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Faculty of Business Economics

Master of Management

Master's thesis

Innovation drivers for Dutch businesses

Erik Toemen

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization International Marketing Strategy

SUPERVISOR :

prof. dr. Bart LETEN

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Abstract

Innovation is considered to be one of the most crucial elements for having successful economic development. At the moment the Netherlands is among one of the leading innovators in the world. There is however some critique from the European Union on the current Dutch policies concerning tax credits for innovation. Additionally, the R&D expenditure of Dutch companies within the Netherlands is lagging behind compared to other European countries. The objective of this exploratory research is thus to understand what drives innovation within the Netherlands. For the Dutch government it is crucial to get a better understanding of this topic in order to improve the current policies and enhance innovation within the Netherlands.

In this research an extensive literature review is conducted in order to review which factors might be drivers or barriers on innovation within the Netherlands. Subsequently, a principal component and regression analysis was conducted on questionnaire data from the governmental funded strategic innovation project. As a result, six internal drivers were found that have a significant effect on innovative performance. However, due to unsatisfactory data on the external drivers and barriers found in the literature, more research is needed in order to obtain an appropriate statistical model where the internal and external drivers and barriers are combined.

Keywords: innovation, innovative performance, drivers, Netherlands, policy, capabilities.

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Background

Innovation is an upcoming topic in many articles. But why is innovation so important? According to Smit et al. (2010) Innovation is one of the most crucial elements to having successful economic development of regions. Studies of Acs (2002) and Brusoni et al. (2006) have established a clear relationship between innovation and regional economic growth. As a result, innovation has a positive effect on competition diversity, employment growth and education systems (Smit, 2010). In addition, Innovative businesses are able to come up with radical innovations that gain them access to new markets creating more jobs, economic growth and opportunities. Furthermore, innovation can help develop solutions to the ever-increasing social issues like the growing global food demand, ageing populations and the overall health care system.

At the moment, the Dutch enterprises are according to the OECD ‘’among the world’s leading innovators with strong technical capabilities and performance’’. However, Dutch companies as a whole invest less in R&D and knowledge-based capital than other countries with advanced innovation systems. Figure 1 shows the different performance indexes where the Netherlands is compared to the middle range of the other OECD

countries. On almost all topics the Netherlands scores high, except on Business R&D expenditure.

Figure 1

According to the OECD, Dutch companies have to broaden their base for innovation and participate in more innovation activities. In addition, they have to collaborate more with knowledge institutes in order to compete with other advanced countries. Furthermore, the OECD states that the current Dutch innovation systems are well-designed but they do not serve all the varying needs of the different business sectors. This is mainly because there is too much focus on tax credits and subsidies for innovation. Critics like Oxfam Novib and the European Union declare that this focus on tax credits and subsidies is mainly to create a favorable tax environment in order to attract more business. This, whilst there is

doubt among many researchers that these innovation tax credits and subsidies contribute effectively to innovation. Especially the so-called innovation box, an innovation tax credit system is under a lot of pressure. According to Oxfam Novib and recent research of the OECD, the innovation box is one of these Dutch policies that leads to unhealthy tax competition. Under the Dutch innovation box regime, eligible income is taxed at an effective rate of 5 percent rather than the top corporate rate of 25 percent. This cost the Netherlands over a billion in missed taxes and is expected to increase the coming years. In addition, the OECD concluded that the innovation box and other subsidies might not be effective policies to stimulate innovation and R&D within the Netherlands. These policies are supposed to encourage innovation. However, there is a high risk that these policies lead to tax avoidance while they do not lead to innovation. (OECD, 2014). Additionally, the Rathenau Institute concluded that fiscal benefits are not decisive incentives to stimulate innovation. They state that drivers like existence of knowledge, researchers and possibilities for cooperation are much more important. (Loeff, 2016)

However, even with the ongoing criticism of the Netherlands being a tax haven, the government decided not to change their policies and only make minor changes for 2018. According to Oxfam Novib the Netherlands is keeping its policies and the innovation box out of fear that companies will leave the country or that innovation within the Netherlands will lag behind compared to other European countries.

Regarding this increasing criticism on the Netherlands being a tax haven and their R&D expenditure lagging behind, it is now more important than ever for the Dutch government to understand what key drivers contribute to innovation and what barriers have a negative effect on innovative performance and R&D spending. If the current policies are not working or not allowed anymore by the European Union in the future, what is actually a right way to stimulate innovative performance within the Netherlands? It is decisive for the government to understand what drives businesses to invest in R&D and improve their innovative performance within the Netherlands in order to come up with better policies in the near future.

Research question

The main research question in this thesis will thus be:

- *What are the key drivers and barriers for Dutch businesses to successfully innovate within the Netherlands.*

When there is a better understanding of what drives businesses to invest in R&D within the Netherlands and improve their innovative performance and what barriers there are that have a negative effect on innovative performance and R&D expenditure. The Dutch government can improve their innovation and R&D policies.

However, before being able to answer this main research question it is crucial to first examine the literature on the following sub questions to get a better understanding of the current policies and innovation climate in the Netherlands:

1. *What is innovation?*
2. *What is the current innovation/tax policy in the Netherlands?*
3. *What environmental factors contribute to innovation within the Netherlands?*
4. *What internal capabilities contribute to innovative performance for Dutch companies?*
5. *What environmental factors are barriers to innovation within the Netherlands?*

Naturally, the first sub question is examined to clarify what the definition of innovation is. The second question is explored in order to recognize the current policies concerning innovation and R&D within the Netherlands to get a better understanding of the existing environment and innovation incentives. Sub question three is investigated to get a better understanding of the external innovation environment and what drives businesses to invest more in innovation within the Netherlands. Question four focusses on the capabilities of companies and their effect on innovative performance. Finally, question five looks at what the different environmental barriers to innovation are.

Literature review

Before starting to work on the research question its first important to pinpoint what innovation actually is. Through the year's various definitions of innovation have appeared in literature. One of the first economists to define and state the importance of innovation was Joseph Schumpeter. He disagreed with the Keynesian theorist's view and the existing literature. He disagreed that economics could only be explained by the statistic equilibrium approach because it did not reflect real-world behavior. He believed that there must be another force that explained the change in development, a force that is embodied in the entrepreneur. Where he defined entrepreneurship as '' the carrying out of new combinations''. Schumpeter believed that an entrepreneur does not invent but rather innovates. This theory was in conflict with all the conventional economic theories at the time because Schumpeter's hypotheses was that entrepreneurial innovation is the primary factor for economic growth. Where he added that innovation is not only invention. Entrepreneurs are driven by numerous variables to improve their firms and create change. They are not following the traditional economic equilibrium theories in order to create this change.

In his work, Schumpeter defined five types of innovation: 1) new production processes, 2) new products, 3) new materials or resources, 4) new markets and 5) new forms of organization. (Carayannis, 2013) In addition, he described his theory about the diffusion of innovation, the process of acceptance or absorption over time within a system. Where

without diffusion there would be no development because the innovation will be an isolated event. He also added that innovations when diffused can affect the entire economic system leading to profits. However financial gain is not the only incentive for the entrepreneur to innovate, Schumpeter states that ‘’ the dream to found a private kingdom, the will to conquer, as well as the joy of creating’’ or in other words the pleasures gained of being the agent of change, are key drivers for an entrepreneur to innovate. Change in an economy is a function of innovation and entrepreneurial activities.

However, according to Schumpeter there is also a more negative side of innovation he calls creative destruction. (Harvey, Kiessling, & Moeller, 2010) Where ‘’industrial mutation’’, or successful innovations that revolutionize the economic structure from within, inevitably destroy the old innovations while creating new ones. This creative destruction might cause bankruptcy for some businesses but on the other hand also growth for other businesses and is an essential part of capitalism. Where for the new smaller companies, it is easier to change and adapt to the changing environment. For the larger more institutionalized firms, due to their core rigidities and learning capabilities this will be prove to be more difficult. This is why it is of big importance for these companies to develop innovation/entrepreneurial capabilities if they wish to compete against smaller entrepreneurial firms.

In short Schumpeter defines innovation as: ‘’ A process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the

old one, incessantly creating a new one'' where he sees development as a historical process of structural changes, substantially driven by innovation. In other words, innovation is the creative destruction that develops the economy while the entrepreneur performs the function of the change creator. (Sledzik, 2013)

However, since Schumpeter wrote about his theories on innovation many alternative definitions on innovation were stated and next to the five types of innovation Schumpeter came up with, many types were added, changed or grouped. For example, Thompson's (1965, p. 2) early and straightforward definition simply states: "Innovation is the generation, acceptance and implementation of new ideas, processes products or services". A more recent definition of Anderson and West is: "Innovation can be defined as the effective application of processes and products new to the organization and designed to benefit it and its stakeholders". Furthermore, some researchers like Kimberly (1981, p. 108) have another vision on the definition of innovation and state: "There are three stages of innovation: innovation as a process, innovation as a discrete item including, products, programs or services; and innovation as an attribute of organizations." Then there is also a group of researchers that think the degree of newness is more important. For example, Van de Ven et al. (1986) state: "As long as the idea is perceived as new to the people involved, it is an 'innovation' even though it may appear to others to be an 'imitation' of something towards a definition of innovation that exists elsewhere". Linked to the Newness theorists is also the emphasis on change. A detailed

definition in this category is Damanpour (1996, p. 694) who gives a very specific definition of innovation: 'Innovation is conceived as a means of changing an organization, either as a response to changes in the external environment or as a pre-emptive action to influence the environment. Hence, innovation is here broadly defined to encompass a range of types, including a new product or service, new process technology, new organization structure or administrative systems, or new plans or program pertaining to organization members.'' Lastly there is also a group of theorists that focusses on knowledge in their definitions. As Plessis (2007, p. 21) notes: ''Innovation as the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services. Innovation encompasses both radical and incremental innovation.'' (Baregheh, Rowley, & Sambrook, 2009)

A more recent study of Baregheh et al. Tried to find a more multidisciplinary and integrative definition on innovation through a content analysis of existing definitions. They did this through pooling definitions on innovation from different articles and disciplines. Through the content analysis on the key attributes of all of these definitions they came up with the following definition of innovation: ''Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace'' (Baregheh, Rowley, & Sambrook, 2009)

Nonetheless, the definition I like most myself is: ‘’Innovation is significant positive change.’’ (Berkun, 2013). Of course, the definition is very simplified and it is not specific on what is significant or positive. However, it is a very easy to understand and all-embracing definition of innovation that suits this research very well. In addition, it is also in line with Schumpeter’s original definition where he sees innovation as a process of creative destruction, where the quest for profits pushes to innovate constantly, by breaking old rules to establish new ones. Where the focus is not only on new products but also on commercialization of new combinations, the introduction of new processes or the opening of a new market (Fortuin, 2009).

