# AN OVERVIEW OF THE 'SAFETY & SECURITY' CLUSTER IN TWENTE

Niek Hinsenveld – s1009788

Prof. Dr. A.J.J. Meershoek

Prof. Dr. G. Hospers

Final Version 18-02-2015

UNIVERSITY OF TWENTE.

ABSTRACT

Since the end of 2010 the 'safety & security' economic cluster is in the center of attention of the ministry of Economy, Agriculture and Innovation (EL&I). Traditionally, security is a concept which has been mostly defined in terms of national security. However a shift in what is considered to be the 'safety and security cluster' can be seen. Unfortunately there is no statistical data about revenue, employee numbers, number of companies and more available on the European or national level. This research focusses on the new 'safety & security' cluster within the region of Twente at the request of Twente Safety and Security (TS&S). It will be about all safety and security developments, products and research which have an economical potency in terms of business activity, employment and economically added value for the Dutch security cluster in general and in specific for the region of Twente. The results of this research will be used in determining policy guidelines.

According to Policy Research Corporation (2013) the 'safety & security' sector within the Netherlands has an estimated size of €6 billion revenue and 61.000 persons employed. When evaluating the competitiveness of the 'safety & security' within Twente, a comparison with the HSD 'safety & security' cluster is in order. 'Safety & security' in the Hague has an annual revenue size of €1,7 billion and employs 13.400 persons. Which is almost one-third of the total revenue and 20% of the persons employed within the Dutch 'safety & security' cluster (HSD, 2014). To establish the economical statistical data for the 'safety & security' cluster in Twente an input-output analysis is used. To complete the overview of the cluster and to enable a more thorough comparison with the HSD 'safety & security' cluster a Porters diamond analysis is used.

As a result from the input-output analysis it becomes clear that the 'safety & security' cluster within the region of Twente can be treated as a regional cluster in terms of competitiveness. The size of revenue within the 'safety & security' cluster within Twente is €1.1 billion in 2012 and has shown an average revenue growth of 5,33% per year. Over the period of 2006 up to 2012 the 'safety & security' cluster has realized a growth of more than 30%. When looking at the competitiveness of the 'safety & security' cluster within the region of Twente the supporting industries, like Troned, Tech Fortune and Safety field labs, which are helping the development of new and innovative products through testing and implementing them in a controlled environment, are important. Next to these supporting industries the presence of unique research institutions such as MESA+ and CTIT make sure that the region of Twente is competitive in the development of new and innovative technologies and products.

When comparing both clusters one can conclude that due to the differences between the two 'safety & security' clusters and the fact that these differences are complimentary to each other, both clusters have the option to benefit and thrive of each other and can both be competitive.

LIST OF ABBREVIATIONS

AIVD	General Intelligence and security service of the Netherlands
CBS	Central Bureau of Statistics of the Netherlands
CPB	Bureau for Economic Policy Analysis of the Netherlands
CTIT	Center for Telematics and Information Technology
DITTS	Dutch Institute Technology, Safety & Security
EC	European Commission
EL&I	Ministry of Economy, Agriculture and Innovation
EU	European Union
FTE	Fulltime Equivalent
GDP	Gross Domestic Product
HCSS	Hague Centre for Strategic Research
HSD	Hague Security Delta
HTSM	High Tech Systems and materials
ICJ	International Court of Justice
KLPD	Royal national police department of the Netherlands
KvK	Chamber of Commerce of the Netherlands
MIA	Social innovation agenda
NFI	Dutch National Forensic Institution
NATO	North Atlantic Treaty Organization
OPCW	Organization for the Prohibition of Chemical Weapons
R&D	Research and Development
SBI	Standard Business Indicator
TS&S	Twente Safety & Security
TNO	Dutch Organization for applied scientific research
UT	University of Twente
VRT	Safety Region Twente
WTC	World Trade Center

Index

1. INTRODUCTION REPORT

Since the end of 2010 the 'safety & security' economic cluster is in the center of attention of the ministry of Economy, Agriculture and Innovation (EL&I). With the introduction of the Hague Security Delta (HSD) which is a consortium in which the Dutch organization for applied scientific research (TNO), The Hague university of Applied Sciences, The Hague center for strategic studies (HCSS), Chamber of commerce (KvK) and several other institutions started working together to professionalize the security network within The Hague. From this point on the cooperation of other, although similar, consortiums focused on 'safety & security' within the Netherlands has also grown (Hague Security Delta, 2014).

With the official founding of HSD in 2013, which happened with the support of the Dutch Ministries of Economic Affairs, EL&I and the Municipality of The Hague, the cooperation between similar 'safety & security' clusters within the Netherlands began. Together with the Dutch Institute Technology, Safety & Security (DITSS) in Eindhoven and Twente Safety & Security (TS&S) HSD forms the center of the national 'safety & security' cluster or as they call it the 'national security innovation cluster' (HSD, TS&S, DITSS, 2014).

In 2011, with the report of B&A consulting (2011), a redefined 'safety & security' started being explored. An overview of its revenue and the persons employed in The Hague delta was made. Later, in 2013, Policy Research Corporation refined the overview of B&A consulting (2011) of The Hague 'safety & security' cluster at the request of HSD and made an extrapolation towards the complete cluster within the Netherlands.

Now, at the end of 2014 TS&S, commissioned by the ministry of EL&I, also needs an overview of the economic activity of the 'safety & security' cluster within Twente. Next to an economic overview of the 'safety & security' cluster within Twente, TS&S also wants in to know if and why the 'safety & security' cluster within the region is competitive in order to focus policy guidelines.

1.1 'SAFETY & SECURITY' ECONOMIC SECTOR

Traditionally, security is a concept which has been mostly defined in terms of national security. National security was again mostly defined in terms of military security. After the Cold War the shift in vantage point towards the security sector from the old 'traditional' security sector towards what is currently defined as the 'safety & security' cluster started. Both the academic and political world moved along with this transition which ends with the 'safety & security' cluster as it is now. This new broader 'safety & security' cluster includes several levels and forms of security; 'international, national (external & internal), societal and human' (Hanggi, 2003).

The European Union (EU) also acknowledges the shift in vantage point towards the security sector and agrees that there are currently different aspects important when looking at it. It sees alterations within both the supply and demand side of the 'safety & security' cluster. According to the EU the supply side consists of the traditional security industry, a security-orientated defense industry and 'new entrants'. These new entrants produce, develop and commercialize existing and innovative (civilian) security products and technologies (ECORYS, 2009). It also sees four demand segments; 'Defense support for internal security, civil security, mixed public-private sector security and private sector security. When the supply and

demand side of this sector are combined, the EU sees the following market segmentation. The 'traditional' security market, a defense market and an emerging 'new' safety market. Together these segments are, from a policy point of view, the 'safety & security' cluster in current day economy (ECORYS, 2009).

Unfortunately there is no statistical data about revenue, employee numbers, number of companies and more available on the European or national level. This is mainly due to the fact that there are no main statistical nomenclatures (NACE, SBI or Prodcom) to distinguish this cluster and that there is, currently, no clear definition of the 'safety & security' cluster. Distilling data for production related items is also difficult because security related items are often put under different headings and the statistics do not distinguish between 'security' and 'non-security'. Also producers and procurers of security equipment and systems might be reluctant to provide information on these matters (European Commission, 2012).

According to the European Commission (EC) the 'safety & security' cluster has three distinctive features; 'It is a fragmented market divided along regional boundaries, it is largely institutional and is has a strong societal dimension (European Commission, 2012).

1.2 RESEARCH QUESTION

This paper will consist of a quantitative and qualitative analysis of the 'safety & security' sector within the region of Twente. To be able to answer the questions from the introduction part of this paper the following research question is asked.

Main research question:

- *What are the determinants of competitiveness of the 'safety & security' cluster within the region of Twente?*

To be able to answer the main research question the following sub questions will be needed to answer.

Sub questions:

- *Is the 'safety & security' cluster within Twente a regional cluster in terms of measuring competitiveness?*
- *What is the size of the revenue of the 'safety & security' cluster within Twente?*
- *How did the Twente 'safety & security' cluster develop economically, in terms of revenue, through time?*
- *What are the strong competitive points within the Twente 'safety & security' cluster?*
- *How competitive is the Twente 'safety & security' cluster in comparison with the HSD 'Safety and Security 'cluster*

The method and the results will be discussed in the respective third and fourth chapter. The research questions itself will be answered in the fifth chapter.

To keep the report methodological comparable to the reports of B&A Consulting (2011) & Policy Research Corporation (2013) this report will use similar techniques to identify the 'safety & security' cluster within Twente and will do so following a similar timeline.

1.3 'TOPSECTOREN' POLICY OF THE NETHERLANDS

The 'Topsectoren' policy of the Netherlands is a policy designed specifically to stimulate economic clusters and for the Netherlands to remain economically in the top of the world. It tries to establish cooperation between government, corporations & companies and researchers in a new smart way and it is the result of the ambition from the Dutch government to remain on course towards the top of the world in a powerful and ambitious way (Rijksoverheid, 2011).

The ambition of the Dutch government is as following:

- The Netherlands should be in the top 5 knowledge economies in the world (2020)
- Dutch R&D practices should rise towards 2,5% Gross Domestic Product (GDP) (2020)
- Public and private parties should participate for more than €500 million in top consortia which conduct high quality research and innovation (2015)

There are nine top sectors within the Netherland:

- Agriculture and Food
- Chemical
- Creative Industry
- Energy
- High Tech Systems and Materials (HTSM)
- Life Sciences and Health
- Logistics
- Horticulture
- Water

According to the policy strong regional economic clusters add up to the total Dutch prosperity and have a strong pull on foreign companies to settle within the Netherlands. So when the national government and regional governments work together the effect of this policy will grow immensely, according to the Dutch government (Rijksoverheid, 2011).

HSD is the national 'safety & security' cluster and wants to develop itself to be the most important 'safety & security' cluster within Europe and one of the most important clusters within the world. At first HSD wants to profile itself as a national / international knowledge hub and innovation platform within the knowledge domain. HSD wants to reach this position by developing itself as a director and stimulator of cooperation between government, corporations & companies and knowledge institutions. Via this cooperation HSD provides a significant contribution to the topsector policy of the government; especially in the sector High Tech Systems & Materials (HTSM) but also other top sectors like logistics and chemical are sectors included within the 'safety & security' cluster (HSD, 2014).

1.4 THE REGION TWENTE

The region of Twente is one of seven Dutch city regions and consists of fourteen municipalities. It consists of the following municipalities; Almelo, Borne, Dinkelland, Enschede, Haaksbergen, Hellendoorn, Hengelo, Hof van Twente, Losser, Oldenzaal, Rijssen-Holten, Tubbergen, Twenterand, Wierden. It has a combined total of almost 630.000 citizens (Regio Twente, 2014).

The mayor of each municipality is tasked with the safety and security of its city, of course within the municipal borders. Each municipal also has its own municipal council tasked with the governance of the municipal. There also is the Safety Region Twente (VRT) which wants to improve the safety of everyone who lives, works or stays in Twente via crisis management and efficient, effective and professionally organized disaster control. To do so they work together with the 14 municipalities, the Twente medical assistance organization (GHOR), the fire department and the police department.

Next to the local governmental bodies of each municipality there is the regional council. The regional council is a voluntary collaborative partnership between the 14 different municipalities (Regio Twente, 2014) .

The region of Twente has roughly 16% of the total citizens within the Netherlands while, economically seen, it produces 3% of the total Dutch GDP (Twente Index, 2014).

The region of Twente is also the host for the University of Twente and the Saxion University of Applied Science, both located in the municipality of Enschede and hosts several secondary vocational educations like, for example, the ROC which is located in Enschede and Almelo.

1.5 TWENTE SAFETY AND SECURITY

Twente Safety & Security (TS&S) is the consortium based in the region of Twente. Responsible for the cooperation between government, knowledge institutions and local businesses. According to TS&S their main three innovation themes are:

- Social innovation to increase safety within society
- Dedicated information supply
- Process innovation within and between professional organizations

TS&S works together with several government, public and corporate parties, parties such as; the VRT, University of Twente (UT), Saxion University of Applied Science, HSD, DITTS, TNO, Thales and many more. Together they promote the region of Twente within the coming action agenda of 2020 from the Dutch ministry of Economy, Agriculture & Innovation (EL&I) (TS&S, 2014). Next to this TS&S has a seat, together with the Centre for Risk management, Safety and Security and the Centre for Telematics and Information Technology (CTIT) of the UT, within the Advisory board of HSD.

1.6 'SAFETY & SECURITY' CLUSTER WITHIN THE NETHERLANDS

The research from B&A consulting (2011) was only about The Hague region. As stated earlier Policy Research Corporation (2013) made the economic overview more accurate and extrapolated the numbers from The Hague region towards the overall Dutch economy. According to Policy Research Corporation (2013) the 'safety & security' sector within the Netherlands has an estimated size of €6 billion revenue and 61.000 persons employed. Next to these estimates about the current size of the 'safety & security' cluster within the Netherlands, HSD also made future forecast for the cluster. The future forecast foresees a growth from €6 billion total revenue and 61.000 persons employed towards a total revenue of €12 billion total revenue and 75.000 persons employed in 2020 and that it will continue to grow to a total of €14 billion revenue and 85.000 persons employed in 2025. (HSD, 2014)

Within the 'safety & security' economic cluster HSD sees the following subcategories: '*National Security, Urban Security, Cyber security, Critical Infrastructure Protection, Forensics and Education & Research*'.

1.7 HSD 'SAFETY & SECURITY' CLUSTER

When evaluating the competitiveness of the 'safety & security' within Twente, a comparison with the HSD 'safety & security' cluster is in order. Similar research for the DITTS 'safety & security' cluster is unfortunately not available due to the fact that it has not been completed yet so a comparison with the DITTS region is currently not possible.

