources

Appendix III

Company List Pivot Park (as of June 12, 2012)

Life sciences related

- BioAxis Research
- BioConnection
- BioNovion
- 3D-PharmExchange
- ModiQuest
- PharmaCytics
- Okklo Life Sciences
- PRRIL Holding

Other companies

- Arnold & Siedsma
- FMD (Financiële Management Diensten)
- Hulshof, Kroonen en Groen
- Maetriq
- Metisz
- Rescop
- Vivenics
- De Vries & Metman
- Zwieters Regulatory Consultancy