Key drivers to innovation

The Netherlands and their enterprises are one of the leading innovators worldwide through their strong core capabilities and innovative mindset. However, recently the Dutch businesses invest less in knowledge-based capital and R&D than is the case in other advanced innovation systems. To stay ahead of their competition, it is crucial for Dutch businesses to broaden their base for innovation, invest more in R&D and collaborate more with knowledge institutes. Although the present policies and tax systems in the Netherlands are well designed, it does according to the research and innovation observatory (RIO) not serve the varying needs of all businesses within the Netherlands. (Janssen, 2015) Even though the Netherlands is still a pioneer in the field of innovation policies, it is still crucial to adapt to the changing environment and politics to ensure the sustainability of this leading position and to tackle the low levels of R&D spending. The recent numerous changes in policy approaches and a high degree of economic and political volatility are a thread to the innovative efforts within the Netherlands. It is thus crucial to know what the key drivers or barriers for Dutch businesses to innovate are, in order to come up with better more sustainable policies to ensure the pioneering role in innovation. (OECD, 2014)

Through the years, a growing number of studies has been conducted in order to determine what drives innovation. Many of these studies have been focusing on the relationships between market orientation, entrepreneurial orientation, learning orientation

and innovativeness performance. In addition, there are many different studies that in their turn focus on other specific linkages such as the innovativeness- core capabilities linkage. However, despite of the number of studies concerning the key drivers for innovation there is a lack of research that circumscribes all the relevant drivers in an integrated way. For example, many of the research is based on one sector or one type of company such as SME's or multinationals. Even though, many of the drivers found in previous research can be tested in this research. Thus, in the following paragraphs the current policy and some of the key drivers and barriers found in the literature will be reviewed.

Subsidies, financial funding and regulations

In the Netherlands, there are several types of monetary incentives for innovation and R&D available, namely:

1. **R&D tax credit, WBSO** (wet bevordering speur en ontwikkelingswerk). The WBSO is a fiscal arrangement of the government to reduce R&D costs for businesses. Using the WBSO companies can deduct taxes on wages, research equipment or prototype costs. The Dutch government releases the budgets on a yearly base. For 2018 the WBSO is budgeted at €1.163 million. The benefit for companies from this tax credit is 32% for the first €350.000 of the R&D wage costs and other costs and expenses for R&D. Wage costs exceeding €350.000 have a deduction rate of 16%. Start-ups and companies that have been taxable for less than five years, are

entitled to a higher deduction of 40% of the wage costs for R&D for a period of two years. (RVO, 2017)

For other R&D related expenses like e.g. the constructing of prototypes, materials and investments in research equipment the tax credit can be calculated in two methods. By an actual cost and expense approach or a fixed sum approach. With the fixed sum approach the maximum amount per year is calculated by a standard sum based on R&D hours which is €10 per hour for the first 1800 hours and €4 for the hours exceeding the 1800 hours. For start-ups, this is €29 an hour. With the actual cost method, the amount is based on the estimated costs for R&D work. (E&Y, 2017)

2. **Innovation credit** is the second financial incentive for innovation within the Netherlands. This is a direct loan for high risk, unique and eligible innovation projects given by the Ministry of Economic Affairs. The largest benefit from this credit is that it only has to be repaid when the project is successful. For small companies, the loan can be up to 45% of the development costs. For medium sized companies, this is 35% and for large companies 25%. In case of joint ventures this percentage is raised to 50% for SMEs and 40% for large companies. The maximum given innovation credit is however €10 million. In case the project succeeded, the loan and the additional interest of between 7% to 10%, depending on the risk, has to be paid back within ten years.

3. **Innovation box**. As already discussed before, the innovation box is one of the most discussed incentives within the Netherlands. In the innovation box R&D income is taxed at a 5% rate, instead of the usual 25%. In addition, the losses are deductible at the 25% rate. The losses can be carried forward for nine years. In some situations, this rule might even create a bigger tax discount for companies that use this rule to their advantage well, because it is applicable to both future or current investments in R&D. As long as the tax returns are not completed the return is still open for appeal. However, because this rule is not in line with European legislation according to the OECD and thus seen as a harmful tax practice, the legislation has been changed. Current companies making use of this rule can use it till 2021. For new companies, this is not possible anymore since January 2017. To have more certainty in the future, it is also standard practice to discuss an advance tax ruling with the Dutch Revenue. Binding agreements with the government concerning these innovation box rules and the profit allocation rules can be made to have more certainty. (Honings, 2016)

4. **Top consortia for knowledge and innovation (TKI).** This is an incentive to improve open innovation within the Netherlands where partnerships are created between investors, private parties and public entities. As of now there are nine TKI's for the nine biggest business sectors with each different a goal;

- Agriculture and food sector: Here it is the goal to stimulate the development of new knowledge and innovation on sustainable and quality food. At the moment twelve of the forty important food companies conduct their R&D activities in the Netherlands. By supporting this sector, the Netherlands aims to keep this leading position. Next to the production of sustainable and quality food, the aim is to also create a sustainable food chain where people and the ecosystem are central.

- Chemical sector: The aim of the government is to have a leading role as the Netherlands in the transition to a green and sustainable chemical sector. There is a growing scarcity of resources which is a chance for the chemical sector. By using sustainable, green solutions materials can be recycled. In addition, new smart materials can be invented as substitutes.

- Creative industry: Sectors like; fashion, architecture, gaming, design, media and entertainment are all grouped as creative industry and makes one of the most dynamic sectors. These sectors provide creative solutions for social challenges like healthcare, safety, infrastructure and energy. The goal of the Dutch government is to keep a top ten position for their creative industry.

- Energy industry: The energy industry is one of the most important sectors to reach the CO2 reduction goals of the Netherlands. Innovations are necessary to create an affordable, reliable and sustainable energy system. Creating

renewable energy, the more efficient use of energy and internationalization of the energy market is the focus of the industry and the government. By making use of their favorable position and infrastructure the Netherlands wants to become the energy hub of Europe.

- High tech systems & materials (HTSM): Especially the industries for micro/nanotechnology, photonics, advanced materials and semiconductors is ingrained in the Netherlands and is essential in solving social challenges. The priorities in this sector are to; stimulate public-private collaboration, increase R&D investments, increase MSE involvement, increasing international collaboration and providing an adequate workforce of beta and technical educated persons. The Dutch high-tech sector is mainly dependent on export and has the ambition to increase export to €74.6 billion in 2025.

- Logistics: International trade has historically been fundamental for the Netherlands. The logistics sector has the challenge to meet the demand of the growing in and export in a sustainable way. Improving the supply chain, making use of more green export and improving connectivity with the ‘’mainports’’ like Schiphol and Rotterdam harbor are some of the priorities for the sector.

- Life sciences & health: The biggest goal for this sector is to improve medical technologies, (bio)pharmaceutics, regenerative healthcare, and the healthcare infrastructure. One of the biggest challenge at the moment is the increasing

ageing of the population and growing demand for healthcare. Thus, the sector in cooperation with universities have to create solutions for affordable and accessible healthcare.

- Horticulture: Very similar to the agriculture sector the aim of the horticulture sector is to supply the growing demand for food in a sustainable way. Some of the challenges include to grow crops using less pesticides and breed crops that are less vulnerable for disease and the weather.

- Water & maritime: the Netherlands has had a lot of experience and knowledge protecting the land against water. As a result of rising sea levels and a more hostile climate there are ever more cities in need for knowledge and innovation in water management. In addition, the use of water as an energy source and reprocessing of water play a big role becoming more sustainable for the environment.

In the top sector approach, cash grants are available to be invested in R&D partnership projects. Where in 2017 40% of the first €20.000 and 25% above €20.000 of the private investment costs is funded. (Rijksoverheid, 2017) In total over €500 million was funded in 2017. As a result of the success, the government

raised the 25% to 30% funding in 2018 (Rijksoverheid, 2018). Figure 2 shows the R&D expenditures for each sector in 2015. (CBS, 2017)

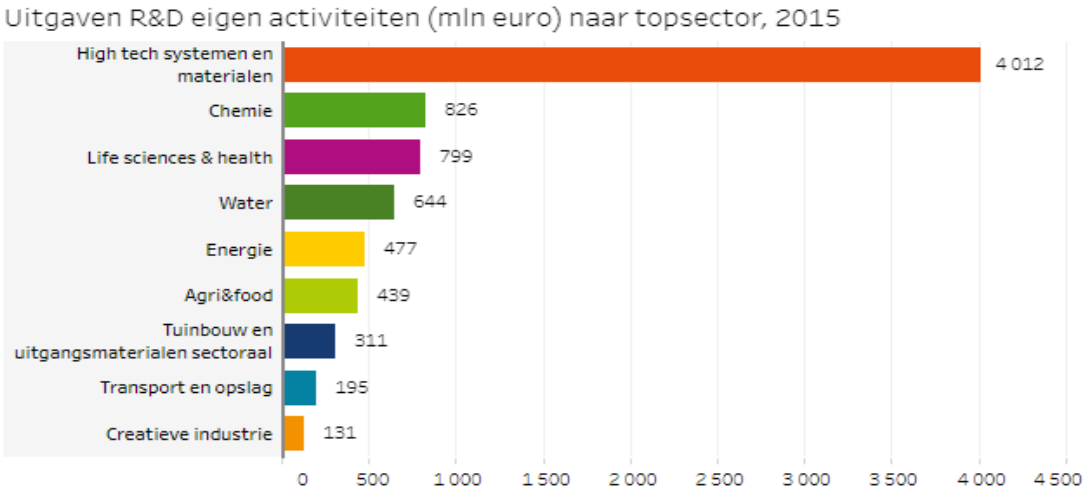

Figure 2

5. **One-time full amortization for R&D intangible assets.** In contrast to the regular laws of amortization in the Netherlands there is a deviating law concerning self-developed intangible assets. Instead of amortization over the whole life cycle this law makes it possible to amortize the whole value at once creating an incidental fiscal profit. (KPMG, 2017)

6. **R&D deduction.** In addition to the above described WBSO in point 1, there are also R&D tax deduction for freelancers. In case the freelancer is part of R&D work he is also able to get a deduction on the wage taxes. An entrepreneur who performs R&D activities can deduct taxes on a minimum of 500 hours spent on R&D work. In total, the maximum lump-sum deduction over a period of five years can be up to €18.786.

In addition to the monetary incentives like the above discussed tax credits and subsidies, there are also different regulations and frameworks to support innovation within the Netherlands. Especially the support and stimulation of high tech campuses is a big success. At the moment, there are 39 campuses that play a big role in innovation and employment for startups and large organizations. These campuses make it easier to conduct open innovation and help public-private partnerships. Currently, there are eight mature research campuses where hundreds of companies work together. In addition, there are several programs to help start-ups at these campuses adding new businesses and resources to the campuses at a fast pace.

Furthermore, the government has many programs to get a highly skilled workforce. The higher education ranks among the best in the world and over 90% of the country is fluent in English. Furthermore, it is fairly easy to obtain a highly skilled migrant visa. This makes it easier for companies to add highly skilled foreign people to their workforce. Additionally, part-time and temporary labor is available and flexible contracts are easy to negotiate in comparison to other countries. As a result, it is easier for companies to obtain a good workforce. (PWC, 2017) According to a recent study of OECD the Netherlands is a strong performer of innovation and has to remain at the top. They state that the overall framework is very strong but there are also weaknesses and threats to the innovation system that

should be considered and should be worked on. Figure 3 shows the SWOT analysis of the Dutch innovation system as reviewed by the (OECD, 2014).