Fortunately there is a lot of data available for the HSD 'safety & security' cluster in The Hague. 'Safety & security' in the Hague has an annual revenue size of €1,7 billion and employs 13.400 persons. Which is almost one-third of the total revenue and 20% of the persons employed within the Dutch 'safety & security' cluster (HSD, 2014).

The Hague and its 'safety & security' is typified by the governmental agencies and international institutions which are all centered together and form a unique position for the region of The Hague. Examples of these institutions are: Europol, the organization for the prohibition of chemical weapons (OPCW), general intelligence and safety service (AIVD), the North Atlantic Treaty Organization (NATO), International Court of Justice (ICJ) but also national governmental agencies like the Ministry of Defense, the royal national police force (KLPD) and the national anti-terrorism coordinator.

The three biggest economic sectors within the HSD 'safety & security' cluster are commercial services (42%), non-commercial services (31%) and knowledge institutions (18%). Industry only covers 5% of the cluster in the region of The Hague.

When looking at subcategories as defined by HSD, especially *National Security* is well represented. After *National Security* comes *Cyber Security* and *Urban Security* both with firms existing mainly in the service industries.

The region expects that the *Cyber Security* subcategory will show the largest growth. Especially due to the fact that the National Cyber Security Center, the European Cyber Security Center and the Joint JIGINT Cyber Unit, also called Symbolon, will expand their activities.

- Next to these general statistical points HSD region has a couple of unique selling points.
- It is internationally focused and is internationally known as a safety and security region due to the presence of many international institutions.
- It has a unique knowledge position with two universities in its vicinity and research institutions like TNO Defense and Safety, Clingendael and NFI.
- Last but not least The Hague is the region where the true policy course of the "Safety and Security" cluster is decided.

Not only is The Hague the political capital of the Netherlands, with many large governmental organizations, like the ministry of defense, foreign affairs, safety and justice but also the KLPD and the general intelligence agency of the Netherlands(AIVD), are located.

2. THEORY

2.1 DEFINITION 'SAFETY & SECURITY'

As stated in the introduction the 'safety & security' economic sector traditionally was focused mainly on national security and largely defined in military terms. With the developments of the last two decades the policy scope has widened and the sector started to include other economic areas involved with safety or security (Hanggi, 2003). This research focusses on this new economic 'safety & security' cluster. Thus the products, developments, tools, research, training, education and similar things are the units we analyze in order to see if a firm or a part of a firm belongs to this cluster.

To determine what exactly is safety and security in terms of a definition for the economic 'safety & security' cluster a combination of several definitions already practiced by institutions in the Netherlands is used. These institutions are the Social Innovation Agenda Security (MIA Safety) and the Central Bureau for Statistics (CBS). This sector includes, as said, all products, developments, research, innovation, protection and all other forms which have an economical potency in forms of safety and security for states, nations, regions and individuals. It includes the prevention of intentional (un-)safety, in other words a situation which is created with intent, for example terrorism and crime. It also covers (un-)safety such as food safety, traffic safety or consumer safety. Next to these areas, the products and developments for the fight and control of crisis, defense, prevention of unsafety, protection of important infrastructure, forensic techniques and questions for metropolitan security also belong to this cluster (Rijksoverheid, 2008). The 'safety & security' cluster envelops political, economic, societal and environmental aspects (Panic, 2009). Products for this sector could be: sensor technology, camera security, mobile communication devices, Lab on a chip, data protection, protective clothing, educational programs up to security agents (Rijksoverheid, 2009).

In short this research is about all safety and security developments, products and research which have an economical potency in terms of business activity, employment and economically added value for the Dutch security cluster in general and in specific for the region of Twente.

Even though a generally accepted definition of what exactly belongs to this economic cluster is not accepted yet. There are however sub domains available to begin with. In these sub-domains a more clear idea of which companies belongs to the 'safety & security' economic cluster can be made (European Commission, 2012).

The research done by B&A Consulting (2011) and Policy Research Corporation (2013) speak of five subdomains in which companies can be categorized by their activities. It is possible that certain activities fall within one or more subdomains. These subdomains are, comparable with the areas the European Commission (2012) foresees in its *'Action plan for an innovative and competitive Security Industry'*. The following subdomains are distinguished and determined by HSD (2014):

National security

National security focusses on the security of the state. Next to border control, defense and state security transnational (organized) crime and climate change play an important new role within the national security subdomain. The biggest thread for national security within transnational crime are cyber-attacks, biological weapons and nuclear weapons. But also demographic changes, like urbanization, migration and population growth, have a big impact on this domain. Military and humanitarian operations need to be prepared in more and more urbanized areas (B & A Consulting, 2011) and (Policy Research Corporation, 2013).

Urban security

The perception of safety and security is an important aspect within urban security is. Due to the general trend of continued urbanization a new heightened risk of new safety and security threats arises. Unemployment, poverty, hunger and crime within urban areas are safety risks which have a negative impact on society. Countering these typical urban problems or providing the perception that citizens are protected from them belong to the urban security domain (B & A Consulting, 2011). The importance of urban design, heightening community involvement and minimalizing risk due to focusing on vulnerable groups, like the elderly is important. Technological developments and the implementation to counter or help with the above described issues are of great importance and are what urban security is mainly about (Policy Research Corporation, 2013).

Cyber security

The cyber security domain focusses on the security of the ICT structure and on the protection of the data & information itself. Malware (viruses, worms and Trojans), phishing, hacking, spam, etc. are subjects often discussed within this domain. Information protection is about data encryption and the development of virtual private networks. Crime within this domain has several faces: skimming, online banking fraud, piracy, child pornography, cyberterrorism and many more (B & A Consulting, 2011).

Critical infrastructure protection

Management, development and protection of infrastructure such as roads, waterways, railroads, pipelines and data/communication lines (HSD, 2014).

Forensics

Forensic research or forensic science is the evidence tracing which is conducted in criminal investigation. It helps to track down perpetrators or to discover the cause of the possible crime trough the analysis of scientific evidence. Forensics is a broad domain and includes almost all beta science including biotech, biometry, and digital sciences. The difference with for example urban security and cyber security is that those are more focused on prevention while forensics is most important when the act already is committed (HSD, 2014) and (Policy Research Corporation, 2013).

This subdomain envelops all knowledge institutions and activities which focus on Research & Development (R&D).

The subdomains described above are determined by HSD itself and are used and explained in a similar way by B&A consulting (2011) and Policy Research Corporation (2013). They are well known and much used subcategories within the 'safety & security' cluster within the Netherlands, as can be clearly seen on the website of HSD.

2.2 ESTABLISHING THE TWENTE 'SAFETY & SECURITY' CLUSTER

2.2.1   ABOUT CLUSTERS

Cluster analysis is based on the concept that national economic or industrial areas are concentrated in very few regions and that organizations working in the same industrial sector are located in the same area. It also is an economic phenomenon which is framed in a competitive context where several firms compete and collaborate to gain economic advantages (Boja, 2011) (Porter, Location, Competition, and Economic Development: LocalClusters in a Global Economy, 2000).

The borders of clusters are often difficult to define or should be seen as a gray area due to the effect that industries not related at first glance sometimes are involved or intertwined within a cluster. According to Porter (2000) '*the drawing of boundaries for a cluster is a creative process which start with understanding the connectedness between the industries and institutions most important for the competition in that specific field*'.

There are several widely accepted definitions given about clusters and cluster characteristics. Boja (2011) gives a summary of cluster characteristics distilled from several definitions written down by Porter(1998, 2000), Krugman(1991) and Morosini(2004). The overview of cluster characteristics from Boja (2011) is as following:

- *The economic activity of the cluster can be on all levels. Thus community level, geographic area level and global level.*
- *It is limited to a certain industry of category*
- *Consists of horizontal productions links within the cluster as well as vertical links consisting of supplier-manufacturer-dealer-customer links*
- *The firms are in competition with each other but this competition, trough specialization of the cluster, contributes to the improvement and development of the cluster*
- *The proximity between firms generates relations like trust and social relations*
- *Infrastructure used in innovation is commonly used die to rapid transfer of knowledge and by support coming from universities and research centers.*

Clusters are seen as the new units of analysis in determining competitiveness. Dynamics within clusters are said to bring more advantages than when the firms are scattered over several areas. According to Boja (2011) clusters have specific observed positive effects which are:

- *'A reduction in financial, transport and time costs'*
- *'A larger labor pool of specialized workforce'*
- *'Easier transfer of information'*

The conclusions of Boja (2011) are drawn upon the analysis done by Marshal (1890) and Krugman (1991). Next to these positive effects, within clusters thereis more innovation and companies have a longer life span than when they are isolated (Boja, 2011).

The positive effects from clusters come from a variety of aspects. Within clusters there are signs of a heightened levels of innovation. This is a result from direct transfer of information in respect to cooperation. But also the transfer of labor force in combination with analysis and observation of the competition result in indirect transfer of information. Spin-offs from results of research or new technical ideas also result in this indirect transfer of information. All these forms of transfer of information lead to heightened level of knowledge within firms, which enables them to innovate easier (Boja, 2011). According to Porter (2000) clusters are also capable of perceiving new byer needs and of perceiving new technological operating and delivery possibilities which again are drivers for innovation. Also, because demand for sophisticated products often exists within clusters, firms from this cluster have a better window on the market to innovate in comparison with isolated firms (Porter, 1998).

Within clusters new firms are easier established than in distant locations. This is mostly due to the fact that the barrier of entry is lower within a cluster than somewhere else. This barrier of entrance is perceived to be lower because within the cluster there is a significant local market, the existence of multiple local customers, a network of established relations and also local firms that are successful (Porter, Location, Competition, and Economic Development: LocalClusters in a Global Economy, 2000). Also the skills, assets, staff and others needed to establish a new firm are easier to find within a cluster. Last investors and financial institutions from within the cluster area are familiar the risks and thus may extend their help more easy (Porter, 1998).

The fact that firms within a cluster seem to have a longer lifespan is the result of a self-reinforcing cycle within clusters that seems to promote its growth. This is especially the case when there is a proper supportive industry and harsh competition between firms of the cluster. Growing clusters gain more influence with the government and also with private and public institutions. Due to the successes within the cluster more firms are attracted to it and thus combining these influences the average lifespan of a firm is higher within a cluster. (Porter, 1998).

So according to theory within a cluster there is more innovation, companies have a longer life span than when isolated and there is an easier transfer of information (Boja, 2011). Next to the effects of clustering on firms and corporations, clusters also help to make governments aim their policies better due to the fact that clusters are easier to distinguish and they are interconnected. Thus they are easier to target than areas with a wide range of single industries (Pessoa, 2012).

2.2.2 ESTABLISHING CLUSTERS

Groups of firms within the same industrial sector working together in a geographical vicinity do not necessarily have to be an economic cluster. Determining whether industrial sectors form regional clusters in terms of measuring competitiveness can be done via several steps of empirical analysis. The first two steps are to determine whether there is a higher density of employees within the labor market than can be expected. The third and fourth step are checks to determine whether there is vertical and horizontal cooperation and to see if companies are linked to each other (Isaksen, 1996).

1   There are three times more jobs within the 'to be determined' cluster than could be expected based on the regions share within the total national economy. Or in other words, it needs to have a locational quotient of 3.0.

2   There is a minimum of 200 Full Time Equivalent (FTE) within the cluster.

3   Regional clusters need to have more than 10 firms within an industry which also has a locational quotient of 3.0. In these clusters there is a bigger chance of horizontal co-operation between firms.

4   The cluster needs to mainly consist of firms whose production chain might be broken down vertically. *'Disintegration means that a local subcontracting system can arise and that the firms can achieve external flexibility'* (Isaksen, 1996).

The above described attributes are a combination of methods used when identifying industrial clusters in a statistical way. The combination consists of specialization indicators, which is the locational quotient and a statistical minimal boundaries which can be established with a traditional input-output analysis (Ki-Young, 2003). When groups of firms qualify for the above described attributes than they are considered regional industrial clusters in terms of competitiveness and adhere to possible further more qualitative forms of cluster analysis. To be able to determine whether or not a cluster qualifies for these attributes quantitative data of the cluster and its companies needs to be available. Determining the size, its national market share and finding out if it has a locational quotient of 3.0 will be done via an Input-Output Analysis. The specific limits described above are chosen by Isaksen (1996) in order to distill small hard to analyze clusters from the equation. For this research the same limits are chosen because the expectation are that the 'safety & security' sector within Twente, based on the estimation of &A consulting (2011), is a well-represented within the national 'safety & security' cluster.

The Quantitative Input-Output Method (QIOM) is an economic technique which represents the interdependency of different economic sectors within a national or regional economy. It is an overview of national economic sectors, their performance and what their spillover effect is on other economic or industrial sectors and shows this in a matrix representation.

It is constructed using data from a certain economic area, national, regional, etc. This data is then used to track flows of products and/or services from each of the industrial sectors (sellers) towards other sectors (buyers) and vice versa. In other words: which interaction, in economic terms, is there between 2 different industrial sectors (Miller & Peter, 2009)?

When looking at the matrix one can see how output from an industrial sector becomes input to another. It shows in the columns the input given towards an industrial sector and in the rows which output this industrial sector gives towards other industrial sectors. This effect can be seen in the grey market area within Table 1 (Miller & Peter, 2009).