Strengths	Opportunities
• Successful long-term socioeconomic performance. • Strong export performance. • A strong human resource base. • Overall good framework conditions for innovation including solid institutions and a supportive business environment. • Tight integration in the global economy. Multinationals with global reach, including in R&D and innovation. • Specialisation in services and some manufacturing industries. • Highly developed infrastructure, including transport and ICT. A first rank European logistics hub. • A strong science base with strong research universities and public research institutes and excellent output in terms of the number and quality of scientific publications, and high productivity. • Strong technological capabilities and performance of Dutch firms. • Strong participation in European Framework Programmes and other international co-operative efforts and networks. • Innovative approaches, design, and delivery of innovation policy. • Strong evaluation culture.	• Good conditions to benefit further from globalisation. • Further contributions of research institutions to social and economic development. • Creation and growth of new innovative firms. • Further development of regional knowledge hubs involving companies and the public research infrastructure with strong national and international connections. • Further internationalisation of research, including through attraction of foreign researchers and students and the attraction of foreign direct investment in R&D. • Further development of innovation in services. • Policy initiatives to address Grand Challenges, including through the use of demand-side instruments. • New approaches and practices in innovation procurement. • Comprehensive innovation strategy to strengthen core actors and long-term commitments across sectors (and levels of government). • Stronger dynamism of the top sectors to allow the growth of economic activities of increasing global importance.
Weaknesses	**Threats**
• Weak post-crisis macroeconomic performance and some longer-term issues around productivity growth. • Lagging productivity in some sectors. • Relatively low share of exports to BRICs. • Some aspects of the framework conditions for innovation, e.g. in the area of financing enterprises. • Low R&D expenditure and low propensity to collaborate with knowledge institutions in parts of the business sector. • Specialisation of parts of the economy in the lower quality range. • Frequent changes in innovation policy. • Limited public recognition of the benefits of science and technology; some weaknesses in the culture of entrepreneurship. • Low graduation success rates in tertiary education.	• Failure to achieve high productivity growth, eroding competitiveness. • Stagnation of R&D intensity, notably in the business sector. • Failure to make full use of the country's rich human capital and knowledge base and loss of innovative edge in the face of global competition and sluggish domestic R&D. • Increasingly fierce competition for top international talent that compounds skills shortages due to an ageing population. • Offshoring of production and R&D activities of multinationals (corporate research centres). • Failure to diversity into sectors of growing global importance. • Cuts in public funding for fundamental and applied research.

Figure 3

Their main critiques are that there are still some enhancements to be made in the earlier described top sector approach (TKI). It could use some more small and entrepreneurial new businesses. In addition, it's important to keep looking for more strengths and not

spend too much public resources on fundamental research in the top sectors. Additionally, the performance of this fundamental research should be monitored at international level.

Moreover, companies within the Netherlands spend relatively few in R&D and knowledge-based capital within the Netherlands. It would be an advantage if companies collaborate more with knowledge institutes and spend more on innovation activities. One way of doing this, is to redesign the tax credit system. At the moment, it is not serving all the businesses varying needs. According to the OECD there should be more focus on joint R&D projects and collaboration with knowledge institutes in combination with the top sector approach. Funding of fundamental research at universities and collaboration between companies and universities is thus crucial. Furthermore, the environment for start-ups should be improved. There are too few start-ups, that grow out to become bigger companies. There should be a safer environment for experimentation. In order to create a safer environment there is a need for improvements concerning licensing and permits. In addition, more flexible labor market regulations and a stronger financing system for innovative small firms is required. At the moment, it is hard for SMEs to lend money at banks and also the role of venture capital in risk financing is limited after the economic crisis of 2009.

Lastly, there is a huge potential concerning the universities of applied sciences. They have a strong link to the industry and play and important role in the provision of innovation

skills. They could be a bridging link to the lesser innovative companies and experienced world class universities. (OECD, 2014)

Reviewing all the above described regulations, subsidies and tax policies it is very clear that policy and the involvement of the Dutch government is an important incentive to innovation and should thus be taken into account in this research. In the coming three paragraphs some of the other external drivers for innovation will be discussed.

Open innovation: collaboration, networking and regional innovation systems

The importance of collaboration, networking and open innovation is becoming ever more popular in the literature. Ooms et al. state that the traditional, linear perspective of innovation, that implies innovation follows distinct stages starting at research and leading to eventual commercialization, without any feedback between those stages is oversimplified and misrepresents real-life innovation. Malmberg and Maskell (1997) state that innovation processes are a continuous incremental progress. It is a process of trial and error and cannot be explained by the original perspective on innovation. Through the years scholar's in innovation changed their perspectives from the original perspective to evolutionary approaches, system-based approaches and open innovation process (Ooms, 2015). Especially the literature about open innovation processes of Chesbrough

gained a lot of attention in recent literature since he came with his first book in 2003. Chesbrough argues that R&D is no longer the strategic asset it once was. In the closed innovation model, businesses argue that successful innovation requires control and they must create their own ideas and technologies. Within this philosophy, businesses used to invest heavily in internal R&D in order to try to beat their competition. This research they protected by controlling their intellectual property in order to prevent exploitation by competitors. However, since the end of the 20th century this philosophy lost its positive effect. The large number of knowledge workers and their improved mobility made it harder to protect their expertise and intellectual property. In addition, it became easier to gain capital for scientists or start-up companies. As a result, the competition grew because these start-ups or scientists could afford to commercialize their own ideas. This broke the cycle of closed innovation because a company that invested in the original research did not necessarily profit from it anymore. This started the open innovation philosophy. Internal ideas started to be commercialized and developed outside of the company and external ideas were bought or developed internal within the company. In this way, the boundaries between firms became more open and innovation could move more easily between companies. In the new Open Innovation philosophy, businesses do not only lock up and protect their IP but try to profit from their own and from other businesses IP. Normally a company has a large number of ideas or innovations but cannot further develop them all. Either because it's not within the current business of the firm or they do

not have the right technology or people internally. In this case, these ideas could still create commercial value for the firm by developing them externally. (Chesbrough, 2003) Thus, Chesbrough defined two individual processes which are; utilizing external innovations internally and externally commercializing internal innovations. In later research, he added that firms also enter into collaborations that combine these inbound and outbound flows in a coupled mode of open innovation. Here they define open innovation as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough & Bogers, 2014, p. 17). (West, 2016) With the open innovation philosophy and the purposively managed flows of information, knowledge has become more widespread and numerous opportunities to gain value out of knowledge are created. However, to manage this type of open innovation takes a considerable amount of work and brings some challenges. The role of R&D has to be stretched beyond the existing boundaries within the company and the innovating companies have to integrate their research, expertise and knowledge with other firms. One of the problems in this is that the advantages of open innovation as a whole are very clear and convincing. However, on individual level the incentives are not so clear and motivating for businesses or individuals. It is thus important we get a better understanding how interaction between businesses and individuals can be supported and managed. According to Friesike, clear policies and incentives need to be implemented.

At the moment the research in this field is still very limited and fragmented (Friesike, 2014).

Du, Leten & Vanhaverbeke (2014) further researched the effectiveness of innovation projects and how to manage open innovation partners. Unlike most studies their research was not analyzed at the more traditional firm-level, but on the R&D project level. In this way they were able to analyze if the formal project management approaches traditionally developed for closed innovation, still work for managing open innovation projects. In their research they found empirical evidence ‘’that there is a positive association between open innovation and (project) performance, provided that the right management approach is in place’’. Where an important distinction is made between science-based partners and market-based partners. They found that different types of partnerships have different relationships with project performance. Thus, in order to manage the innovation processes effectively, different management approaches should be used for the different type of partners and relationships. For example, they found a positive association on project performance for market-based partnerships that are managed in a formal way. Where for loosely managed market-based partnerships, a negative effect is associated with the project performance. For science-based partnerships this is the opposite. Here loosely management is associated positively with financial performance. Thus, the more traditional management styles as proposed in in the literature may not always be applicable to all types of projects. Consequently, the management style used, should be

reviewed and adjusted to each innovation project and partnership separately. Hereby considering the nature of the project, the technological complexity, the type of partnership and the resources available. (Du et al., 2014)

In addition, one of the policies that is being discussed in the European Union to better manage open innovation and the commercializing of IP, is the opening of a financial market for IP. According to the research of Friesike, ‘’the tradability of knowledge in form of IP is a catalyst for opening up science’’ Although patent valuation remains difficult, the opening up of a more efficient market place for IP might lead to a more open approach in research. There has however to be investigated in more detail how IP can be made more tradable.

A second policy to support collaboration and open innovation is public funding through European authorities, local authorities and the central government. In a recent research of Greco, they found a direct positively association between local and national subsidies and the propensity to collaborate with other organizations. (Greco, 2017) In addition they introduced the concept of OI efficiency. OI efficiency is the ratio between the typical innovation performance output which is the turnover share from the innovation and a collaboration intensity measure. This approach tries to verify if the collaboration intensity for publicly funded enterprises is matched by an improvement of the innovation performance. This measure can make short terms with the creation of merely formal collaborations in order to gain public subsidies because the innovation performance

output will not rise. This could help the authorities to allocate their resources better in order to improve collaboration and OI more effectively. According to the research, the European public subsidies and incentives are focused too much on the collaboration intensity at the moment. As a result, there is no significant increase in turnover share from radical innovations after European subsidies. Mostly because the collaborations at the moment are only formally in order to acquire collaboration subsidies. In order to solve this, the authorities could integrate the subsidies by providing a platform or consultancy service that supports firms with finding the right partner and coordinating the collaboration process. In addition, innovation inducement awards have been proven successfully according to research of Williams (2012). Incentivizing results that are likely only reached through external support could foster OI efficiently.

Another way to foster OI and stimulate the creation of knowledge could be a virtual lead user community (also defined as crowdsourcing). ‘’A VLUC is a firm-hosted virtual community in which members with lead user characteristics interact to create knowledge about new product and services.’’ (Mahr, 2012). In this virtual community the firm and the members of the community communicate and improve the collective knowledge about research needs and solutions. In VLUCs there is usual a more open and a safe trial and error culture which tolerates errors and diversity. As a result, there is more outside of the box thinking and experimenting. Certainly, in combination with an incentive system with rewards like innovator of the month, also appeal to the intrinsic motives of the contributors.

However further research is needed to understand how to manage these VLACs efficiently to optimally create and share knowledge.

Since the 1990's the theory of regional innovation systems is becoming more popular. Within the Netherlands multiple big innovation campuses are starting to pop up. According to research from (Doloreux, 2005) the increasing popularity of regional innovation systems in the literature is mainly because of the swiftly globalizing economy and increasing competition. He argues that specific regional resources and capabilities like learning processes, specific skills, specialized resources, institutions and values can stimulate innovation and regional competitive advantage. He defines regional innovation systems as; '' A set of interacting private and public interests, formal institutions, and other organizations that function according to organizational and intuitional arrangements and relationships conducive to the generation, use, and dissemination of knowledge''. These regional innovation systems usually arise out of the success of some group of specialized companies or out of a concentrated network of businesses that settles in a region. Empirical evidence has been found that in most cases learning processes and knowledge transfers are highly localized. Within the research there are three key features that are described.

1. The first key feature is contextual innovation. It is believed that innovation is a geographical process and innovation capabilities are sustained regional through communities sharing the same knowledge bases. (Porter, 1998) states that most

often competitive advantage is regional as a result of a regional concentration of; highly specialized skills and knowledge, institutions and a large group of related businesses and customers in a specific region. The innovative performance is mainly based on regional resources like the available work force, infrastructure, supplier and subcontractor systems, spillover effects and supporting organizations and policy makers.

2. The second key feature is social relationships. Over time social relationships develop within a regional economy. In this, the regional context provides a set of norms and rules about social behavior and expectations which creates a mutual trust. Camagni points out that ‘’The set, or the complex network, of mainly informal social relationships on a limited geographical area, often determining a specific internal representation and sense of belonging, which enhances the local innovative capability through synergic and collective learning processes’’ (Camagni, 1991). For regional innovation capability and learning capacities to grow, assets like; the internal dynamics, an open culture, political assets, the informal flow of knowledge between firms and researchers are crucial. Most of these assets are derived from the social relationships and networks in the region. This kind of social capital helps to reduce costs and market failure through their learning capability and strongly related dense networks.

3. The third stimulant for innovation is the geographical concentration and proximity in innovation. Regional clusters play a crucial function in innovation processes. A regional cluster is defined as ‘’a group of firms in the same industry, or in closely related industries that are in close geographical proximity to each other is meant to include geographically concentrated industries included so-called industrial districts. (Enright, 1998) The clusters can also include research institutes, universities and governmental institutions with the same specializations as the firms in the cluster. These clusters normally lead to collaborations that improve knowledge spillovers, the learning process and several forms of adaptation. This is mainly due to the fact that in such an environment the different actors have a bigger change of getting in touch and creating collaborations. However, the research done in this field is not yet conclusive. Most of the studies done on regional innovation systems are based on a few successful regions. There are however a significant number of regional innovation systems or sector-based campuses that were unsuccessful. According to research from Ooms there is no single approach to imitate successful innovation regions like Silicon Valley. (Ooms, 2015) In each situation the approach to create a regional innovation system is different. Nonetheless regional innovation systems can be an enormous boost for a knowledge economy. For policy makers in the Netherlands it is thus interesting

to conduct further research on this topic and support regional innovation systems where possible.

Financial resources

Innovation is a process that in most cases requires large investments. Naturally, the importance of financial resources is one of the variables that comes up to mind first. However, on the importance of financial funding to innovation there are different views. According to research of Le Blanc et al. (1997) the lack of financial resources is for 43% of the American SMEs the most dominant limitation for product development. In addition, Birchall et al. (1996) also sees the financial resources as a key factor in the innovation process. However, Hoffman et al. (1998) has conflicting results. In his findings, he agrees that the lack of financial resources limits the introduction of new technologies and expansion. However, they conclude this is no barrier for SMEs while the access to financial resources is easily gained. Only a few of the SMEs applying for financial aid failed in this.

In addition, the discussion about the link on R&D spending's to innovation can be found. While researchers such as Oerlemans et al. (1998) suggest there is a direct positive relationship between innovation and R&D spending there are other researchers such as Birchall et al. (1996) that state this relation is more complex. In their research, they found

no direct relationship between the amount of turnover spent on R&D and innovation. They state that this implies that SMEs with low R&D expenditures are just as likely to successfully innovate. However, in the research is stated that the impact on successful innovations is low for SMEs in both cases. (Keizer, 2002)

Regarding the diversified results and statements made by the several researchers it is insightful to further look into this variable as a key driver to innovation. Specifically, because some of the research might be outdated since the economic crisis in 2009. As a result of this crisis, banks are according to the OECD taking les risk loaning money to SMEs.

In the following paragraphs will be described what internal capabilities of the company might have an impact on the innovative performance.

Capabilities

As a result of globalization, the business world has become increasingly competitive all over the world. In response companies are pro-actively seeking to adapt sustainable competitive advantage strategies. In all of those sustainable strategies, innovation has proven to be one of the most important factors for success. Innovation however, is ever depended on the core capabilities of businesses in order to succeed. The capacity of the company to generate, obtain or apply knowledge and the capacity to make timely

decisions on when to invest in assets, knowledge or human resources, to further develop capabilities beyond the already acquired capabilities, is crucial for gaining competitive advantage through innovation. In addition, the competitive market and capitalistic mindset to always desire larger profits further stimulates the incentive to drive innovation. This type of innovation also derives from the ability of the company to make use of their core capabilities in order to meet the needs of their customers. Through a sustained business strategy, based on those capabilities, the company is not only able to meet those demands in the present but also in the future. (Wernerfelt 1984)

In order to find out what drives innovation it is thus crucial to take into account firm capabilities in order to get a sufficient and meaningful explanation of innovation drivers. Additionally, there should be a further understanding of what factors are included in these capacities. In the Research of Neely et al. (2001) innovation capabilities are described as: the capability to innovate internal processes, the capability to understand the surrounding environment and the organizational culture. Others like Calantone et al. (2002) describe the innovation capacities more simplified as ‘’the level to which companies attain innovation.’’ A more overlapping definition from Guan states that ‘’all the steps taken by a firm with the objective of implementing and attaining their strategic and competitive goals in the surrounding environment are reflections of the innovation capabilities in effect. (Guan, 2003) Also on the methods of measuring the capacity to innovate there are some different theories. Researchers like Yam et al. (2011), Puranam

et al. (2009) and many others believe innovation capacities are measured through the number of patents registered and the amount of R&D expenditures. However, Wonglimpiyarat (2010) proposes that innovation capacities are measured through an organizations innovation, in processes, in services, in products and in marketing. In addition, it is believed that the greater the learning capacities of the business are, the faster the company will respond to the change in needs of the market with their products and services. In other words, they believe knowledge and how the business manages knowledge is a key innovation capacity.

Summarized most theories focus on: the capacity to understand and adapt to the environment and involve the customers (needs), the capacity to manage and explore new ideas, the capacity to create and use (technological) knowledge, the capacity to manage innovation projects and employees, and lastly, the capacity of firm cooperation and making use of customers and networks (Fernandes, 2013). In the following paragraphs some of these capabilities will be discussed in more detail.

Customer and market adaption

Through the years there has been a shift in how companies innovate. Traditionally companies would focus on their own resources and capabilities in order to innovate. Recently it has become more important to tap into external sources such as the customer. In many occasions customers can be an important source of knowledge. Knowing your

customers and involving them, can help translating their needs into new products or services and adapt to the market needs (Hult et al., 2017). In the literature many studies can be found supporting the idea of customer involvement and adapting to their needs. However, in the contrary other research suggests customer involvement may not be as beneficial and can even hinder innovation. Ittner and Larcker (1997) state that: ‘’overemphasis on customer feedback in the design process can make a firm reactive rather that proactive and can push the organization to exceed its capabilities in an attempt to provide products that respond to every customer demand’’. It is thus crucial for companies to find a balance between involving customers and using their own capabilities and knowledge.

Other research argues that information technology is a crucial factor affecting the relationship of customer involvement and innovation performance. Research of (Saldhana, 2017) found that the relational information processing capability of a company and their CRM systems complements the product focused customer involvement processes. Product focused customer involvement in its turn has a significant positive effect on the innovation performance for a company.

Information intensive customer involvement has however no found significant effect on innovation. According to the research there is thus no effect of customer feedback and suggestions on innovativeness. Nevertheless, when coupling information intensive customer involvement with strong analytical information processing capabilities, a

positive interaction can be found. The customer involvement, in combination with the right analytical information processing capability, does create more innovation opportunities.

In addition, they found that simply adding more IT practices may not increase innovation unless these IT capabilities are appropriately managed. In conclusion, including customers in the innovation process and adapting to the needs of the customer by using information technology has a crucial role in the innovation process and adapting to the market needs according to the research of (Saldhana, 2017).

(Technical) knowledge management

Knowledge is seen as one of the foundations where innovative ideas are generated from. It is a fundamental process of learning, searching and exploring. In this process, the combination of knowledge and old and new ideas results in new services, products, processes and new markets. With the global economy becoming ever more competitive firms start to focus more on their ability to manage what information and knowledge is available in their own company. By extracting and managing this knowledge, ideas can be transformed to faster product innovation processes and new markets. The ability of managers to proactively manage the knowledge assets available in the company is crucial to achieve innovative performance and the implementation of new innovation projects (Nisula, 2013). There is however some debate in the literature on what factors

drive knowledge management. Du Plessis (2007) argues knowledge management is driven by, ‘’the need to create and sustain competitive advantage through the utilization of knowledge and collaboration processes, the capacity of an organization to reduce complexity in the innovation process by managing knowledge as a strategic resource and lastly, making knowledge for innovation more accessible through the integration of internal and external knowledge sources’’. Other literature argues that there are only two major factors for knowledge management, infrastructure and processes. It is however widely accepted in the literature that knowledge management has considerable influences on innovative performance. Nevertheless, there are only few studies that empirically tested the link between knowledge (management) and innovation. The research of (Cabrita, 2015) tried to fill this research gap by conducting an exploratory research in order to better understand the influence of knowledge management on innovative performance. In their study there was a focus on the knowledge management process where they tested how organizations create, acquire, retain, store, disseminate, use protect and finally manage the knowledge they have. In addition, they added four scales to measure knowledge management infrastructure factors:

- Technology: where the adequacy of the technological infrastructure, the ability of transferring new technology applications and the employee motivation to learn new technologies was measured.

- Organizational culture: where was tested if the organizational culture is supportive of; knowledge transfer, knowledge sharing, learning with mistakes and teamwork.

- Organizational structure: where was tested if the organizational and top management was supportive of knowledge management applications.

- Intellectual capital: where was measured the organizations use of its intellectual capital and the significance of intangibles for knowledge management applications.

From their factor analysis on 24 Likert items followed by partial leased squares regression procedure they found a significant impact of knowledge management on innovative performance. Companies recognize knowledge management as an important factor in the innovation process where the managers identify; sharing knowledge and daily interaction with colleagues, promoting the development of new skills and applying knowledge in developing new products and services as the most important factors in the innovation process. For the knowledge management infrastructure, they found most important that the organizational culture supports; knowledge management applications, knowledge sharing and support of learning with mistakes (Cabrita, 2015).

Human resource capabilities

In the literature human resource capability is described as a resource-based view that regards competencies, capabilities and skills or strategic assets as a key source of sustainable competitive advantage (Chuang, 2014). From an organizational perspective, a company's ability to innovate closely depends on the intellectual capital (Subramaniam & Youndt, 2005). It is thus crucial for companies to develop the human resources with the aim of gaining intellectual capital assets and in turn improving its innovation capacity and organizational performance (Swart, 2010). In the literature many studies can be found where it is proven that human resources contribute to increased flexibility, productivity or financial performance. However, the research on the effects of human resource capabilities and management on innovative performance has according to Hatch less conclusive results. This is mainly for the reason that ''the effect of innovative-oriented HR practices would not be directly reflected in innovation outcomes, but in intangible-intermediate- variables related to human cognition and social relations, among others.'' (Hatch, 2004). Nevertheless, the research of Mario et al., found a positive effect of human capital on innovative performance. Furthermore, research of Takeuchi et al., (2007) found that highly skilled employees are more likely to learn quicker and apply knowledge more effective to solve problems and contribute with more creative solutions than less skilled employees.