Table 1: Input-Output Transaction Table   **Source: (Miller & Peter, 2009)**

		PRODUCERS AS CONSUMERS								FINAL DEMAND			
		Agric.	Mining	Const.	Manuf.	Trade	Transp.	Services	Other	Personal Consumption Expenditures	Gross Private Domestic Investment	Govt. Purchases of Goods & Services	Net Exports of Goods & Services
PRODUCERS	Agriculture												
	Mining												
	Construction												
	Manufacturing												
	Trade												
	Transportation												
	Services												
	Other Industry												
VALUE ADDED	Employees	Employee compensation								GROSS DOMESTIC PRODUCT			
	Business Owners and Capital	Profit-type income and capital consumption allowances											
	Government	Indirect business taxes											

When sectors purchase products of other sectors they also pay for other items, like labor, capital and taxes. All these together are called *'value added'* which can be seen in Table 1 under the gray marked area. When adding all rows from one column together one gets the total revenue generated by an industrial cluster.
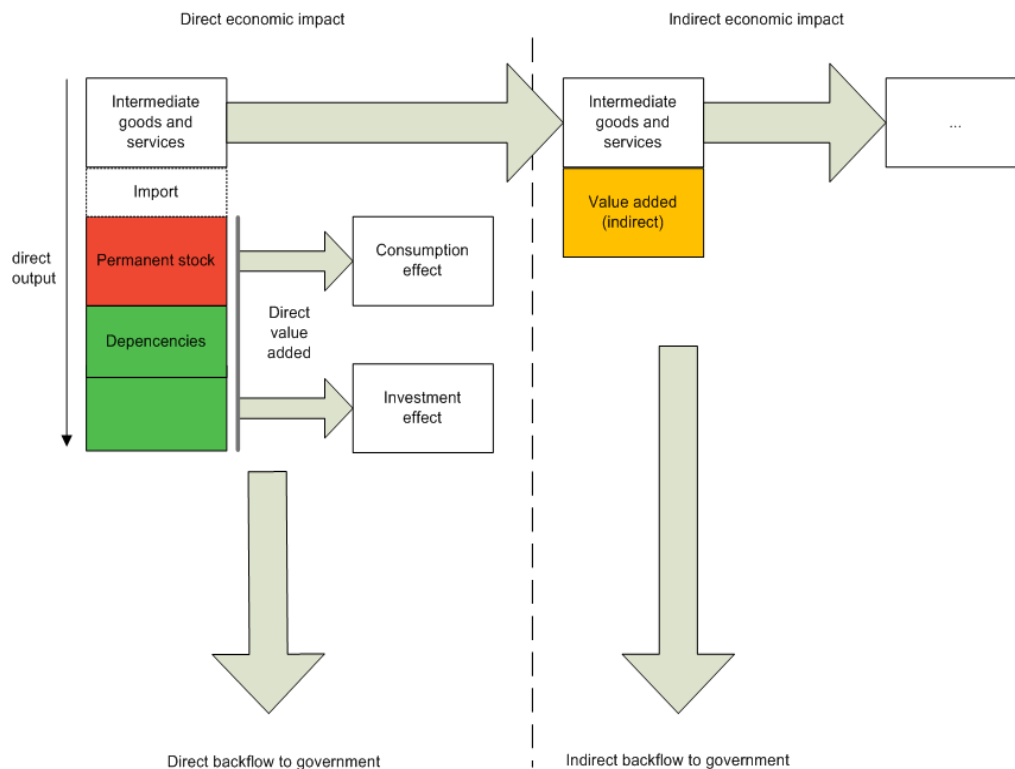
Figure 1: Overview of impact of an industrial sector   **Source: Author**

An overview of what is described above can be found in Figure 1. Which gives a schematic overview of direct and indirect impact of industries on the GDP of a country.

Within this overview one is able to see how the production of a product and the sales of it towards another industrial sector effects the total GDP of an economy, which is what you get when you add up all data from the Input-Output table as shown in Table 1 in the bottom right corner.

The Input-Output analysis can be used for several goals. Determining cluster size, growth or national market share and thus is useful when comparing regional clusters and determining competitiveness (Titza, Brachert, & Kubis, 2008).

2.4 PORTERS DIAMOND MODEL: THE COMPETITIVE ADVANTAGE OF AN ECONOMIC CLUSTER

Older economic theories which are mainly based upon factor endowments are incapable of explaining why there is a difference between nations who have similar factor endowments. This is the case because they are unable to explain why countries which have opposite factor conditions are similarly in terms of competitiveness and vice versa. Factor endowments are the amount of land, labor and capital a country has and is capable to exploit in terms of production.

The Diamond model, which is suggested for the first time by Michael Porter in 1990 is a model created to determine why some nations fail when others succeed when competing in an international environment. In his original study Porter assessed the competitiveness of ten nations. From this assessment he derived what the specifics were from which a possible

competitive advantage could come from. Although the model was originally created to assess the competitiveness of nations it uses regional industry clusters within these nations to focus upon (Porter, The competitive Adventage Of Nations, 1990).

Porter (2011) states that comparing regions in terms of competitiveness is similar to that of nations, thus the Diamond model is capable of determining the competitiveness of economic clusters.

The diamond model uses four determinants for competitiveness and two other variables which influence the determinants for competitiveness. The essence of this model is that all factors are interdependent of each other (Boja, 2011). But even though the determinants of competitiveness are interdependent it does not necessarily mean that a region is weak, in terms of competitiveness when one of the determinants is not strong.

The four determinants of competitiveness are; 'Factor conditions, Demand conditions, Related and Supporting Industries and Firm Strategy, Structure and Rivalry. These determinants allow clusters to evolve and maintain their competitive advantages (Boja, 2011). The determinants together form the four points of the diamond as can be seen in Figure 2.
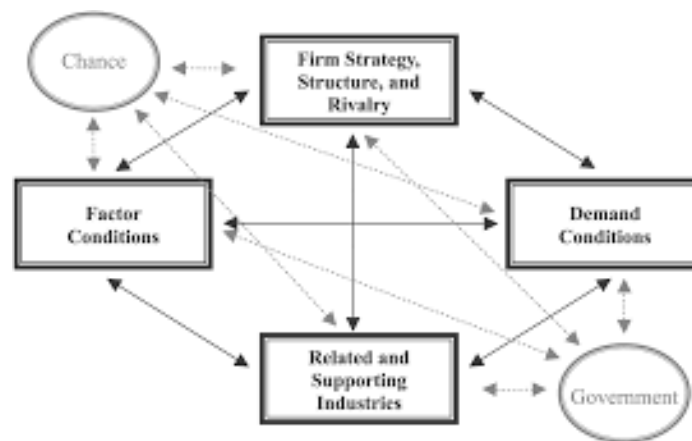
Figure 2: Porters Diamond Model   **Source: (Porter, The competitive Adventage Of Nations,**

Next to the four determinants of competitiveness there also are two variables which influence the four determinants, Chance and Government. These two variables are not interdependent and do not react with one another.

2.4.1 FACTOR CONDITIONS

The factor conditions of the diamond model are about the surroundings of the cluster. They are divided into five types of resources; 'human (labor costs, qualification, quantity, etc.), physical (Natural resources, geographical location, climate, etc.), knowledge (Scientific and other knowledge, quality of R&D within region), capital and infrastructure (Systems of transportation & communication but also necessary infrastructure to do business). Some of these resources can be created or stimulated, for example skilled labor. Local disadvantages are driving factors for innovation due to the fact that they lead firms towards innovation which then again leads to a comparative advantage (Porter, The competitive Adventage Of Nations, 1990).

2.4.2 DEMAND CONDITIONS

When demand in local markets is high this pushes industries towards more innovation, which could lead to a competitive advantage. When local markets are trend-setting this helps local players anticipate global competitors. Plus when a certain product is mainly local in comparison with foreign markets the extra attention local firms give the products gives them also an additional advantage. Global success has more chance of succeeding when the local market is sophisticated and very demanding (Porter, The competitive Adventage Of Nations, 1990)

2.4.3 RELATED AND SUPPORTING INDUSTRIES

When there are competitive related or supporting industries, local firms gain advantage through more cost effective and innovative inputs from related industries or via an efficient and cost effective input for the supporting industries.

Next to rivalry and competition firms also share common grounds such as technologies, distribution and activities. Through which they stimulate each other and sometimes share information. Competitive rivalry also leads to internationalization, due to the fact that firms might look for easier demand markets or feel more capable of doing so due to harsh local market conditions. The effect of internationalization, and the effect for more innovation is strengthened when suppliers are global competitors (Porter, The competitive Adventage Of Nations, 1990).

2.4.4 SECTOR STRATEGY, STRUCTURE AND RIVALRY

There are local conditions which affect firm strategy, for example if a firm is hierarchical or not. These firm structures and management styles help to determine in which industry a firm will excel. How firms set goals and how they manage themselves is important for firms to succeed. Lastly also local rivalry might force firms to go beyond local basic advantages from the local region or home country towards foreign markets or forces firms to improve their products and services (Porter, The competitive Adventage Of Nations, 1990).

2.4.5 GOVERNMENT

The government is capable to influence the cluster in several ways or to try and raise its performance. For example by enforcing strict product standards, stimulate rivalry or let them specialize on a specific factor creation. The governments can influence all determinants of the diamond model via policy, restrictions, tax advantages and employee regulations. The government can be a stimulating or a counter stimulating force depending on its willingness to cooperate (Porter, The competitive Adventage Of Nations, 1990).

2.4.6 CHANCE

Chance is everything the word says. Some things are outside the control of the marker or the firm. This could result in both positive and negative advantages. Chance is often used in Porters Diamond analyses in which the historical development is also taken into account.

2.4.7   CRITIQUES ON PORTERS DIAMOND MODEL

The model of Porter is used to evaluate the competitiveness of a nation, as said before. But it does not mean that it is the standard for measuring competitiveness, there are some critiques. One of the most important critiques about porters Diamond Model is that it remains unproven. It is said by Ingram (1991) that his research is a *'shower of anecdotes'*. It is also suggested that the different hypotheses of Porter are suggestive and not tested (Ingram, 1991). But it could also be that it is the result of the designs of the study which lays emphasis over description over validity (Yetton, Craig, & Davis, 1992). Also, according to Davies & Ellis (2000), it fails the most basic tests of research due to the fact that it has no set of predictive hypotheses which are tested to a proper dataset. The second is that 'Conceptual foundations are undermined'. The term competitiveness which is construed as productivity or as market share held by a sub-set of industries. Porters switches back and forth whilst clearly stating the former (Davies & Ellis, 2000). The third critique is that it is not a method for national competitive advantage but more of a theory about firm or industry competitiveness (Yetton, Craig, & Davis, 1992). Porter also does not deal with cluster dynamics and the emergence of new firms within the cluster. The reason why this new firms emerge and if there is a stimulus to do so is of influence on Porters model (Yetton, Craig, & Davis, 1992).

Even though there is critique on Porters theories it does not render them unusable due to the following two arguments:

   1) Porter uses easy to understand descriptions when he explain his theory instead of using mathematical tools. Through the combination of management with economics his theory became easily accessible for policy makers. In other words: the operational effectiveness was increased (Stonehouse & Snowdon, 2007).

   2) The '*apparent neatness of the diamond as offering a generic solution for the problem all managers and governments would like to be able to solve—how to generate and keep strong firms that contribute to economic growth*' (Yetton, Craig, & Davis, 1992).

In the case of this research, which is specifically requested by TS&S, the two counter arguments previously mentioned are deemed more important than the arguments against Porters Diamond. The main goal of this research is to provide policy makers and the consortium TS&S with a tool to effectively manage and guide the 'safety & security' cluster within Twente. It is however important to keep the critiques on Porters Diamond model in mind when using it to discuss regional competitiveness.

3. METHOD

3.1 INPUT-OUTPUT METHOD

3.1.1 ESTABLISHING THE TWENTE 'SAFETY & SECURITY' SECTOR

As the 'safety & security' sector within the Dutch economy has never been defined in this way, a thorough market evaluation is necessary. Traditionally an economic sector within the Netherlands can either be defined by the sectors used by the Bureau for Economic Policy Analysis of the Netherlands (CPB) and the Bureau of Statistics of the Netherlands (CBS) or the Dutch Chamber of Commerce (KvK). The KvK uses codes to define to which economic sector a company belongs to, called Standard Business Indicator (SBI) codes. Both can be combined and via this way an economic sector can be defined under normal circumstances. For this research, which uses a non-traditional sector, establishing the total revenue for the 'safety & security' cluster has to be done via a different way.

Companies within the 'safety & security' cluster are expected to be categorized within several different SBI categories, due to the fact that the cluster has not yet been defined with economic statistical nomenclature as was explained earlier. Thus an estimate of the total revenue of this cluster can be done via a quantitative Input–output analysis, because the input-output method allows us to make an estimate about the revenue of an individual firm which results in the total revenue of a cluster when the revenues of individual firms are added up (Titza, Brachert, & Kubis, 2008). The estimate of the total revenue can be made by the following five steps:

1) First the total revenue within the Netherlands per SBI category can be established via the Input – Output tables from the (CBS) as explained in paragraph 2.3.
2) After this the total number of employees per SBI category can be established via Statline, which is the program from the CBS which enables one to obtain statistical data of the Netherlands, and thus the average revenue generation per employee of a certain industry type/SBI category can be established (Miller & Peter, 2009).
3) Than you need to establish how many companies, which all have an SBI category coupled to their activities by the KvK, belong to the cluster within your region.
4) After this the total number of employees each company has needs to be established.
5) When you multiply the average revenue generated by a single employee within a SBI category with the actual number of employees of a company within that same SBI category, a revenue estimate of that individual firm can be made (Miller & Peter, 2009).

When step 1 to 5 are repeated for each individual firm which belongs to the 'safety & security' cluster and are, as said earlier, added together, the total revenue from cluster becomes clear. Input-output tables are published yearly by the CBS so this method also allows the analysis of historical revenue growth.

3.1.2 INPUT-OUTPUT TABLE

Input-output tables consist, as explained earlier, of input generated by a certain industrial sector and its output effect towards other industrial sectors. When al off these different input and output effects are put together, the input-output matrix can be created. In this matrix one can see in a column, when summed up, the total revenue of a specific sector and in a row the revenue output one industrial sector has on itself and in other industrial sectors.