In addition, the research gives some managerial implications that contribute to the implementation of innovation and managing human capital. They state that competitive advantages based on innovation are increasingly important in dynamic environments. Managers should constantly invest and check for human capital availability in order to improve the company's innovative capabilities. After acquiring human capital, systems oriented toward coordinating the different kind of intangible assets should be created. Investments in selective staffing, training programs and high compensations systems could be used in order to improve human capital. However, the research also states that in addition to human capital, it is also important to take into account the social capital in innovation processes as described in the next paragraph. (Wright et al., 2001).

Social capital

Social capital is described as ''the network of social relations, based on shared norms, goals, trust and good atmosphere, by which material and knowledge resources become available that are useful for the actions of the members of the network.'' (Ehlen, 2014) According to research of Ehlen et al., (2012), four dimensions can be distinguished in social capital, namely:

- The structural dimension. This dimension addresses properties of the group like: ties, positions and time spent.

- The relational dimension focusses on the more personal aspects of the relation like trust, identity, respect, expectations and norms.

- The cognitive dimension includes items like shared language, goals, values and capacities.

- The action dimension which focusses on networking, collective activities, sharing of knowledge, designing and implementing.

In the research was found that all four dimensions where important for the innovation process and knowledge creation. Important findings where that the composition of multi-disciplinary groups is an important condition for knowledge gathering. In addition, they found good team relationships on a horizontal level through the firm are important. Appreciation, trust, motivation, sympathy and getting to know each other are vital parts in the process. In this it is important to set a commonly accepted goal by the group members. Another conducive factor is the capability to understand each other's jargon while working together on innovation projects with people whom have different expertise. However, the research of (Ehlen, 2014) is qualitative and has no empirical evidence that social capital has an impact on innovation performance.

Nonetheless, according to research of (Kwon, 2002).''Social capital encourages collaboration and facilitates information flow, knowledge creation and the accumulation, and fosters creativity. These assets have all proven to be positively related to the

innovation capabilities for creating or improving new products, processes or services. Social capital can be fostered by decreasing the horizontal barriers. This can be done by increasing employee's autonomy, establishing broad job design, improve teamwork and use group incentives. All these methods improve horizontal connectivity and create more open and effective project teams working together. In order to sustain the cooperation between the different employees and teams, a forum for knowledge sharing and knowledge transferring throughout the firm is crucial. Information technology can play a crucial role in supporting the sharing of knowledge both horizontally within the company as vertically throughout the value chain. However, according to the study of Adler & Kwon (2002), both the social and human capital are important assets. They depend on each other and on intangible assets where both are needed to have a significant effect on innovation performance. The human capital impacts innovation as better employees learn easier and apply their knowledge better in order to create new ideas or solve problems. It is however also needed that these employees are encouraged to collaborate, facilitate information flows, create knowledge and have the room to be creative. Not only at the horizontal level, but also vertically these principals should be used in order to improve innovation performance.

Furthermore, the principals of social capital are of big importance in open and regional innovation. Governments can foster this connectivity by for example regional innovation centers or high-tech campuses. Centering industries to one geographic region may

decrease connectivity barriers between the company and their customers but also the barriers between the competition, leading to more open innovation (Wright et al., 2001).

Culture

Culture is an import factor within every company. The culture dictates how individuals cooperate with their colleagues, how motivated employees are, what type of leadership or management is used, how loyal employees are to their company, how open employees are to change and how the things are done within the company. The organizational culture also describes the firms; vision, values, norms, systems, symbols, language, assumptions, beliefs and habits (Needle, 2004) In addition, the culture affects the way how individuals and teams interact internally in the firm, but also with their components in the value chain like their customers, suppliers, competitors and partners. The culture correspondingly defines how employees identify with their organization (schrodt, 2002) The organizational culture within the company is however not stagnant. Through the years, the culture within the company is slowly formed and changed by individual groups, employees, managers and the changing external environment. If, however necessarily change is needed because of environmental developments, it can be a challenge to change the organizational culture and current business model. Especially for older and bigger companies, there are many factors that might become problematic to implement change. In the literature this inability to change is mostly described as inertia.

Organizational inertia is the tendency of a mature organization to continue on its current trajectory. Inertia is usually a negative by-product for mature businesses resulting from the need for reliability and accountability making it hard to implement changes within the firm. Hannan and Freeman argue that the strength of inertial pressures on organizational structure suggests the application of models that depend on competition and selection in populations of organizations where inertia is proposed as an explanation for the lack of adaptive change. This inertia results both from internal as from environmental constraints like: sunk cost of firms, communication structures, internal politics, and the dominance of institutional norms barriers to entry and exit, bounded rationality, and social legitimacy. (Dess B. a., 1955) Henceforth, the organizational culture and the capability to change and overcome inertia barriers is seen as a key factor in the companies' ability to innovate. The culture has a big impact on the processes of the company, how things are done and interactions within the value chain. Furthermore, the research of (Shahzad, 2017) found empirical evidence that different dimensions of organizational culture have a significant relationship with innovation performance for the software industry of Pakistan. They found that especially the organizational climate and flexibility/support to change has a tremendously impact on innovation performance. In the following paragraphs some of the key barriers to innovation are discussed.

Key Barriers to innovation

As already mentioned earlier in this review, innovation depends on multiple factors and capabilities to succeed. Some of these capacities are financial resources, human capital, social capital, culture, functional networks, knowledge management the understanding of the market and customers, the capacity to change etcetera. Some companies however, do not have these capabilities or the need to change and keep using the same processes and way of working. Other firms try to innovate trough higher R&D budgets but still fail in making successful innovations. It is thus important to understand what barriers there are for companies that obstruct successful innovation. Certainly, for policy makers it is crucial to understand these barriers in order to fix the systematic failures in their policy or to avoid spending money on innovation subsidies that have no positive effect on innovation. According to research of (D'Este, 2011) the barriers can be grouped in four categories: cost barriers, market barriers, knowledge barriers and regulation barriers. However, the biggest barrier to innovation for most companies is the lack of need for innovation. Over sixty percent of the companies in D'Este's research were considered as ''not innovation-oriented'', which meant that they had no need of innovation due the current market conditions. In the following paragraphs the other four types of barriers are discussed.

Cost barriers

As described earlier there is some conflicting research on whether financial capacities can be seen as a driver for innovation. It is also mentioned here that this variable can also have a negative effect on innovation when a company cannot attain monetary funding for their projects. Thus, the costs of innovation could also be an important barrier to innovation. D'Este et al. tested the following cost factors: excessive perceived economic risks, direct innovation costs, cost of finance and the availability of the finance. In this research they found that firms that engage in innovation activities do not always face cost barriers. They found that there is a non-linear relationship between the cost barriers and innovation activities. If the company engages in less than two innovation activities there is no significant cost barrier. However, beyond a certain threshold of engagement in innovation activities a positive relationship is found and becoming more significant if the number of innovation activities rise. In addition, they found that especially for smaller firms the availability of finance and the associated economic risk of innovations was one of the larger barriers to engage in innovation projects. However, for larger companies the economic risk was assessed ass less important. The innovation experience and the previous innovation learning processes play a big role in reducing uncertainty for these businesses.

Market barriers

Most studies and policies tend to focus only on the financial barriers and see them as the most important factors as drivers of innovation. It is however crucial to also acknowledge the other barriers, like the market barriers too. The availability of knowledge and good regulation are crucial in the context of innovation policy. The research of D' Este found that especially for smaller or new firms it is hard, to in some cases almost impossible to participate in an innovation based competitive market. Some markets are dominated by established bigger firms creating a significant barrier for these newer firms. Regardless of the fact that there is a broad consensus in literature that smaller firms are more often better at developing radical innovations and large established firms often endure organizational inertia preventing these radical innovations. (Hamilton, 1992) As described earlier, this is partly because the lack of financial capacities of the smaller and newer firms. A second significant factor might be explained by the uncertainty in the demand for innovative services and goods. According to research of (Lammarino et al. 2009) the risk of not meeting demand is also seen as a risk. Because if the firm does not meet its demand it fails to increase market share creating an opening for larger companies to follow and flood the new market. In this way the first mover advantage is not gained by the innovative firm but by the followers. As a result, the decision to invest in innovation is demand-led. In order to enlarge the group of innovative companies this should be taken into account by policy makers. According to D'Este, policy makers ''should be macro-

oriented in order to stimulate consumption, increase market response to new products to match demand and supply side of innovation. This would reduce the structural risk of not meeting market's demand or facing high market concentration and therefore encourage initial innovative efforts.'' However, how to do this is not covered in his research and should thus be further analyzed. In addition, in the literature can be found that firms are more likely to adapt new technologies in order to differentiate and create competitive advantage when there are high levels of competitive pressure for the company on the market. (Porter, 1985) Furthermore, there is a relationship between external economic uncertainty and innovation. This is mainly because in volatile economies, companies are incorporating innovation in order to survive and increase their competitiveness. (miller, 1987). In addition, research of Leten et al. (2016) shows that there are less market entries by new companies in a concentrated technologic market. Furthermore, the few entries that do happen are more likely to be unsuccessful. This is mostly as a result of protectionism by established companies that want to keep their oligopoly market power.

In addition, the research suggests that for a more complete understanding of a firm's entry and their performance in a new technologic development market, two key characteristics of the technology environment should be considered. Namely, the technological opportunities and technology competition. A market with substantial technology competition reduces the probability of entry and the subsequent technological performance. Where a market with many technological opportunities attracts firm entries.

However, only companies possessing related technological resources are likely to capitalize on the technological opportunities. If the related resources and related knowledge is absent, the technology development efforts are likely to be less effective and the market entry more perilous. Even though the lack of capabilities and the amplified risk, large R&D intensive firms do experiment more with new technologies when they observe new opportunities. This is mainly because they have the substantial resources needed and a failure is less distressing for them.

In addition, they found that it is important to keep in mind strategies and technology development efforts of competitive firms. Technological opportunities present themselves to the competition too and if a large number of R&D intensive firms enters the market, the opportunity area might become crowded and the chance of success small. If one of the companies acquires a leadership position they are likely to raise entry barriers to defend their technologic leadership. As a result, it is hard for other companies to compete or enter the market. (Leten, 2016)

Knowledge barriers

Knowledge barriers are mainly created by the lack of; qualified staff, market information and information on technology. The research of D'Este proves that these factors have a significant effect as barriers on innovation. However, he does not get into detail in explaining these factors. However, in other research (Madrid-Guijarro, 2009) the lack of qualified staff is also further described as a barrier to innovation. Most of the barriers

explained by human resources are internal barriers. The culture within the company, resistance to innovation of employees, the management or inertia within the company have a big role in the capacity to successfully innovate. However, at a macro-economic level the lack of human resources can also be seen as a barrier for some companies. According to the research of Madrid-Guijarro, the lack of qualified personnel is the third biggest barrier after the high costs of innovation, market barriers and insufficient governmental support. As already described earlier in this review the Dutch government already has many programs to provide a skilled workforce for companies and invests heavily in education. In addition, the process of obtaining a highly skilled migrant visa is simplified in order to acquire skilled foreign personnel. (PWC, 2017) However, there are still many policies that could be improved in order to make it easier for companies to obtain qualified staff and in order to further educate them. In the 2014 review on the Dutch innovation policy of the OECD they found that the Netherlands faces some challenges in maintaining quality in tertiary education and in responding to emerging labor market needs. In order to solve this the OECD recommended to encourage profiling and specialization of university teaching and research activities in order to enhance efficiency. The government should also be aware to avoid blank spots in the coverage of different disciplines. In addition, the government should help coordinating the human capital agendas in the top sectors and the technology pact in order to improve responsiveness to the demand in the labor market. (OECD, 2014)

The second barrier within the knowledge barrier is the lack of information about the external market and the uncertainty about government policy. The lack of information about market opportunities, technological changes and governmental policies impact the innovation adoption strategies of companies. According to (Frenkel, 2003) the uncertainty about policies and the lack of governmental assistance is the third most important barrier to innovation in European countries.