The input-output table from the CBS of the Netherlands is slightly different from the example in Table 1. Where in Table 1 the industrial categories are not divided into more subsectors. In the overview of Table 2 on the next page, which is part of an input-output table from the Netherlands, this is the case. The horizontal red lines show where one can see the total revenue from the different subsectors. The vertical red lines outline several subsectors which together form an industrial sector of the economy which corresponds with the letter coding of the SBI nomenclature which can be seen in the top row.

The letter coding in Table 2 will be explained in more detail in Table 3. SBI nomenclature categories work as following. Each industrial cluster corresponds with a letter (A-Z), each subcategory within the same letter category corresponds with a full number (10 / 13 / 80). Each further specification corresponds with a decimal code (,01 / ,02).

For example, agriculture, forestry and fishing, which is the red market area in Table 2, has letter code A. The three different rows which can be distinguished are from left to right agriculture, with number code 01, forestry, with number code 02 and fishing with number code 03. This is the maximum level of detail given in the input-output tables. An example of a decimal code specification is SBI code A 01.4 which is the code for companies which are breeding and keeping animals.

Table 2: Section of an input output table from the Netherlands   Source: (CBS, 2008 - 2012)

SBI Categorie		A	A	A	B	B	C	C	C	C	C	C	C	C
2012V	1969	Landbouw	Bosbouw	Visserij	Winning van aardolie en aardgas	Delfstoffenwinning (geen olie en gas)	Voedingsmiddelenindustrie	Drankenindustrie	Tabaksindustrie	Textiel-, kleding lederindustrie	Houtindustrie	Papierindustrie	Grafische industrie
		1	2	3	4	5	6	7	8	9	10	11	12
1	Landbouw	4 255	–	–	4	4	9 229	19	–	7	–	3	1
2	Bosbouw	–	2	–	–	–	10	–	–	–	–	–	–
3	Visserij	–	–	–	–	–	6	–	–	–	–	–	–
4	Winning van aardolie en aardgas	–	–	–	306	–	291	29	–	–	–	188	–
5	Delfstoffenwinning (geen olie en gas)	11	–	–	–	52	22	–	–	–	–	–	–
6	Voedingsmiddelenindustrie	4 201	–	–	–	1	8 961	348	–	11	–	40	–
7	Drankenindustrie	–	–	–	–	–	53	96	–	–	–	–	2
8	Tabaksindustrie	–	–	–	–	–	2	–	29	–	–	–	–
9	Textiel-, kleding- lederindustrie	7	–	–	–	–	–	–	2	484	–	5	3
10	Houtindustrie	29	–	–	–	3	24	14	1	2	85	12	4
11	Papierindustrie	9	1	–	3	2	520	120	112	9	3	487	45
12	Grafische industrie	2	–	–	–	–	90	35	11	6	4	31	422
13	Aardolie-industrie	379	1	120	102	29	118	6	4	8	6	30	19
14	Chemische industrie	217	–	–	3	5	177	25	16	156	4	149	31
15	Farmaceutische industrie	1	–	–	–	–	20	3	5	1	–	1	2
16	Rubber- en kunststofproductindustrie	41	–	–	10	7	280	12	8	9	30	39	13
17	Bouwmaterialenindustrie	10	–	–	–	–	35	118	–	–	–	1	–
18	Basismetaalindustrie	2	–	–	4	5	20	–	–	4	3	27	–
19	Metaalproductenindustrie	42	3	1	14	13	195	52	5	4	39	10	27
20	Elektrotechnische industrie	–	–	2	5	2	34	2	8	6	–	8	5
21	Elektrische apparatenindustrie	3	–	–	30	–	67	11	–	2	8	5	7
86	Handels- en vervoersmarges	1 355	5	15	44	70	4 015	268	126	264	251	402	282
87	Totaal verbruik tegen aankoopprijzen	18 688	103	330	4 966	498	48 205	2 713	1 898	2 716	1 663	4 374	3 153
88	Niet-productgebonden belastingen	542	6	1	13	7	223	40	13	18	3	52	7
89	Niet-productgebonden subsidies	– 986	– 20	–	–	– 3	– 58	– 3	–	– 4	–	– 3	– 2
90	Lonen	2 111	45	50	474	72	4 028	432	155	518	430	838	967
91	Sociale premies werkgevers	698	11	15	138	23	1 366	150	49	154	116	216	272
92	Exploitatie-overschot	6 534	15	50	19 469	459	6 025	962	1 584	528	404	195	523
93	Toegevoegde waarde tegen basisprijzen	8 899	57	116	20 094	558	11 584	1 581	1 801	1 214	953	1 298	1 767
94	Totaal	27 587	160	446	25 060	1 056	59 789	4 294	3 699	3 930	2 616	5 672	4 920

Each section from the SBI grouping has, as said, several columns in the input-output table belonging to it. The Letter coding partly shown in Table 2, which is a small section of the national input-output table from the Netherlands, corresponds with the Table 3 below.

Table 3: Input Output table from the Netherlands   **Source: (CBS, 2008 - 2012)**

SBI Category	Industry sector
A	Agriculture, Forestry, Fishing
B	Mining and quarrying
C	Industry
D	Production, distribution and trading of electricity, natural gas, steam and cooled air
E	Production and distribution of water; sewerage, waste management and remediation activities
F	Construction Industry
G	Wholesale and retail trade; repair of motor vehicles
H	Transport and storage
I	Tourist accommodation; meal-; and provision of drinks
J	Information and communication
K	Financial Institutions
L	Rental of and trade in real estate
M	Advising, research and other specialist services
N	Lease of movable goods and other business
O	Public administration, public services and compulsory social security
P	Education
Q	Health and welfare
R	Culture, sport and recreation
S	Other services
T	Households as employers

Each letter from the SBI grouping corresponds with a certain economic sector, together with the color coding it becomes clear what the total revenue for each of the corresponding economic sectors is when the totals from the different rows are added up.

3.1.3 CREATING THE COMPANY LIST, EXPERT INTERVIEWS & COMPANY SURVEYS

A preliminary list of companies already known to be categorized for this economic sector according to the definition was established. This preliminary company list was send towards experts within or with great knowledge of the Twente business sector. Experts consisting of, for example, the director of the local chamber of commerce, the director of the local World Trade Center (WTC) and several consultants and partners of Twente Safety and Security. See Appendix I for the full list. The next step was to use the companies on this list to check if there were colleague-companies not yet represented on the list. The final stage for the establishment of the list with companies active within the economic 'safety & security' cluster of Twente was to request a list which was build-up from all companies within the region of Twente who had similar SBI codes to companies already on the list so far. This list was obtained via the LISA institute. This list was then manually checked to see if companies on this list and their activities matched with the definition of the 'safety & security' cluster as given in paragraph 2.1. This resulted into the final company list which can be seen in Appendix II

3.1.4 LISA INSTITUTE

The LISA institute is an institute in the Netherlands which holds a database with the employment data of Dutch companies. This data is gathered each year via a survey. Due to the enormous amount of data and the time period LISA already gathers the data from the LISA database is deemed more reliable than company registrations within the chamber of commerce database. Thus the employment data from LISA has been used (LISA, 2013).

3.1.5 WEIGHING OF COMPANIES

As not all companies have a revenue one hundred per cent linked towards 'safety & security' a weighing was added to correct this. This was done via annual reports, direct questioning, survey's and expert interpretations.

3.2 DISTRIBUTING COMPANIES TO SUBCATEGORIES OF THE 'SAFETY & SECURITY' CLUSTER.

After the input – output analysis it is possible to divide the companies belonging to the 'safety & security' cluster of Twente could be divided amongst the five subcategories as explained in paragraph 2.1. This division was made in several steps. The first step was to use the SBI nomenclature to easily distribute the first groups of companies to the different groups. After this was completed simple desktop research was carried out in order to determine the other companies. This was done cross checking products and activities on websites with the matching descriptions given in paragraph 2.1. Finally the distribution of the companies from the HSD cluster in The Hague was known and was used to do a final check to see if the research done by Policy Research Corporation (2013) distributed equivalent similar companies towards the same subcategory. The last step was a cross check from a representative of TS&S to see if the doubtful cases were selected into the proper group. Below are the general criteria used to determine whether a company belonged to which group.

National security

- Manufacturing of military equipment or technology in the broadest sense
- Cross border Intelligence and interception solutions

Urban security

- All firms with SBI nomenclature N 80 (security agent firms)
- Camera surveillance
- Unmanned surveillance
- Sensor technologies
- Protective clothing
- Crisis management
- Manufactured products used to improve the safety of society

Cyber security

- All firms with SI nomenclature J 62.01 & 62.02 (development of software and the advice on the field of information technology)
- Data protection
- Protected servers and domains
- Anti-hacking
- Firewalls
- All other forms of IT security

Critical infrastructure protection

- Infrastructure protection
- Safe roads
- Oil rig security
- Management, development and protection of infrastructure

Forensics

- Forensic research institutions
- Forensic Laboratories
- Data analysis bureaus
- Trace evidence bureaus
- Detectives
- Business recherché
- Lab on a chip

Education & research

- All firms with SBI nomenclature P (education)
- Knowledge institutions
- R&D institutions
- Think tanks
- Training facilities

4. RESULTS

In this chapter the theory and method will be used to start answering the research questions. The first part will be the results of a Quantitative Input – Output Analysis, the second part will consist of a more qualitative Porters Diamond Analysis.

4.1 INPUT-OUTPUT ANALYSIS OF THE 'SAFETY & SECURITY' CLUSTER IN TWENTE

4.1.1 REVENUE TOTAL PER SBI CATEGORY

As explained in paragraph 3.1.1 on page 24 the input-output analysis is used in order to estimate the total revenue size of the 'safety & security' cluster within. The first step, which corresponds with the five steps explained in paragraph 3.1.1, is to determine the total revenue of each national industrial sector per year. This data can be found in the yearly national Input-Output tables from the CBS. When adding the total revenue from each subcategories from each industrial sector together as explained in paragraph 3.1.2 and putting the total revenues of all corresponding years from all industrial sectors in one table the following Table 4 is created.

Table 4: Total revenue in million euros per Industry Sector per year   **Source: (CBS, 2008 - 2012)**

SBI Category	Industry sector	2006	2007	2008	2009	2010	2011	2012
A	Agriculture, Forestry, Fishing	24266	25368	26274	24568	26632	27205	28193
B	Mining and quarrying	21089	20716	27128	20993	21426	24066	26116
C	Industry	247579	268667	283031	237987	269956	301495	310406
D	Production, distribution and trading of electricity, natural gas, steam and cooled air	31874	33271	38076	38227	38475	37408	38224
E	Production and distribution of water; sewerage, waste management and remediation activities	10524	10942	11810	11851	12210	12829	13014
F	Construction Industry	73719	80454	86687	83713	75591	79117	73609
G	Wholesale and retail trade; repair of motor vehicles	109405	117448	120988	113096	118264	122308	121003
H	Transport and storage	49684	52458	55358	50087	51975	54104	55574
I	Tourist accommodation; meal-; and provision of drinks	17465	18507	18573	17920	17638	18285	18468
J	Information and communication	49741	53162	53919	51452	51468	51835	50789
K	Financial Institutions	62856	61648	64875	77364	82064	80029	82176
L	Rental of and trade in real estate	55209	57249	58853	59130	59784	60938	61420
M	Advising, research and other specialist services	61267	64938	68825	66283	64619	63851	62271
N	Lease of movable goods and other business	40709	45613	49007	46544	46122	47704	48552
O	Public administration, public services and compulsory social security	59049	61638	65677	70418	70594	68878	68884
P	Education	28736	30595	32297	34073	34769	35045	35270
Q	Health and welfare	55726	58876	63168	67536	70122	72246	75995
R	Culture, sport and recreation	10423	10941	11272	11350	11469	11475	11518
S	Other services	9224	9690	10145	10300	10477	10678	10632
T	Households as employers	2033	2089	2165	2249	2316	2402	2470

In this table the overview of all total revenues, in millions, of all industry sectors according to the SBI categories for the period of 2006 – 2012 can be seen.

4.1.2 EMPLOYEES PER SBI CATEGORY

The next step of the input-output analysis is to determine the total number of employees, on a national scale, per year for the period of 2006 – 2012, per industrial sector. This can be retrieved from Statline, the statistical program of the CBS. In Table 5 an overview of all persons working in a certain industrial sector per year from 2006 up to 2012 can be seen.

Table 5: Total number of Employees per Industry Cluster 2006-2012   Source: (CBS, 2014)

SBI Category	Industry sector	2006	2007	2008	2009	2010	2011	2012
A	Agriculture, Forestry, Fishing	215000	213000	209000	204000	203000	201000	199000
B	Mining and quarrying	8000	8000	8000	8000	8000	8000	9000
C	Industry	845000	844000	847000	822000	799000	792000	783000
D	Production, distribution and trading of electricity, natural gas, steam and cooled air	21000	22000	23000	22000	24000	24000	24000
E	Production and distribution of water; sewerage, waste management and remediation activities	31000	31000	31000	32000	32000	33000	34000
F	Construction Industry	529000	546000	555000	549000	523000	522000	507000
G	Wholesale and retail trade; repair of motor vehicles	1376000	1408000	1421000	1399000	1396000	1414000	1420000
H	Transport and storage	393000	401000	400000	392000	985000	390000	390000
I	Tourist accommodation; meal-; and provision of drinks	332000	343000	344000	337000	343000	355000	360000
J	Information and communication	247000	257000	265000	260000	252000	256000	258000
K	Financial Institutions	283000	284000	279000	275000	266000	261000	255000
L	Rental of and trade in real estate	77000	80000	83000	83000	79000	79000	76000
M	Advising, research and other specialist services	640000	670000	691000	691000	668000	674000	676000
N	Lease of movable goods and other business	989000	1055000	1073000	1011000	985000	1009000	995000
O	Public administration, public services and compulsory social security	495000	495000	498000	509000	523000	507000	495000
P	Education	485000	500000	514000	523000	522000	524000	519000
Q	Health and welfare	1229000	1266000	1312000	1349000	1400000	1425000	1439000
R	Culture, sport and recreation	136000	146000	152000	155000	155000	158000	157000
S	Other services	172000	184000	191000	195000	195000	198000	196000
T	Households as employers	17000	18000	19000	20000	20000	23000	21000

Together with the revenue data from Table 4 it is now possible to calculate the average revenue generated per person working in a specific industrial sector. This is done by simply dividing the revenue from Table 4 with the corresponding number of employees from Table 5. Which corresponds with step three explained in paragraph 3.1.1. The results of this division can be seen in Table 6, which shows the average revenue generated by a single employee per industrial sector for the period of 2006 – 2012 on a national scale.

SBI Category	Industry sector	2006	2007	2008	2009	2010	2011	2012
A	Agriculture, Forestry, Fishing	0,112865	0,119099	0,125713	0,120431	0,131192	0,135348	0,141673
B	Mining and quarrying	2,636125	2,5895	3,391	2,624125	2,67825	3,00825	2,901778
C	Industry	0,292993	0,318326	0,334157	0,289522	0,337867	0,380676	0,396432
D	Production, distribution and trading of electricity, natural gas, steam and cooled air	1,51781	1,512318	1,655478	1,737591	1,603125	1,558667	1,592667
E	Production and distribution of water; sewerage, waste management and remediation activities	0,339484	0,352968	0,380968	0,370344	0,381563	0,388758	0,382765
F	Construction Industry	0,139355	0,147352	0,156193	0,152483	0,144533	0,151565	0,145185
G	Wholesale and retail trade; repair of motor vehicles	0,079509	0,083415	0,085143	0,080841	0,084716	0,086498	0,085213
H	Transport and storage	0,126422	0,130818	0,138395	0,127773	0,052766	0,138728	0,142497
I	Tourist accommodation; meal-; and provision of drinks	0,052605	0,053956	0,053991	0,053175	0,051423	0,051507	0,0513
J	Information and communication	0,201381	0,206856	0,203468	0,197892	0,204238	0,20248	0,196857
K	Financial Institutions	0,222106	0,21707	0,232527	0,281324	0,308511	0,306625	0,322259
L	Rental of and trade in real estate	0,717	0,715613	0,709072	0,71241	0,756759	0,771367	0,808158
M	Advising, research and other specialist services	0,09573	0,096922	0,099602	0,095923	0,096735	0,094734	0,092117
N	Lease of movable goods and other business	0,041162	0,043235	0,045673	0,046038	0,046824	0,047278	0,048796
O	Public administration, public services and compulsory social security	0,119291	0,124521	0,131882	0,138346	0,134979	0,135854	0,13916
P	Education	0,059249	0,06119	0,062835	0,065149	0,066607	0,06688	0,067958
Q	Health and welfare	0,045343	0,046506	0,048146	0,050064	0,050087	0,050699	0,052811
R	Culture, sport and recreation	0,07664	0,074938	0,074158	0,073226	0,073994	0,072627	0,073363
S	Other services	0,053628	0,052663	0,053115	0,052821	0,053728	0,053929	0,054245
T	Households as employers	0,119588	0,116056	0,113947	0,11245	0,1158	0,104435	0,117619

4.1.3 COMPANIES PER SBI CATEGORY

There are 166 companies and institutions active within the 'safety & security' Cluster within the region of Twente. For a complete list of the companies from within the region of Twente see Appendix II.
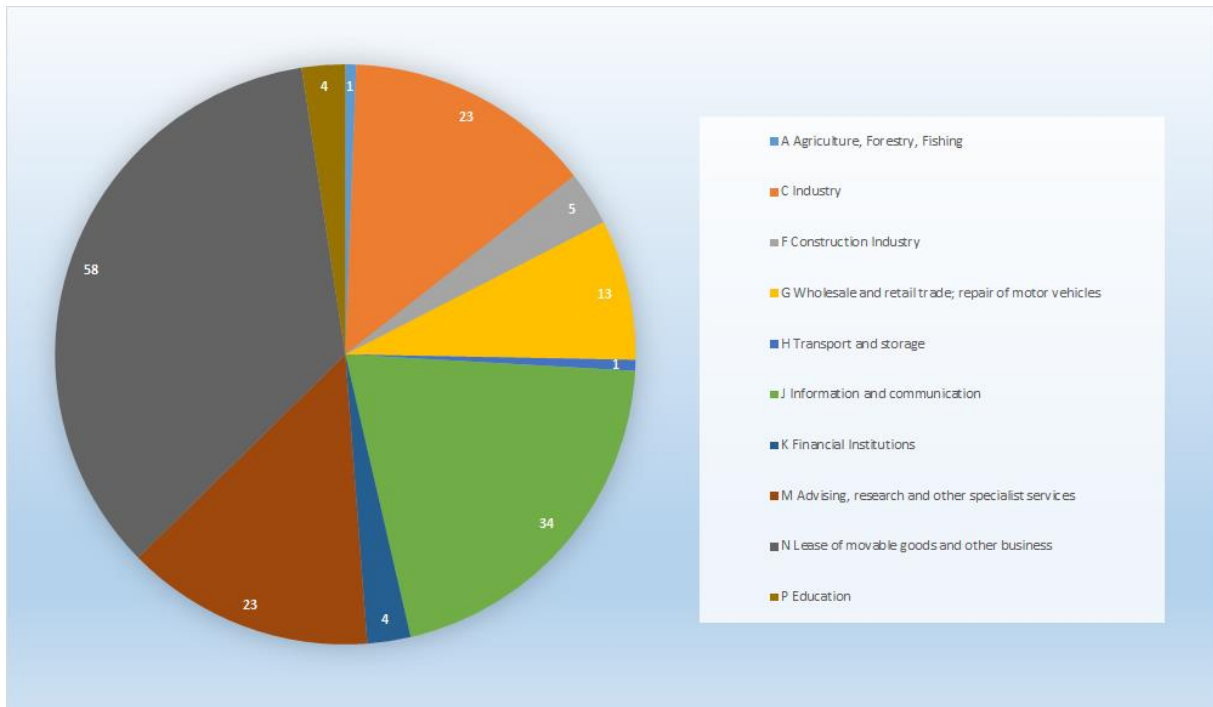
Figure 3: Pie chart of number of companies categorized by industrial section **Source: Appendix II**

From the distribution in Figure 3 it is able to distinguish that there are four sectors which host most of the companies:

- N - Moveable property (31%)
- J - Information and communication sector (18,2)
- C - Industry (12,3%)
- M - Specialized corporate services (12,3%)

Within the different groups one can now see which specific industrial sectors are most active, according to number of companies. These are; N – Mostly traditional security officers, J – Software development and management, C – Production of electrical products/machines, M – consultancy & advisory.

Next to the distribution from the SBI categories it is now also possible to assign the companies to the subcategories of the 'safety & security' cluster as described in paragraph 2.1 and in paragraph 3.2 which are; '*National Security, Urban Security, Cyber security, Critical Infrastructure Protection, Forensics* and *Education & Research*' according to the method described in paragraph 3.2. The distribution can be seen in Figure 4.
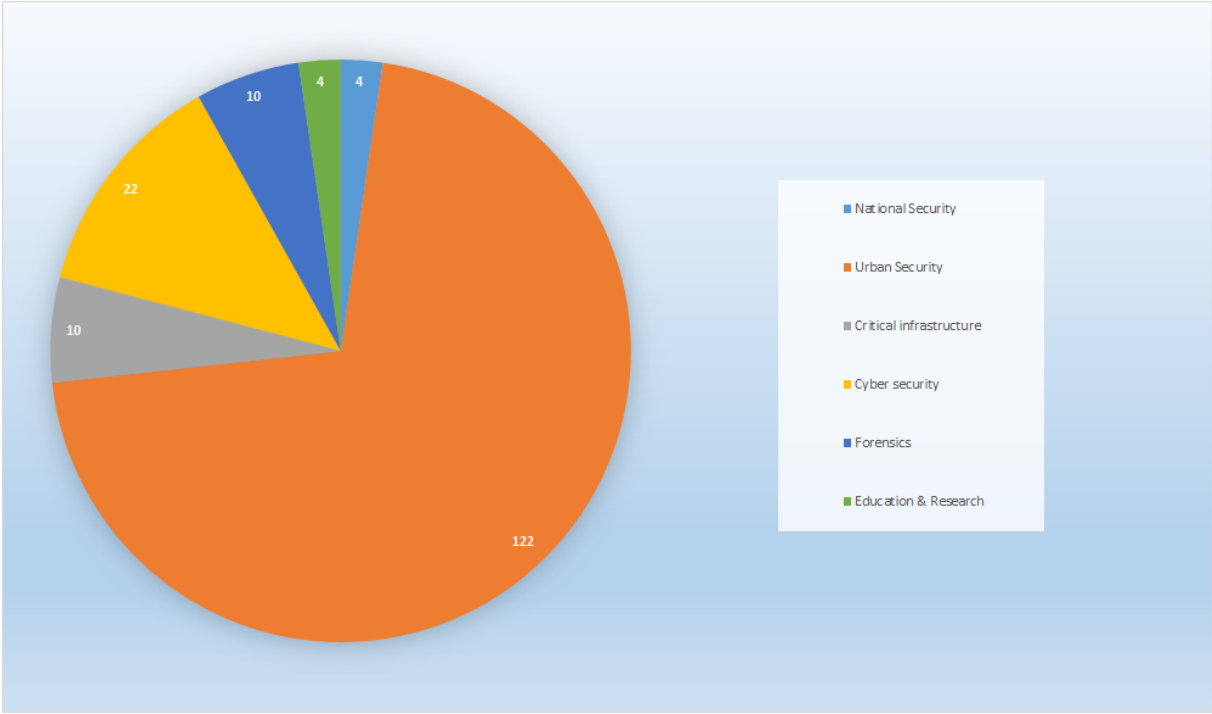
Figure 4: Pie chart of number of companies categorized by subcategories 'Safety and Security Source: Appendix II

From this subdivision one can clearly see that there is one subcategory which is dominant within the 'safety & security' cluster within Twente when looking at the number of companies established within Twente.

4.1.4 EMPLOYEES FROM THE TWENTE 'SAFETY & SECURITY'

When all companies from Appendix II are, via their KVK numbers, linked to the database of the LISA institution, the number of their employees can be established, corresponding with step 4 of paragraph 3.1.1. The total number of employees, per SBI category, per year over the period of 2006 – 2012, can be found in Table 7.

Table 7: Number of employees per industrial sector within the 'Safety and Security cluster   Twente Source: Appendix III

SBI Category	Industry sector	2006	2007	2008	2009	2010	2011	2012
A	Agriculture, Forestry, Fishing	14,1	15,5	16,5	23	23,2	25,1	21
C	Industry	2686,1	2583,95	2776,45	2673,7	2518,7	2591,25	2565,55
F	Construction Industry	49	59	72	71	72	77,8	82,6
G	Wholesale and retail trade; repair of motor vehicles	70,1	78,85	81,95	89,95	138,35	141,75	149,45
H	Transport and storage	0	0	0	3,6	11,7	19,08	18,72
J	Information and communication	114,15	139,75	162,9	173,15	179,9	174,85	168,5
K	Financial Institutions	46	54	81	79,5	68	70,5	60,5
M	Advising, research and other specialist services	76,55	84,55	91,45	149,55	139,35	146,45	141,05
N	Lease of movable goods and other business	223	221	225	313	346	446	445
P	Education	201,65	201,05	205	205	205	205	201

When multiplying Table 6 and 7 the total revenue of the 'safety & security' cluster within Twente can be determined, which is shown in Table 8. To keep the method easy to overview step 5 and the total summation of each companies are done together. When determining the total revenue size of the subcategories: *'National Security (1), Urban Security (2), Cyber security(3), Critical Infrastructure Protection(4), Forensics(5) and Education & Research(6)'* of the 'safety & security' cluster, the division from Appendix III should be used. In Appendix III all companies have a number corresponding them to the above corresponding subcategories.

4.1.5 REVENUE 'SAFETY & SECURITY' SECTOR

Sections 4.1.1 up to 4.1.4 all lead to this section, where the revenue generated per employee from each industrial sector is combined with the total numbers of employees active within the 'safety & security' cluster of Twente which results in the total revenue of the 'safety & security' cluster of Twente which can be seen in Table 8. This table also shows the respective growth or decline in percentages of the 'safety & security) cluster within Twente as well as the total revenue of all different industrial cluster combined.

Table 8: Revenue in millions per industrial sector 'Safety and Security 'cluster Twente 2006 - 2-12   Source: Table 6,7,10

SBI Category	Industry sector	2006	2007	2008	2009	2010	2011	2012
A	Agriculture, Forestry, Fishing	1,591398	1,846028	2,074263	2,769922	3,043657	3,397241	2,975141
C	Industry	787,0082	822,538	927,7703	774,0947	850,9865	986,4254	1017,065
F	Construction Industry	6,828414	8,693747	11,24588	10,82627	10,40641	11,79177	11,99231
G	Wholesale and retail trade; repair of motor vehicles	5,573612	6,577255	6,977457	7,271612	11,7205	12,26107	12,73514
H	Transport and storage	0	0	0	0,459983	0,617368	2,646934	2,667552
J	Information and communication	22,98759	28,90813	33,14492	34,26505	36,74243	35,40371	33,17034
K	Financial Institutions	10,21688	11,7218	18,83468	22,36523	20,97877	21,61703	19,49666
M	Advising, research and other specialist services	7,328108	8,194788	9,108605	14,34533	13,48003	13,87386	12,99308
N	Lease of movable goods and other business	9,179077	9,554951	10,2764	14,40976	16,20123	21,08621	21,71421
P	Education	11,94766	12,30225	12,8811	13,35557	13,65449	13,71035	13,65948
	Total	**862,661**	**910,337**	**1032,314**	**894,1634**	**977,8313**	**1122,214**	**1148,469**
	% Growth per year	**100,00%**	**105,53%**	**113,40%**	**86,62%**	**109,36%**	**114,77%**	**102,34%**

When comparing these sector revenue totals and compare these to the number of companies per sector we see the next overview:

- C – Industry (88, 6%) Revenue vs (12, 3%) Companies
- J - Information and communication sector (2, 9%) Revenue vs (18, 2%) Companies
- N - Moveable property (1, 9%) Revenue vs (31%) Companies
- M - Specialized corporate services (1, 1%) Revenue vs (12,3%) companies

The revenue totals from the 'safety & security' subcategories: *'National Security (1), Urban Security (2), Cyber security(3), Critical Infrastructure Protection(4), Forensics(5) and Education & Research(6)* can now also be determined.