Regulation and policy barriers

Throughout this review, different regulations and policies are already described as eventual drivers or barriers to innovation. However, because there is no simple relation between innovation and the regulatory environment this paragraph will further describe some of the regulation and policy barriers in the Netherlands. As of the moment the Dutch policy mix to assist business in innovation is still heavily dependent on R&D tax incentives. For start-ups there are some special loan or allowance instruments available but according to the OECD there are still large barriers to overcome after the start-up. A significant number of start-ups seems to face problems acquiring funding to stimulate further growth after the start-up phase. In order to overcome this problem, risk financing has to be encouraged by improving the regulatory and legal environment. Specifically, by improving restrictions on banks, insurance companies and pension funds for investments in alternative assets such as venture capital. In this way it gets easier for start-ups to

acquire funding for further growth. In addition, some enhancements in the product market regulation have to be made. The environment to experiment for smaller companies has to be improved regarding licensing and permits making it more favorable to expand (OECD, 2014). A second barrier is the legislation concerning permanent contracts for personnel. The legislation should according to the OECD allow a more flexible re-allocation of workers in order to create a more dynamic labor market. Especially for young businesses more flexible regulations will make it easier to find a more qualified, skilled and dynamic workforce which is necessary for firm growth and innovation. (OECD, 2014)

Naturally there are many more barriers to innovation. Most of the internal barriers are however not discussed in this section because most of the barriers like inertia, bureaucracy, management etc. are already discussed in the capabilities section. While these capabilities can be drivers to innovation they can also be an incapability or barrier for a company when they do not perform well on the specific topic.

Theoretical framework and methodology

In the above literature review the different factors that influence innovation are extendedly described and there could be seen that the variables can be grouped in drivers and barriers to innovation. Where the internal and external innovation drivers have a positive effect on innovative performance and the barriers a negative effect. However, some variables like policy could be seen as both a driver or a barrier to innovation depending of the different aspects of the policies. The purpose of this research is to find out to what extend these variables and their different aspects have a positive or negative effect on the dependent variable; innovative performance. In figure 4 the variables are shown in a theoretical framework.

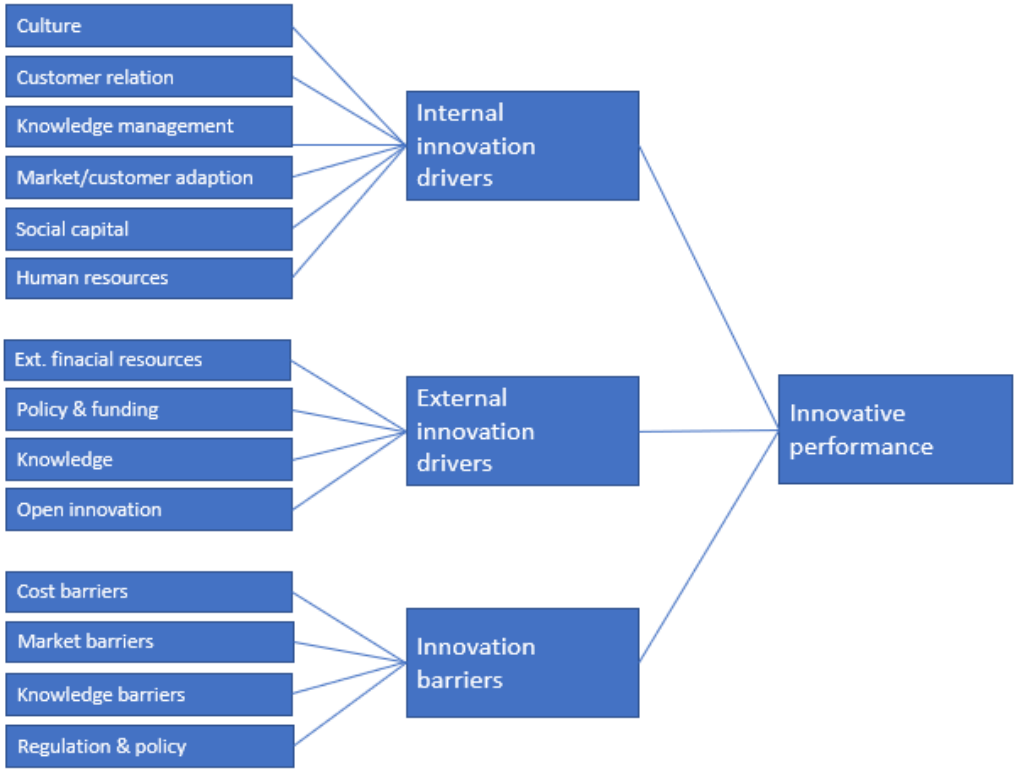

Figure 4

Methodology

Because there is insufficient literature on this specific topic for the Netherlands, the research will have the characteristics of an exploratory research. The goal of the research is to find what variables are drivers or barriers to innovative performance within the Netherlands. As can be seen in the literature review there is abundant research on this topic. However, most of the literature focusses on specific sectors or countries. For this research it is thus important to define and group which variables have an impact on innovation and innovative performance in the Netherlands. In order to do this, an extensive literature review has been conducted to define and clarify the variables as can be seen in the chapters above. In addition, qualitative research in the form of an exploratory interview was conducted to provide a better initial understanding of the firm's drivers and how they perceive the governmental rules and policy. This interview was conducted with the innovation and subsidies manager at VDL, Michiel Pieters.

In addition, a quantitative research has been conducted in order to get empirical evidence on the different factors that drive innovation. However, as a result of using external questionnaire data, not all variables found in the literature can be empirically tested by the available data. Only for the sub topic internal innovation drivers, as can been seen in the upper part of the theoretical frame work (figure 4), empirical data is available. The following chapter explains in detail which data is used and what the outcomes of the data analysis are.

Data analysis

Started in 2008 and finished in 2011 the Strategic innovation project in Belgium and the Netherlands was conducted. This was a government-funded project in order to stimulate SME companies to participate in a strategic review process. In the selection process the only criterion was that the participating businesses were SME's according to the definition of the European commission. Meaning, it is a company with 250 or less employees, a maximum turnover of €50 million and a balance sheet total or less than €43 million. For the project, three types of data collection were conducted; in depth discussions with management, a questionnaire and strategic conversation sessions. Unfortunately, for this analysis only access to the questionnaire data is granted. The questions from the questionnaire that are used in this analysis are translated from Dutch to English and are added in appendix 1.

The questionnaire had a response of 354 companies within the Netherlands. However, not all companies fit the target group for this research. In order to filter out the companies that have no affinity with innovation, a selection criterion is used. Companies with less than 10 employees and an innovation urgency score lower than 7.5 out of 15 are filtered out. (The urgency score is defined by three, one to five scale Likert items that ask about the urgency for the company to innovate). This leaves a sample of 189 companies.

The questionnaire consists only of ordinal data in the form of 1 to 5 Likert scale questions focusing on the following topics:

-**Strategic conversation (SC):** where eight questions are asked about the strategies of the company and the involvement and acceptance of the strategy by employees.

-Capabilities (CA): On this topic seven questions are asked about technological, management and knowledge capabilities.

-**Innovation climate (IC):** Here questions are asked about how the climate within the company is considering innovation. E.g. There are questions about the culture within the company and the involvement of employees with the innovation process. In addition, there is one question about formal rules and procedures being a barrier.

-Importance of innovation (UR): In this topic respondents are asked to order six different goals in what they think is most important to them.

-**Urgency of innovation (UR):** Three questions are asked about how essential innovation is to their company and whether they can do without it or not.

-Vertical connectivity (VC): Here five questions are asked about the connectivity in the company on a vertical level through the company. For example, questions are asked about the communication between management and employees and how much responsibility the employees get. In addition, there is one question about how top-down management is a barrier.

- **Horizontal connectivity (HC):** Here five questions are asked about the connectivity within the company on horizontal level. Meaning how different departments or teams in projects work and communicate together.

-Market orientation: In this topic, questions on responsive market orientation, proactive market orientation and emerging market orientation are asked. This are all questions about how active the company is in looking for new trends, developments, opportunities and new markets. However, only 114 respondents filled in these questions.

-Innovative performance (IP): Lastly, four questions are asked to indicate the innovative performance of the company.

The scores given by individual companies are however not rounded up numbers but are presented as the average score of the multiple employees that responded in the questionnaire. The specific questions on each topic are added in Appendix 1.

In order to reduce and group the number of factors that will account for the maximum variance in the data, an exploratory principal component analysis is conducted.

Principal component analysis

The data contains 33 Likert items that could have an influence on innovative performance. Which is too many independent variables to analyze. For this reason, a factor analysis is conducted in order to reduce the dimensions. ‘’A factor analysis is an interdependence technique in which all correlated variables are considered simultaneously. In this method

the observed variables are considered as a dependent variable that is a function of some underlying, latent, and hypothetical set of factors or dimensions. Conversely, each factor is a function of the originally observed variables.'' (Pandey, 2014)

As the method of factor analysis, the exploratory principal component analysis was chosen. This method looks at the common variance and extracts uncorrelated factors from correlated original variables. A lack of correlation means that the variables belong in different dimensions. As thump of rule, the first factor has maximum variance. The following factors explain progressively smaller parts of the variance as can been seen in figure 6. The examined data consisted solely of Likert items which were all one to five Likert scale questions on; Capabilities, innovation climate, vertical connectivity, horizontal connectivity and customer connectivity as described above. Two items were asked in a negative sense (barrier) and are thus inverted. There are however not enough Likert items to fully cover all the innovation barriers as found in the literature and the available data might be insufficient to prove a significant effect. The questions and their labels are added in appendix 1.

The first step is to analyze if a principal component analysis is suitable. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.888 is above the minimum recommended value of 0.6. Secondly, the Bartlett's test of Sphericity was significant at the 1% level and lastly the communalities were all above 0.3 confirming that there is shared common variance. Given these indicators, principal component analysis seems suitable.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,888
Bartlett's Test of Sphericity	Approx. Chi-Square	3456,592
	df	496
	Sig.	,000

Figure 5

In order to compute and identify composite scores for the underlying factors, a principal component analysis with a varimax rotation and Kaiser normalization was used. Varimax is an orthogonal rotation method which simplifies the factor matrix as can be seen in the rotated component matrix. This type of rotation minimizes the number of items that have high loadings on each factor. Figure 6 shows the eigenvalues and the total variance explained by the eight different factors.