Table 9: Revenue in millions per 'Safety and Security 'subdivision Twente 2006 - 2012   Source: Table 6,7,10

Nr.	HSD Category	2006	2007	2008	2009	2010	2011	2012
1	National Security	570,8304	565,8396	637,047	512,9851	543,1538	592,5024	599,147
2	Urban Security	225,0181	268,0124	312,4682	299,6929	339,3424	418,2662	435,1372
3	Cyber Security	28,27773	32,26673	34,8514	34,9024	46,24657	57,54128	56,59525
4	Critical infrastructure protection	16,0842	20,43806	22,99104	22,81793	23,27357	23,4624	22,76801
5	Forensics	11,19928	12,20192	12,59203	10,99502	12,94975	17,511	21,2762
6	Education & Research	11,35516	11,81273	12,37842	12,83438	13,12163	13,17531	13,45561

With only 4 companies within the National Security subcategory it still is the subcategory which produces the most revenue within the sector. The Dutch company Thales is responsible for this phenomenon being 100% a National Security company. Thales being an important international player within this cluster and being one of the biggest companies within the region of Twente this could give a misperception.

When looking at the total revenue numbers, one can see, with the exception of 2009, the 'safety & security' cluster within Twente kept growing with a minimum of 2, 34% per year and a striking maximum of 14, 77%. But even when comparing the average growth from 2006 up to 2012 the 'safety & security' cluster went through an average growth of 5, 33% per year.
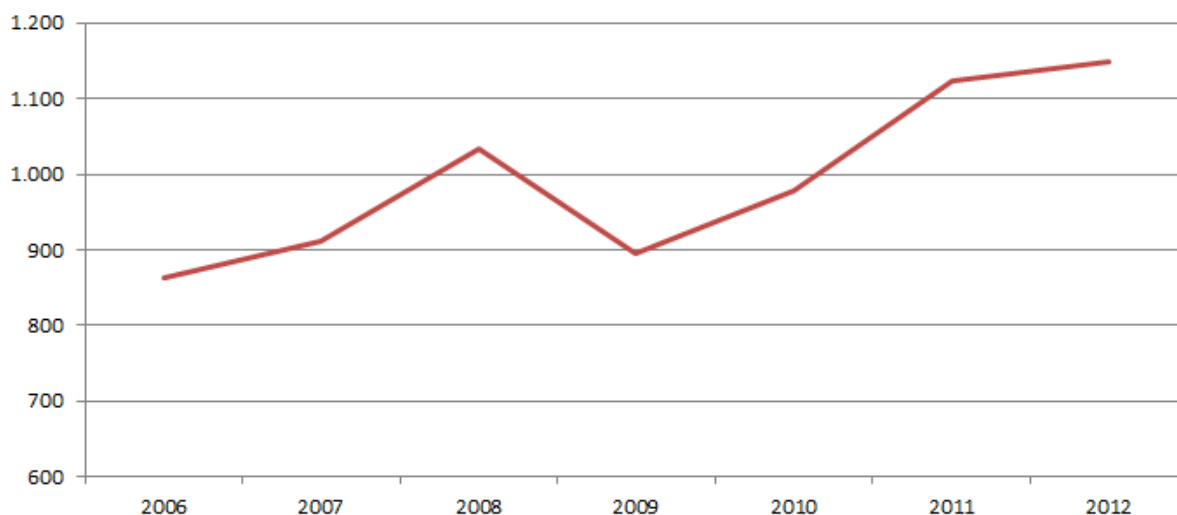
Figure 5 : Graph Growth 'safety & security' Twente 2006 – 2012   **Source: Table 11**

Figure 5 gives an overview of the revenue totals for the 'safety & security' cluster from 2006 up to 2012. Within this graph the fall of revenue in 2009 can be clearly seen.

4.1.6   RESULTS INPUT-OUTPUT ANALYSIS

Based upon the results of the input-output analysis there are several things which can be seen. The first interesting detail is the drop in revenue in 2009. Though there is no true conclusion to be drawn it probably has to do with the global economic crisis of 2008 it is however the case that the 'safety & security' cluster bounced back very quickly.

When taking this into account a strong growth can still be seen between 2006 and 2012. A growth in total revenue of €286 million, from €862 million in 2006 up to €1148 million or €1.1 billion in 2012. This is a total growth in revenue of 33% in less than six years and an annual growth of 5,33%, which is higher than the average growth in GDP of the Netherlands (0,6%) for this period of time, 2006 - 2012. (CBS, 2008 - 2012)

Within the sector itself the economic sector industry, with SBI code C, which can be seen in Table 5, is largely responsible for the revenue even though only 12,3% of the companies belong to this specific SBI category. The specific countries which are mainly responsible within this cluster for its huge revenue are Thales, Ten Cate and Elektromach. Thales is responsible for more than 50% of the revenue within the industrial sector.

Next to the big representation of industry within the 'safety & security' cluster the two 'safety & security' subcategories *'National Security'* and *'Urban security'* are the two main categories represented within the region of Twente which together cover more than 80% of the total revenue of the 'safety and security' cluster within Twente.

When using the Input-Output analysis to check if the 'safety & security' cluster is indeed a regional industrial cluster, according to the criteria given in paragraph 2.2.2, the main answer is yes.

1. 10% of the jobs from the total national 'safety & security' cluster are located in Twente thus the locational quotient of 3.0 is reached.

2. It has more than 200 FTE.

3. It has 166 firms in total thus more than 10 firms necessary.

4. The cluster consists mainly of firms which could be vertically disintegrated due to the fact that they are industrial / manufacturing companies.

Thus all statistical criteria established in paragraph 2.2.2 are met. Therefor the 'safety and security' cluster within Twente can be treated as a regional industrial cluster for the continued purpose of this research.

4.2 PORTERS DIAMOND ANALYSIS OF THE 'SAFETY & SECURITY' CLUSTER IN TWENTE

4.2.1 FACTOR CONDITIONS

Several aspects within the factor conditions of the region Twente are under quick development. Especially when looking at the capital conditions and the labor conditions.

Table 10: Labor force (15-64) by education   **Source: (CBS, 2014), (Stichting Twente Index, 2013)**

Year	Higher education	Middle education	Lower education	Total workforce
2000	60	112	72	244
2001	49	129	74	252
2002	53	121	72	246
2003	57	127	66	250
2004	61	126	59	246
2005	67	125	58	250
2006	67	124	59	250
2007	68	131	61	260
2008	75	135	63	273
2009	73	128	62	263
2010	76	126	59	261
2011	78	125	62	265
2012	80	120	57	257

When looking at Table 10: the division of education level within the population of Twente we can see that the amount of people with a higher education has risen with 25% to 80.000 which is almost 30% of the labor force.   But still the lower educated part of the labor force is well represented. Next to the labor force there are more than 30.000 students at the Saxion and the UT which can be considered as a high qualified cheap labor cost (Stichting Twente Index, 2013).
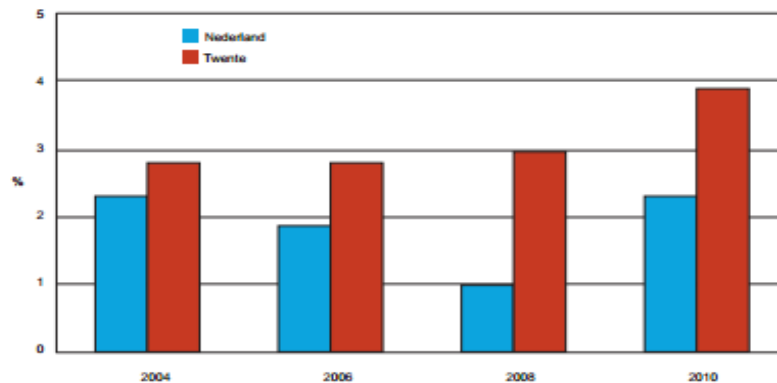
Figure 6: Percentage of R&D employees of total labor force Source: (Stichting Twente Index, 2013)

Within the Region of Twente there are percentage wise more R&D employees than within the Netherlands, as can be seen in Figure 6.

The geographical location of the region of Twente is, when looking from a Dutch vantage point, an outpost, but when looking across borders the region is a transit towards the German industrial Ruhr area. It has close proximity with several airports and it has its own inland container harbor which is one of the biggest within the Netherlands.

Within the region of Twente the topsector HTSM is especially well developed (Commissie van Wijzen, 2014). Almost 5% of the persons employed within the HTSM topsector are employed within Twente, which is 2% more than could be expected when comparing this with the general percentage Twente holds within the Dutch economy, which is 3%. (Stichting Twente Index, 2013)HTSM is also the top sector to which most of the firms from the 'safety & security' cluster within Twente belong to. Thus there are extra capital investments possible via the 'Topsectoren' policy.

When looking at the rest of the capital market there are financially enough options to gain funding. Especially when looking at the fact that Cottonwood Technology Fund will invest €30 million in new start-ups around the campus of the University of Twente, their CEO speaks of an economic region with high potential (University of Twente, 2014). Also Kennispark, which is the largest innovation campus of the Netherlands, is a large incubator for innovation with total investments of up to €275 million. Next to this the average innovation expenditure was in the region of Twente a bit higher than the Dutch average, 2,6% in comparison with 2,2%.

Next to the topsectoren policy and the capital market the academic infrastructure within Twente is growing, with more than 900 high tech spins-offs only from the UT and a growing number of university and higher education students.

4.2.2   DEMAND CONDITIONS

Demand conditions are more difficult to distill from a sector so scattered across different sectors of industry. With big international companies within the cluster such as Thales, Elektromach, Ten Cate and Rosen Europe foreign subcontractors determine some of the demand conditions within the Twente 'safety & security' cluster. For the 'Home Market' most demand from within the 'safety & security' cluster will probably be within the smaller firms. Firms belonging to the ICT sector or private security agencies.

There is however, via one of the advisory groups of TS&S, a big push for more social security. Using technology for society and implement diverse developments in healthcare, crowd control, etc. the drive to implement these technologies on a larger scale within the region of Twente is growing.

4.2.3   RELATED AND SUPPORTING INDUSTRIES

With an economic cluster scattered across so many other economic sectors there are a lot of supporting and related industries. Especially when looking at the IT sector (Cyber security) and the electrical engineering / manufacturing industry (Sensor Technology, communication devices, etc.) which both are heavily responsible for the economic revenue of the 'safety & security' Cluster.

These economic sectors are represented by a big part of the 'Safety and Security 'cluster within Twente. The support for these sectors on research and development is big. Projects like; Troned (a development, innovation and testing area located at the former military airfield of Twente), Techfortune, Risk Factory (which is a safety education system) and Safety Field Labs(hosts innovation programs from knowledge institutions and companies) which are all together the boosting the innovative engine of Twente, the knowledge generated there is used to produce new products but these facilities are also used to test newly developed products.

Next to these the support for startups from the UT and Saxion is done excellently. The TOP program from the Kennispark helps entrepreneurs and startups from the entire region. Next to this the Kennispark itself is a growing hub of startups and companies which itself acts as a supporting factor for startups and networking and is at the moment the biggest innovation campus in the Netherlands.

The UT and Saxion itself have several high profile research institutions who do top level innovations in areas of nano technology (MESA+, one of the largest and leading institution in its field of nano technology), Risk management & business development (Iseti), Information and communication (CTIT), Moses and Tech for future. Region of Twente has big chances on the areas of remote sensing, business case development for unmanned surveillance (B & A Consulting, 2011).

4.2.4 SECTOR STRATEGY, STRUCTURE AND RIVALRY

With big corporations in the cluster like Thales, Stork, Ten Cate and some more, rivalry is constantly present. Next to the big corporations, the University of Twente and the Saxion University of Applied Science make way for many often high tech spin offs, which keeps a focus and pressure on high quality products.

There is just one thing which is typical for the region of Twente. This is the cultural specific soberness of the Twente population. According to the Commissie van Wijzen (2014) the region has to break with these internal forces and give each other support and divide the tasks to be done.

4.2.5 GOVERNMENT

There is a lot of focus from the government on the 'safety & security' cluster within the region of Twente. TS&S is a consortium founded by amongst others the mayor of Enschede Mr. Den Oudsten. Next to policies already into effect, the Commissie van Wijzen (2014) called for the implementation of board consisting of people from the government, knowledge institutions and business community which together could make quick and effective decisions to help stimulate the region with innovation and growth.

Next to TS&S and the to be established board there is the VRT, an organization which focusses on keeping the region safe, secure and regulates this. The different levels of government in the Twente region are actively aware of the possibilities now arising. They are actively supporting growth in the region and are in a facilitating mood instead of being counter active.

An example of this is the provincial government, which made an extra investment to the Topsectoren policy of the national government of €100 million.

4.2.6 CHANCE

Due to the fact that there are a lot of initiatives working within the region to boost innovation and support the 'safety & security' cluster there are opportunities. The beginning of TS&S in the beginning of 2014 gives focus to these opportunities within the cluster and the report from the Commissie van Wijzen (2014) boosts urgency.

With the closing of Airport Twente, chance already had a big effect on the region and possibly also towards the 'safety & security' cluster. How this further develops has to be seen.

4.3 COMPARING THE HAGUE WITH TWENTE

When combining the data from paragraph 1.7 with the results from the input-output analysis and the Porters Diamond analysis one can say that comparing the 'safety & security' cluster in Twente with the 'safety & security' cluster in The Hague is difficult.

When comparing the distribution of revenue between the region of The Hague and Twente it becomes clear that there are, in economic terms, differences between the two clusters. The size in revenue and the persons employed within the 'safety & security' cluster in The Hague is higher than in Twente: €1.6 billion revenue in The Hague versus €1.2 billion revenue in Twente. This means that the HSD 'safety & security' cluster is 25% larger than the cluster in Twente. It is notable that the revenue generated per employee is higher within Twente than it is in The Hague.

When comparing the cohesion within the clusters themselves, the regions are more or less complimentary to each other. This can be seen when comparing the 'safety & security' subcategories between The Hague and Twente. Where The Hague region is largely represented by institutions from the *national security* domain (with institutions like Europol, OPCW, National coordinator anti-terrorism, TNO Defense and Safety), the *cyber security* (with ICT companies) and *urban security* (with Service Industries). The Twente 'safety & security' cluster is mainly represented by the subcategories *national security* and *urban security*, both mainly with companies within the industrial manufacturing domain.

Differences within the *education & research* subsection are also important to mention. Where The Hague has many national and international policy research institutions, the research done within Twente is mainly focused on new innovations and research in the HTSM top sector area. So where the 'safety & security' cluster in The Hague is big on education and knowledge sectors and is important for policy makers, governments and others, research done within the 'safety & security' cluster in Twente has a huge impact for the industrial and manufacturing section.

The dominating firms or institutions also differs between The Hague and Twente. The Hague cluster is dominated by many international institutions and research institutions which are mentioned earlier, the cluster within the region of Twente is dominated by a large industrial and manufacturing sector with big companies as Thales, Ten Cate and Elektromach.

When looking at which subdomains within the 'safety & security' clusters will show the biggest growth within the two clusters there again is a difference. The Hague 'safety & security' cluster expects the biggest growth within the *cyber security* subdomain. Within the Twente 'safety & security' cluster the *urban security sub*domain shows the biggest growth rate.

5 DISCUSSION AND CONCLUSIONS

5.1 CONCLUSIONS

As a result from the input-output analysis it becomes clear that the 'safety & security' cluster within the region of Twente can be treated as a regional cluster in terms of competitiveness as it fulfills all statistical criteria established in paragraph 2.2.2. It has a locational quotient of 3.0, more than 200 FTE, 166 firms thus more than the 10 necessary and the largest part of these firms can be vertically disintegrated. It is however, due to the research design, not possible to determine whether there is more innovation within the cluster, if firms have a longer life span and if there are generally more new firms created within the cluster.

The size of revenue within the 'safety & security' cluster within Twente is €1.1 billion in 2012 and has shown an average revenue growth of 5,33% per year. Over the period of 2006 up to 2012 the 'safety & security' cluster has realized a growth of more than 30%.

Within the national 'safety & security' cluster the 'safety & security' cluster of Twente is strongly represented. Companies and knowledge institutions, who focus completely or partially on 'safety & security', are together worth almost 7,5% of total employment and almost 20% worth of total revenue of the national cluster. While the total part of the 'normal' economy of Twente is only 3% of the total national economy, or GDP. The cluster is both in revenue and in employees many times bigger than could have been expected on terms of the normal economic part the region of Twente has within the Dutch economy. This is an indicator that the climate within the region of Twente is favorable for the 'Safety & Security' cluster.

The 'safety & security' cluster consists mainly of private companies (162) next to four knowledge institutions. The SBI sector Industry is dominant within the 'safety & security' cluster, it generates almost 85% of the revenue. Thus the cluster within Twente is dominated by industrial and manufacturing companies.

When looking at the competitiveness of the 'safety & security' cluster within the region of Twente the supporting industries, like Troned, Tech Fortune and Safety field labs, which are helping the development of new and innovative products through testing and implementing them in a controlled environment, are important. Next to these supporting industries the presence of unique research institutions such as MESA+ and CTIT make sure that the region of Twente is competitive in the development of new and innovative technologies and products.

The large presence in the national top sector of HTSM, in combination with a large number of high tech spin-offs, complete the picture of the 'safety & security' cluster within Twente as an industrious manufacturing economic cluster with a focus on High Tech Systems and Materials. Which is broadly supported by R&D for new technologies and spin-offs for more innovation. Due to all the support and focus on innovation and research for high tech products and developments, companies focusing on 'safety & security' related products from within the manufacturing business are promising.

When comparing the HSD cluster with the TS&S cluster it is possible to say that the HSD cluster could be typified as a research hub with big international institutions and governmental organizations supported by companies and firms in the service industry. The TS&S Twente cluster could be typified as a big industrialized manufacturing cluster with huge support from innovation specific projects and testing areas completed with high tech research institutions and spin-offs. Due to the differences between the two 'safety & security' clusters and the fact that these differences are complimentary to each other, both clusters have the option to benefit and thrive of each other and can both be competitive.

5.2 DISCUSSION

There are some points of discussion important to take in mind when reading this paper. Even though putting together of the company list and the weighing of companies was done with great care, it is possible that companies are not on the list or that companies are not weighed properly. It also is possible that there are companies who currently do not exist anymore or are missing on the list due to the fact that the KvK does not have an archive.

This research mainly focusses on the region of Twente. A similar research with other 'safety & security' clusters is not done, therefore the competitiveness of the Twente region in comparison with other regions is difficult to establish. Doing a comparable research would improve the knowledge of the competeiveness of the different safety regions and could help HSD, DITTS and TS&S with focusing their policy aims.

Due to the fact that this research was requested to remain methodologically comparable with the researches from B&A consulting (2011) and Policy Research Corporation (2013) the exact definition of the ' safety & security' cluster as well as it subcategories remains unclear. The orders of the cluster, as Porter (2000) explained are more or less determined but not thoroughly analyzed.

With the proper time and preparation a more in depth survey amongst the 'safety & security' cluster in Twente would give a more accurate picture in terms of revenue, percentage of activities within the cluster and employment numbers. When supplemented with questions about R&D, products and regional networks a complete picture of the Twente 'safety & security' cluster and a more accurate Porters Diamond analysis could be provided.

This research has an empirical (input – output analysis) and a literature part (Porters Diamond analysis) which makes it able to conclude a lot on a micro economic level. Unfortunately many aspects of clusters and relations within clusters are difficult to determine, thus this research provides a basic view but lacks the information analyze the cluster up to a proper level.

The 'safety & security' cluster within Twente is highly dominated by a couple of large firms. It could be that the cluster forms around these firms and thus is company dependent and not regional dependent. A research studying the impact of these large firms on the cluster within Twente could be conducted to determine their impact and effect.

6. RECOMMENDATIONS BASED ON THIS PAPER

A lot of recommendations can be made. First of all it is important for TS&S to keep a proper archive of the companies active within the 'Safety &Security' cluster. For further analysis purposes the construction of a database with data about the 'safety & security' cluster is important. It will also help to see if policies created to influence this cluster have an actual effect. Next to help in the field of policy analysis an actual overview of companies active within the 'safety & security' sector helps with the distribution of innovation money. It also enables TS&S to bring firms or researchers into contact with each other for the benefit of all.

Next to this a more qualitative research about the strong points from within the 'safety & security' cluster is necessary. Knowing which developments are taking place within the cluster would enable TS&S to ensure that the policies are not hindering these developments but rather improve or stimulate them.

It also is important to know in which direction the 'safety & security' in Twente will develop itself in the future thus a study anticipating the future or with a future forecast would enable more accurate policies guiding the cluster towards a prosperous future.

Via the quick glance from this research and from the researches of B&A consulting (2011) and Policy Research Corporation (2013) an overview from the region Twente is established as a region which has big chances within areas as high tech systems and materials, unmanned surveillance and remote sensors a research done to see if this is true is also very useful.

To be able to say more about the way the 'safety & security' cluster functions within Twente an analysis using a combination of the Cluster Factors Model end the funnel model of cluster determinants should be executed. This requires extensive interviews with important stakeholders and participants from within the cluster.

7. REVERENCES

B & A Consulting. (2011). *De veiligheidssector in de regio Den Haag en Nederland.* Den Haag: B&A Consulting.

Boja, C. (2011). Cluster Models, Factors and Characteristics. *International Journal of Economic Practices and Theories, 1*(1), 34-43.

CBS. (2008 - 2012). *NR: Aanbod- en gebruiktabellen, input-outputtabellen en rekeningenstelsel*. Opgeroepen op 09 28, 2014, van Centraal Bureau voor de Statistiek: http://www.cbs.nl/nl-NL/menu/themas/macro-economie/cijfers/incidenteel/maatwerk/2012-i-o-cm.htm

CBS. (2014). *Arbeidsvolume naar bedrijfstak*. Opgeroepen op 04 01, 2015, van Centraal Bureau voor de Statistiek: http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=82579NED&D1=0-1&D2=0&D3=0&D4=1,6-7,34,36,39,44,48,54-55,61,65,67,76,82,84,86,90,93,97-98&D5=11&HDR=G2,G1,T&STB=G3,G4&VW=T

CBS. (2014). *Standaard Bedrijfs Indeling 2008 versie 2014.* Opgeroepen op 01 04, 2015, van Centraal Bureau Statistiek: http://www.cbs.nl/nl-NL/menu/methoden/classificaties/overzicht/sbi/sbi-2008/default.htm

Commissie van Wijzen. (2014). *Technology Base Twente*.

Davies, H., & Ellis, P. D. (2000). Porter's 'Competitive Advantage of Nations': Time for a final judgment? *Journal of Management Studies, 37*(8), 1189-1213.

ECORYS. (2009). *Study on the Competitiveness of the EU security industry.* Brussels: ECORYS.

European Commission. (2012). *Action Plan for an innovative and competitive Security Industry.* Brussels: European Commission.

Hague Security Delta. (2014). *About HSD*. Opgeroepen op 01 03, 2015, van The Hague Security Delta: https://www.thehaguesecuritydelta.com/about-hsd

Hanggi, H. (2003). Making sense of Security Sector Governance. In L. Biason, H. Born, V. Ghebali, H. Hanggi, & J. V. Stevenson, *Challenges of Security Sector Governance* (pp. 3-22). Geneva: DCAF.

Hanggi, H. (2004). Conceptualising Security Sector Reform and Reconstruction. In H. Hanggi, & A. Bryden, *Reform and Reconstruction of the Security sector* (pp. 3-21). Minster: Transaction Publishers.

HSD. (2014). *Strategie en urgentie programma.* The Hague: HSD.

HSD, TS&S, DITSS. (2014). *Convenant nationale samenwerking veiligheid en innovatie.* Opgehaald van Hague Security Delta: https://www.thehaguesecuritydelta.com/about-hsd

Ingram, G. K. (1991). The competitive Advantage of Nations By Porter. *Finance and Development*.

Isaksen, A. (1996). *Regional Clusters and Competitiveness: The Norwegian Case.* Oslo\: STEP.

Ki-Young, Y. (2003). *Method for Identifying Industry clusters.* Chapel Hill: University of North Carolina.

LISA. (2013). *LISA-Handboek Definities, protocollen en achtergronden van LISA.* LISA. Opgehaald van http://www.lisa.nl/include/LISA_Handboek_versie_november_2013.pdf

Miller, R., & Peter, D. (2009). *Input-Ouput Analysis - Foundations and Extensions* (2 ed.). Cambridge: Cambridge University Press.

Panic, B. (2009). Societal security - security and identity. *Carl schmitt and copenhagen school of security studies, 23,* 29 - 38.

Pessoa, A. (2012). Regional cluster policy: key features and critical issues. *ERSA Conference papiers.* European Regional Science Association.

Policy Research Corporation. (2013). *Security Delta.* Den Haag: Policy Research Corporation.

Porter, M. (1990). *The competitive Adventage Of Nations.* New York: The Free Press.

Porter, M. (1998). Clusters and the New Economics of Competition. *Harvard usiness Review,* 77-90.

Porter, M. (2000). Location, Competition, and Economic Development: LocalClusters in a Global Economy. *Economic Development Quarterly, 14*(15), 15-34.

Regio Twente. (2014). *Regio Twente Website*. Opgeroepen op 1 3, 2015, van http://www.regiotwente.nl/

Rijksoverheid. (2008). *Maatschappelijke Innovatie Agenda Veiligheid.* Opgeroepen op 01 03, 2015, van Rijksoverheid: http://www.rijksoverheid.nl/documenten-en-publicaties/notas/2008/07/04/4-maatschappelijke-innovatie-agenda-veiligheid.html

Rijksoverheid. (2009). *Maatschappelijke Innovatie Agenda Veiligheid : Fysieke bescherming.* Opgeroepen op 03 01, 2015, van Rijksoverheid: http://www.rijksoverheid.nl/documenten-en-publicaties/notas/2008/07/04/4-maatschappelijke-innovatie-agenda-veiligheid.html

Rijksoverheid. (2011). *Naar de Top; het bedrijveneleid in actie(s)*. Opgeroepen op 1 3, 2015, van Documenten en pulicaties: http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2011/09/13/naar-de-top-het-bedrijvenbeleid-in-actie-s.html

Stichting Twente Index. (2013). *Twente Index 2013.* Enschede: Twente Index 2013. Opgeroepen op 01 14, 2015, van http://twente.com/static/downloads/TwenteIndex2013.pdf

Stonehouse, G., & Snowdon, B. (2007). Competitive advantage revisited: Michael Porter on strategy and competitiveness. *Journal of management inquiry, 16*(3), 256-273.