The figure indicates that the eight components explain respectively 20.045%, 9.494%, 9.302%, 9.172%, 7.922%, 5.202%, 4.752% and 3.526% of the variance (cumulatively 69.414%). In order to decide how many factors were extracted the Latent Root Criterion is used. This criterion is based on factors having an eigenvalue higher than 1. This criterion is mostly used in exploratory principal component analysis when the number of variables is between twenty and fifty, as in this study.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10,966	34,268	34,268	10,966	34,268	34,268	6,414	20,045	20,045
2	2,952	9,223	43,491	2,952	9,223	43,491	3,038	9,494	29,539
3	1,848	5,776	49,268	1,848	5,776	49,268	2,977	9,302	38,841
4	1,537	4,804	54,072	1,537	4,804	54,072	2,935	9,172	48,013
5	1,347	4,209	58,281	1,347	4,209	58,281	2,535	7,922	55,935
6	1,309	4,091	62,372	1,309	4,091	62,372	1,665	5,202	61,137
7	1,199	3,747	66,119	1,199	3,747	66,119	1,521	4,752	65,889
8	1,055	3,296	69,414	1,055	3,296	69,414	1,128	3,526	69,414

Figure 6

Looking closer at the rotated component matrix it shows which Likert item loads to which component. The coefficients are ranked on their loading and scores under 0.3 are suppressed to get a better overview.

Rotated Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
VC4	,813							
VC3	,806							
IC6	,797							
IC7	,733							
VC2	,701							
IC8	,692							
VC1	,682							

IC5	,675					,322		
VC5	,569							-,513
CA4	,524	,418						
CC2		,838						
CC3		,796						
CC1		,731						
CA1			,762					
CA5			,719					
CA2			,703	,407				
CA3	,330		,648					
IC1			,329	,720				
CA7				,699				
CC6				,685				
IC2	,374	,328		,532		,358		
CC4		,444		,527				
CC5		,397		,416		-,316		-,394
HC4					,783			
HC5	,338				,656			
HC3					,655	,347		
HC1	,387				,558	,474		
HC2	,338		,408		,464			
IC4	,396					,729		
invertbur							,804	
invertopdown							,784	
CA6	,428							,632

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 25 iterations.

Figure 7

Analyzing and naming the different factors is important for the interpretation of the statistics. There is however no scientific method to do this. The method used to name the factors is based on the subjective view of the analyst and the earlier described literature. By reflecting on the different factors and the different items loading on these factors, a

name can be assigned. As a result, the items can be grouped and named as the following factors with the items loading highest to the factor shown underneath it:

Organizational culture

- VC4: In our organization decisions are made in consultation.
- VC3: Problems can be openly discussed between management and employees within our company.
- IC6: Employees have a lot say-so on how things happen within the company.
- IC7: In our company we give space, time and resources to launch new initiatives.
- VC2: In our company the communication between leadership and employees is excellent.
- VC2: In our company the communication between leadership and employees is excellent.
- IC8: In our company failure is seen as a learning experience
- VC1: In our organization we give maximum responsibility to our employees.
- IC5: Employees are actively involved with the innovation process in the company.
- VC5: Our company does not suffer much from bureaucracy.
- CA4: We learn from our mistakes.

Customer relation capabilities

- CC2: We know very well who our customers are.
- CC3: We know very well what our customers appreciate.
- CC1: We maintain long term relations with our customers.

(Technological) knowledge management capabilities

- CA1: In our company we have enough expertise (knowledge and experience) to develop new products and services our self.

- CA5: Our company has enough skill and expertise to effectively implement new developments.
- CA2: Our company has the right technical skills and expertise to realize innovations.
- CA3: In our company we have enough management knowledge to implement innovations effectively.

Market/customer adaption capabilities

- IC1: Our company is a precursor in redeveloping products, services and processes.
- CA7: Technology has a crucial role in our company.
- CC6: Information technology is an essential tool for us to connect or stay connected with our customers.
- IC2: Our company is successful in reacting to new developments in the market.
- CC4: We involve customers actively with innovation projects.
- CC5: Suggestions and complaints are often the starting point for improvements of our processes.

Social capital

- HC4: In our company we are used to work in multidisciplinary teams.
- HC5: Project management is one of our strengths.
- HC3: The collaboration between teams and departments is effective in our organization.
- HC1: People with different expertise work together well in our company.
- HC2: In our company we have effective methods to manage innovation projects.

Change culture

- IC4: Most employees are open to change.

Innovation barriers

- IC3: innovation is being hindered by formal rules and procedures within the company.
- VC6: In our company management is too much top-down.

Human resources investment

- CA6: Our company invests more in education and training of the staff then the average company in our sector.

Figure 8 shows how the internal innovation drivers found in the principal component analysis are linked to the theoretical framework as earlier described in figure 4. In figure 4, culture is described as one variable. However, observing the results of the principal component analysis, the variable culture is split up in the variables change and organizational culture. Additionally, the variable, innovation barriers was extracted in the principal component analysis and is thus added in the model. The effect of these eight extracted dimensions on innovative performance will be analyzed in the following multiple regression analysis.

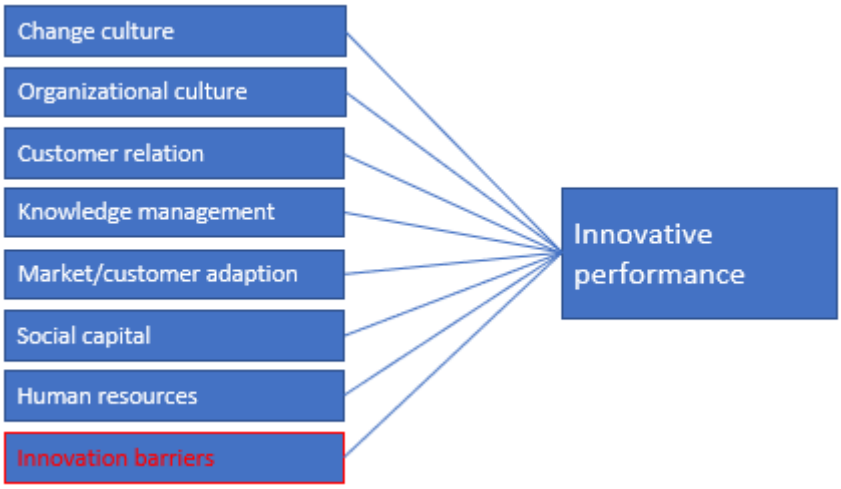

Figure 8

Regression analysis

In order to analyze the different Likert scale groups, the factor scores are generated by SPSS after reviewing the results of the factor analysis. There is enough evidence from the factor analysis that the components are sufficiently intercorrelated and can be grouped to measure the underlying variable. Standard multiple regression will be used in order to determine the effect of the eight predicter values and the outcome on the dependent variable, innovative performance. The dependent variable, innovative performance, is computed by averaging the scores of the four questions on innovative performance as can been seen in Appendix 1.

Assumptions

Before conducting the multiple regression, the first step is to check if the data passes the assumptions for using multiple regression. (OU, 2012)

1. The first assumption is to check if the dependent variable is measured on a continuous scale. As already explained in the limitations the dependent variable will be treated as an interval variable.

2. Assumption two is whether there is a linear relationship between the dependent and independent variables. By looking at the scatterplots, a clear linear relationship can be confirmed.

3. Assumption three checks if the variance of the residuals is constant. Looking at the plots of the squared residuals and predicter residuals, homoscedasticity can be observed. (No obvious funneling or fanning of the scatterplot output is observed)

4. Assumption four, the data shows no multicollinearity. Factor scores have no correlation to each other. This can also be proven by looking at the Pearson correlation between the predicter variables. With all values being 0 it can be assumed there is no multicollinearity. In addition, the collinearity diagnostics output from SPSS show no signs of multicollinearity.

5. Assumption five states that there are no significant outliers or influential cases biasing the model. Looking at the Casewise diagnostics and residual plots, one outlier is detected. By analyzing the Cook's distance of the different respondents, the overly influential case has been found and exterminated from the data.

6. Assumption six checks if the residuals are approximately normally distributed. By looking at the PP-plot and the standardized residual plot we can determine the residuals are approximately normally distributed.

7. Assumption seven checks if the values of the residuals are constant. The Durbin-Watson statistics showed that this assumption has been met. The obtained value of 2.203 remains between the critical values of 1.5 and 2.5

After testing for the assumptions, multiple regression analysis can be conducted. As already mentioned earlier, all eight predicter variables in the regression are based on factor scores. Because these factor scores are calculated by using the refined regression method, the predictor variables all have a mean of zero. In addition, the factors are orthogonal, meaning there is no correlation between the variables. Furthermore, there should be considered that the factor scores are estimates. A factor score estimate is a numerical value that is meant to indicate a person's relative spacing or standing on a latent factor. A positive factor score for an individual respondent thus indicates a positive score compared to the mean. Adversely, a negative factor score estimate, represents that the respondent is beneath the average. For example, a factor score of -2 for the variable customer relation would be a rather extreme score and means the company scores very bad (two times the standard deviation less than average) on customer relations compared to the other respondents. (DiStefano, 2009)

In table 2 the regression results of the eight predicter variables on the dependent variable, innovative performance is shown. As can been seen in the table, the variables; Organizational culture, Customer relation, Knowledge management, Market/customer adaption, change culture and HR investment have a significant impact on innovative performance at the 1% level. For social capital and the innovation barriers, no significant effect can be found within the data available. The insignificant effect of the innovation barriers on innovative performance might however be as already discussed earlier on the

ground of insufficient questionnaire data available on the topic. The overall fit of the model was .670, meaning that 67% of the variance is explained by the model.

Table 2: Regression results using innovative performance as the criterion.

Predictor	b	b 95% CI [LL, UL]	beta	t	Sig.	Fit
(Constant)	2.933	[2.887, 2.978]		127.276	.000	
1. Organizational culture	.142	[.097, .188]	.258	6.151	.000	
2. Customer relation	.112	[.066, .157]	.203	4.834	.000	
3. Knowledge management	.190	[.144, .235]	.344	8.204	.000	
4. Market/customer adaption	.353	[.307, .398]	.641	15.258	.000	
5. Social capital	.004	[-.041, .050]	.008	.183	.855	
6. Change culture	.091	[.046, .137]	.166	3.954	.000	
7. Innovation barriers	.002	[-.043, .048]	.004	.102	.919	
8. HR investment	.078	[.033, .124]	.142	3.388	.001	
						R^2 =.670*

Note. b presents unstandardized regression weights. beta indicates the standardized regression weights. LL and UL indicate the lower and upper limits of the confidence interval, respectively.

In addition, a hierarchical multiple regression analysis was conducted in order to test for possible confounding variables. The results are shown in table 3. The control/dummy variables; size of the company, age of the company, sector of the company and whether the company is a family business or not were tested in different models. However, adding these control or dummy variables did not have a significant effect (5% level) on the predictor variables, outcome estimates and the explained variance of the models. However,

for the variable size there is a significant effect on innovative performance at the 10% level. Moreover, the sample in this research is solely represented by SME's. It might be possible that the size of the company has a confounding effect if large companies would have been represented in the sample. Additionally, the lacking effect of the control variables might be due to the measurement method of the dependent variable, innovative performance, as will be further discussed within the limitations in the following chapter.

Table 3: Regression results for the different models using innovative performance as the criterion.

	Model					
Predictor	**1**	**2**	**3**	**4**	**5**	**5**
(Constant)	2.933*	3.004*	2.932*	2.940*	2.803*	2.903*
1. Organizational culture	.142*	.141*	.142*	.142*	.151*	.150*
2. Customer relation	.112*	.107*	.112*	.111*	.110*	.105*
3. Knowledge management	.190*	.189*	.190*	.190*	.189*	.188*
4. Market/customer adaption	.353*	.351*	.352*	.352*	.351*	.348*
5. Social capital	.004	.006	.004	.004	.004	.005
6. Change culture	.091*	.089*	.091*	.092*	.098*	.097*
7. Innovation barriers	.002	-.001	-.002	.003	-.005	-.007
8. HR investment	.078*	.080*	.077*	.079*	.077*	.079*
Family company		-.054				-.057
Sector			-6.385E-6			-4.393E-6
Age				-.003		-.010
Size					.105***	.109***
Fit	.670*	.671*	.669*	.669*	.675*	.672*

*Note. unstandardized regression weights are presented. * indicates significant at 1% level. ** indicates significant at 5% level. *** indicates significant at 10% level.*

Limitations

The study is subject to some limitations. Commonly, Likert scale data is treated as ordinal data. However not in this research. In the used data set the Likert scale input is not available as rounded up numbers. This is because the Likert scale data is computed by taking the average of scores given by different respondents in each company. As a result, there are too much ‘’categories’’ to analyze. In the literature there is still a big debate if Likert scale data can be used for parametric statistical procedures such as Factor analysis and linear regression. Jamieson (2004) argues that only nonparametric statistics should be used on Likert scale data because the intervals cannot be assumed equal. Other literature such as (Lubke, 2014) and (Glass et al., 1972) however suggests that parametric tests like factor analysis are valid in some situations and that ANOVA can compute accurate P-values on Likert items.

Taking into account the certain advantages and disadvantages and testing assumptions for the parametric tests. It is decided to treat the data as continues scale data. That means we also assume the intervals between the scale values are equal. In addition, middle response bias as often seen in Likert scale measurement is ignored. Thus, in the absence of definitive answers from the literature and the limitations of the dataset there has to be proceeded with caution and there should be awareness that results could be biased.

Likewise, in the regression analysis the data is treated as continues data. Because the used data set uses the factor scores and there is a normal distribution for all variables the

data can be treated as a continues measure scale (Sullivan, 2013). In addition, according to research of Dr. Geoff Norman ‘’parametric tests are sufficiently robust to yield largely unbiased answers that are acceptably close to the truth when analyzing Likert scale responses’’. As mentioned earlier there is however still a long-standing controversy in the literature on the validity of using parametric tests on Likert scale data.

Another limitation is how the dependent variable, innovative performance, is measured. In this research innovative performance is measured averaging the four questions on innovative performance (IP) as can be seen in appendix 1. These questions dot not measure the innovative performance in absolute terms but relatively in comparison with competitors. However, as Tatikonda (2007) already discussed in his research, innovative performance measurement is an expansive and elusive subject. ‘’this is due to the multiplicity of meanings associated with performance measurement; the varied, but simultaneous, roles that performance measurements play; and the numerous distinct customers of performance measurement’’. At the moment the most appreciated innovative performance measurements by executives according to the Boston Consulting Group are: time to market, new product sales, and return on investment in innovation.

Hsu and Fang (2009) however, go into more detail. They identified four dimensions when measuring innovative performance:

- Market performance: where the focus is on things such as revenue, market share, market forecast accuracy, etc.
- Financial performance: where there is focus on overall profitability and investment returns.
- Customer performance: where the performance is based on customer satisfaction and customer acceptance.
- Product performance: here there is a focus on the quality of products, competitive advantages and if the products are launched on time.

However, there is a lot of incoherence in the literature on which dimensions should be measured and how they should be grouped. Nevertheless, by looking at the common characteristics and not at the conceptual differences, some key themes such as financial, market and technical performances can be extracted. (Hannachi, 2015). In the questionnaire, the themes: time to market, process improvement, product development, answering customer needs, and how the company is viewed by its consumers considering innovation are covered. Even though these themes do link with the literature on innovative performance measurement, it should be considered that the used measurement method of innovative performance in this research is not idyllic.

Discussion and conclusions

Innovation and appropriate innovation policies are crucial for every country and their economic development. It is thus vital for the Dutch government to understand what drives innovation in order to improve their policies and the environmental economic climate concerning innovation. The objective of this study was therefore to investigate what the key drivers and barriers for Dutch businesses are to successfully innovate within the Netherlands.

In the literature review several drivers, barriers and the Dutch policies concerning innovation were explored and discussed. However, the available empirical data was not sufficient to cover all these topics. For the empirical research, a data sample from the ''strategic innovation project Belgium and the Netherlands'' is used. This was a research project where 354 Dutch SME's participated in a strategic review process and completed a questionnaire. A principal component analysis was conducted on the Likert items from the questionnaire in order to determine the different dimensions concerning internal drivers to innovative performance. Subsequently, a multiple regression analysis was conducted on the resulting factors in order to explore which internal drivers have a significant effect on the innovative performance of Dutch companies.

The results from the principal component and regression analysis show a significant effect of the variables: organizational culture, customer relation, knowledge management, market/customer adaption, change culture and HR investment on the innovative

performance for Dutch companies. Out of all these variables, market and customer adaption had the largest effect on innovative performance.

For the variable social capital, no significant effect on the innovative performance was found. Likewise, for the barriers no significant effect could be found on innovative performance. However, this could be due to insufficient questionnaire data available in order to appropriately test the effect of the barriers on the innovative performance for Dutch companies.

Furthermore, the confounding variables; size of the company, age of the company, sector of the company and whether the company is a family business or not, had no significant effect at the 5% level.

While there is lacking research on drivers of innovative performance for Dutch companies, there is literature available where the drivers of innovative performance are researched for other countries, regions or specific sectors. The results of this research are consistent with the results of prior research. However, the insignificant effect of the confounding variables is unexpected. Examining preceding research, some of the confounding variables like the seize of the company or the sector of the company do have a significant effect. This inconsistency with the literature could be for the reason that in this research there was only data available on SME's. Incorporating large companies in the research might alter the results. A second explanation for the inconsistency with the literature could be the unidyllic method of measuring the dependent variable, innovative performance, in

this research. For further research it is thus crucial to use an appropriate method to measure innovative performance prior to making the questionnaire. Additionally, it is crucial that the sample represents a larger variety of companies in order to test for confounding variables.

Additionally, as mentioned previously, the external innovation drivers found in the literature could not be empirically tested due to unavailable data. Drivers such as open innovation, financial resources and Dutch policies concerning innovation and the innovation climate might have a substantial effect on innovation according to the examined literature. Furthermore, within the literature it is described that many of the in this research empirically tested capabilities such as culture, customer relation/involvement and knowledge management might be strongly linked to open innovation. While this research found empirical evidence on the effects of some of the internal drivers of innovative performance, it is still crucial to incorporate both the internal and external drivers in a single statistical model in order to get a more comprehensive understanding of what drives innovative performance for Dutch companies.

Likewise, the barriers found in the literature could not be empirically tested due to the unavailability of questionnaire data. Factors such as; cost, market, knowledge and policy barriers might have a substantial negative impact on innovative performance. Further research is thus needed in order to include all the variables found in this research and

provide an incorporated statistical model to empirically test the internal and external drivers and barriers simultaneously.

Nevertheless, this exploratory study offers several theoretical contributions and implications for research. The literature review provides a good basic understanding of which barriers and external drivers might have an effect on innovative performance. Additionally, this study shows empirical evidence on which internal drivers have an effect on innovative performance for Dutch companies. This provides a good base for further research that aims to incorporate all the factors discussed in the literature review in one statistical model.

Furthermore, the findings of this research are vital for the Dutch government in understanding all the drivers and barriers for Dutch companies to improve their innovative performance. This knowledge is crucial for the government in order to improve their policies and regulations and will help creating an innovation fostering environmental landscape within the Netherlands for innovative companies to thrive in.

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Appendix 1: Questionnaire questions

Questionnaire questions: all questions are measured on a one to five Likert scale, five being fully agree and one fully disagree. (note: two questions, displayed in red, are asked in a negative sense).

	Capability questions How do the following statements apply to your company?
CA1	In our company we have enough expertise (knowledge and experience) to develop new products and services our self.
CA2	Our company has the right technical skills and expertise to realize innovations.
CA3	In our company we have enough management knowledge to implement innovations effectively.
CA4	We learn from our mistakes.
CA5	Our company has enough skill and expertise to effectively implement new developments.
CA6	Our company invests more in education and training of the staff then the average company in our sector.
CA7	Technology has a crucial role in our company.

	Innovation climate questions How do the following statements apply to your company?
IC1	Our company is a precursor in redeveloping products, services and processes.
IC2	Our company is successful in reacting to new developments in the market.
IC3	Innovation is being hindered by formal rules and procedures within the company.
IC4	Most employees are open to change.
IC5	Employees are actively involved with the innovation process in the company.
IC6	Employees have a lot say-so on how things happen within the company.
IC7	In our company we give space, time and resources to launch new initiatives.
IC8	In our company failure is seen as a learning experience

	Innovation urgency questions How do the following statements apply to your company?
UR7	In our company innovation is seen as an essential way to diversify ourselves from our competitors.
UR8	If we don't innovate we can see this back in our financial results quickly.
UR9	Without innovation the existence of our company is in danger.

	Vertical connectivity questions How do the following statements apply to your company?
VC1	In our organization we give maximum responsibility to our employees.
VC2	In our company the communication between leadership and employees is excellent.
VC3	Problems can be openly discussed between management and employees within our company.
VC4	In our organization decisions are made in consultation.
VC5	Our company does not suffer much from bureaucracy.
VC6	In our company management is too much top-down.

	Horizontal connectivity questions How do the following statements apply to your company?
HC1	People with different expertise work together well in our company.
HC2	In our company we have effective methods to manage innovation projects.
HC3	The collaboration between teams and departments is effective in our organization.
HC4	In our company we are used to work in multidisciplinary teams.
HC5	Project management is one of our strengths.

	Customer connectivity questions How do the following statements apply to your company?
CC1	We maintain long term relations with our customers.
CC2	We know very well who our customers are.
CC3	We know very well what our customers appreciate.
CC4	We involve customers actively with innovation projects.
CC5	Suggestions and complaints are often the starting point for improvements of our processes.
CC6	Information technology is an essential tool for us to connect or stay connected with our customers.

	Innovation performance questions How do the following statements apply to your company?
IP1	Our company is one of the first that gets new products and services on the market.
IP2	Our company is better than our competitors in improving internal processes.
IP3	Our company is better than our competitors in developing new products and services that suit the needs of our customers.
IP4	Consumers see our company as more innovative as our competitors.

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Toemen, Erik

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