Titza, M., Brachert, M., & Kubis, A. (2008). The Identification of Regional Industrial Clusters using Qualitative Input - Output Analysis. *IWH-Discussion Papers, 13,* 1-25.

TS&S. (2014). *Partners*. Opgehaald van Twente Safety & Security:
http://www.twentesafetyandsecurity.com/

University of Twente. (2014). *AMERICAN INVESTMENT FUND STARTS FIRST EUROPEAN HUB IN THE NETHERLANDS*. Opgeroepen op 10 01, 2015, van University Twente:
http://www.utwente.nl/en/newsevents/2014/5/347113/american-investment-fund-starts-first-european-hub-in-the-netherlands

Van der Linden, J. (1998). Input-Output and the Analysis of Sector policy Scenarios. *Conference on Input-Output Techniques.* New York.

Yetton, P., Craig, J., & Davis, J. (1992). Are diamonds a Country's best friend? a Critique of Porter's Theory of national competition as applied to canada, new zealand and Austrlia. *Australian Journal of Management, 17*(1), 89-119.

8.1 APPENDIX I LIST OF EXPERTS

Informanten Veigheidscluster Twente

Naam		Functie	Organisatie	Telefoon vast	Mobiel		email	
Informanten								
I		Directeur	WTC-Twente	074-	06-1	7	f.fr	l
I		Adjunct-directeur	Kennispark	053-	06-5	3	p.c	k.nl
I		Directeur High Tech Factory	Kennispark		06-1	2	r.g	ite.nl
I		Consultant	Pino & Partners	074-	06-5	5	flij	ers.com
I		Business Developer	Kennispark		06-4	8	mĩ	il
I		Lector	Saxion		06-4	0	w.l	on.nl
I		Directeur	Design Lab UT	053-	I31		i.b	
I		Directeur	IKT	053-			a.t	
I		Lector	Saxion		06-2	1	w.l	
I		Sectormanager	Oost-NV					
I	se	Coordinator	TKT				mã	
I		Voorzitter	Stichting Fris	053-			mã	m.nl
I		Business Developer	Saxion		06-5	0	k.s	
I		Projectleider Industrie-Oost	Kamer van Koophandel (syntens)		06-3	7	ba	
I		Directeur	Verenigde Maakindustrie Oost	053-			inf	
I								
I					06-5	1	p.ł	iente.nl
I		KSO - Saxion	Integrale veiligheidskunde	053-	057-	1	i.m	nl
I		UT						
I		Lector Saxion	Verbonden aan Thales	088-			i.h	il
I		Politie	co 24	088-			w.:	t.nl
I		Teamleider kenniscentrum	Brandweer Twente	088-	06-1	8	y.a	twente.nl
I		Financial control Saxion		053-				
I		Lector Saxion	Textiel		06-2	7	g.i	
I		Lector Saxion	Medische materialen		06-5	0	f.g	in.nl
I	en	Student gegevens Saxion			06-5	3		
I		Evenementen Kennispark			06-1	4		
I		VRT		088-				

8.2 APPENDIX II LIST OF COMPANIES

SBI Code	SBI-Code	Bedrijf	KVK nummer	LISA nummer
A	0910	Rosen Europe B.v.	08089342	AG574928886
C	1320	Ten Cate Advanced Composites B.V.	06001690	AG100086702
C	1320	Ten Cate Thiobac B.V.	14023727	AG576364083
C	1330	Ten Cate Protect B.V.	06036546	AG100092932
C	1399	Ten Cate Koninklijke Ten Cate N.V.	06016321	AG585081483
C	2013	Enrichment Technology	08115958	AG592229283
C	2562	Demcon Advanced products	06079800	AG304395553
C	2611	Concept tp Volume	06089402	AG583708083
C	2630	Group 2000	06061483	AG100098912
C	2630	Inertia Technologies	08185401	AG620028483
C	2651	Benchmark	06090691	AG304030186
C	2651	Demcon production	31031099	AG577040286
C	2651	Demcon Advanced Mechatronics	06070325	AG304066186
C	2651	Ostendum	08172916	
C	2651	Thales Nederland	06061578	AG100027976
C	2660	panalytical	06069492	AG100001669
C	2712	Electromach	06040491	AG100054609
C	2733	Sensata	34243027	AG604176480
C	2790	TKH Group N.v.	06045666	
C	2829	THOLE toegangssystemen bv	58560173	AG598600080
C	2896	Stork Plastics Machinery B.V.	06041991	AG100068397
C	2790	Wardenburg Beveiliging bv		AL000711483
C	2712	Hitec Power protection		AG304029409
C	3311	Stork Thermeq B.V.	06082444	AG304163746
F	4321	Europe Security	08103202	AG584650080
F	4321	Lammerink Beveiligingstechnieken B.V.	08100373	AG583202283
F	4321	Van der Molen beveiligingstechniek	06069667	AG100095488
F	4321	Voskamp solutions center	06079517	AG569960886
F	43222	Klein Poelhuis Bedrijven	08039132	AG633946083
G	4321	Platvoet beveilignssystemen Onderhoud	08142381	AG551588286
G	4321	Schaafstra Techniek B.V.	50107070	AG632644086
G	4614	Velco Brandbeveiliging	06067175	AG100136455
G	4651	Sigmax Law Enforcement B.V.	08176862	AG614839083
G	4651	Sigmax Mobile Products B.V.	08170616	AG612973686
G	4651	Switch	06070240	AE225060714
G	4652	Voskamp toechanstechniek	06048769	AG219568033

G	4652	Xsens technologies B.V.	50142224	AG304468903
G	4662	Trumpf	08090682	AG605789886
G	43999	Ruko Design	08115493	AG590459883
G	46421	Wevotex	08176281	AG574721280
G	46424	Nijhof Safety	08153123	AG606679683
G	46695	Uniqkey Biometrics	08138741	AG601574883
H	52291	TKH loghistics	24198743	AG618761283
J	6201	Controllab	06076204	AH582403792
J	6201	IACT	08084559	AG574028280
J	6201	Ovsoftware B.v.	06049464	AG100168566
J	6201	Phoenix	08110267	AG587996280
J	6201	Recore Systems	08138814	AG602927886
J	6201	Re-lion	51352516	AG304404136
J	6201	Sequrix BV	58699848	
J	6201	Sigmax Field Mobility B.V.	08181837	AG640134483
J	6201	Sigmax Government Products B.V.	08176866	
J	6201	Sigmax Mobile Solutions B.V.	08176870	AG582493083
J	6201	Stratech Automaisering	06080040	AG220338459
J	6201	Telecats	06069106	AG224126936
J	6202	The Backbone B.V.	08124047	AG602000886
J	6202	Caase	06066446	AG219664102
J	6202	Groupsecure B.V.	51873354	AG637021686
J	6202	Stratech opleiding en advies	06080041	AG570098283
J	6209	Nederlands-Duitse Internet Exchange B.V.	08096278	AG604148883
J	6209	Sterbon beveiligingsadvies	59973323	
J	6220	Security Matters B.V.	8180892	AG636014880
J	620102	Coblue Cybersecurity BV	55442366	
J	6209	Cigma Automatisering B.V.		AG590530083
J	6209	Rineca IT & VOIP		
J	6202	Echelon BV		AB300201399
J	6202	Magenta Multimedia Tools BV		AG304049119
J	6202	BT Computer Service		AG304462693
J	6202	ICS Computers		AE300282772
J	6202	DD&H Digital Communication B.V.		AG633145083
J	6202	NovaSystems B.V.		AN643352940
J	6201	Sigmax ICT Specialisten B.V.		AG304421776
J	6201	Quarantainenet B.V.		AG599286486
J	6201	Impulse Software		AG599755083
J	6201	DGB-Earth Sciences B.V.		AG304036216

J	6201	TNO Informatie- en Communicatie Technologie		AG587398680
J	6201	Atricom B.V.		AG595165680
K	6420	Sigmax Mobile Holding B.V.	08099213	AG582493083
K	6420	Ten Cate Advanced textiles B.V.	06063994	AG588687480
K	6420	Ten Cate Nederland B.V.	06036179	AG100084861
K	6420	Ucare4	08213436	AG625184886
M	7112	Demcon BUNova B.V.	06086379	AG304332529
M	7112	FIGO B.V. (Doorstart WMC)	52934969	
M	7112	Imotec	53948238	AG576150480
M	7112	KITT Engineering	06076619	AG304033606
M	7112	Nieuwenhuijse arends B.V.	08085776	AG631197483
M	7112	Norma MPM B.V.	08156859	AG618738480
M	7112	Tebodin (Vestiging Twente)	27336603	AC111098395
M	7112	USE system engineering B.V.	52898210	AG567804486
M	7220	AVIV	06042829	AG220329167
M	7311	Service2Media B.V.	34222026	AG600614280
M	70221	Virtu Secure Webservices (equinix)	06092246	AG304468723
M	71202	Maser engineering	08160369	AG609491283
M	72192	Demcon Advanced Products	06079800	AG304395553
M	72192	Forensica	59115890	
M	72192	Novay	41032471	AG304442239
M	72192	Steray	08139295	AG600842880
M	72192	3T	06070318	AG225128919
M	72199	DaisyData		
M	72199	Integrity Technology Solutions		
M	72199	Acmaa Almelo B.V.		AG575737683
M	72192	Nationaal Forensisch Onderzoeksbureau B.V.		
M	72192	HILT Services		
M	72192	Bluemark Innovations B.V.		
N	8010	A.J.S. Security	08154118	AG606820083
N	8010	AE Beveiliging	59794232	
N	8010	Detrax B.V.	08133104	AG598348686
N	8010	G.S.B. Security	08119712	AG592515483
N	8010	GGE Bedrijfsdiensten B.V.	56269099	AG623607480
N	8010	GHL Security	50692305	AG590899680
N	8010	Grande Security B.V.	59921935	
N	8010	GS4 Security & Consulting	60068450	
N	8010	H&S Horeca Security	08087745	AG574636680

N	8010	HvS Protection & Safety Reponse Team	54434025	AG642979080
N	8010	Iseti	08159829	
N	8010	Jan Hooiveld Safety & Security Consultant	08221411	AG631348683
N	8010	JF beveiliging	58523103	
N	8010	Logistiek Centrum Hengelo Transport B.V.	08149867	AG632093286
N	8010			
N	8010	Max Security	08144779	AG607466283
N	8010	OZ Security	50298127	AG633503283
N	8010	Platvoetr beveiligingssy=stemen Meldkamer	08142402	
N	8010	Pro-Dogs Total Security	08124894	AG609772083
N	8010	QSS Security	08112565	AG588997080
N	8010	RDS Beveiliging	30220781	AG598787886
N	8010	Regionale Toezichthouders Groep B.V.	52027198	AG637421286
N	8010	RJ Safety & Security	08124577	AG304264096
N	8010	RWV security	53157397	AG640383480
N	8010	S.H. Beveiliging	08189083	AG618284880
N	8010	Sa-Int Security B.V.	59626771	
N	8010	Schroduer Security	08133372	AG598404486
N	8010	Select Security	08099286	AG588735483
N	8010	Thema Beveiliging B.V.	50092715	AG633574080
N	8010	Tijink Security Systems	08114147	AG590005080
N	8010	Traffic Security Nederland B.V.	54169488	AG636788283
N	8010	TSS Twente Security Service	50249096	AG633422880
N	8010	TVO-Security	54318777	AG632507286
N	8010	Veiligheid Almelo B.V.	06091330	AG572984886
N	8010	W.E.B. Security V.O.F.	59371234	
N	8010	Wering Service & Advies	52309568	AG638036280
N	8010	YSC Yska Security Company	08190008	AG618514086
N	8010	All Four One Security	08223903	AG632001486
N	8020	B.T.V. Techniek	58305386	
N	8020	Benelux Vision	56404182	
N	8020	Central Alert	57042365	
N	8020	Fair Bewaking B.V.	39053102	AF220268489
N	8020	Luka Beveiliging en Bewaking	08086048	AG550562883
N	8020	Nijkamp Veilig Wonen	59924217	
N	8020	Securion	06086362	AG304293616
N	8020	VASP	59923792	
N	8030	Prio Bedrijfsrecherche B.V.	57416451	
N	8030	The Investigator	50621297	AG634486680

N	82999	Auspective	50520202	AG634330686
N	8010	G4S		
N	8010	Excellent Drive Security	8084636	AG550398486
N	8010	DBS Technology B.V.	8116779	AG594276480
N	8010	JS Security & Driving Service	8137793	AG600161883
N	8010	Guard-Elite	54887275	AG644119683
N	8010	Total Security Oost	38019494	AG304181206
N	8010	Paalman/De Roy van Zuydewijn Recherche	8135387	AG599252883
N	8020	Certafix B.V.	54801451	AG645309483
N	8020	RM-Vision	52176762	AG637664286
O	8424	Politie Twente		AG224166182
P	85592	Fireflash	24364781	AG598105080
P	85592	Hofman veiligheidsopleidingen	06082539	
P	85592	Veilig werken Nederland	08179270	
P	85592	VVCR Europe		AF219252055
		T-Xchange	AG647215086	

Instituten				
		Saxion(Academies)	AG110173716	
		Kenniscentum design & Technology (Saxion)		
		Kenniscentrum Leefomgeving (Saxion)		
		SCS		
		Universiteit Twente (Academies)	AG100013879	
		CTIT (UT)		
		MIRA (UT)		
		MESA+ (UT)		

8.3 APPENDIX III COMPANIES WITH EMPLOYEE NUMBERS FROM LISA

		WZP							
Bedrijf	Wegingsfactor	2006	2007	2008	2009	2010	2011	2012
Group 2000	100,00%	47	50	57	55	54	64	74

		1997	1813	1941	1800	1629	1571	1513
Thales Nederland	95,00%	1997	1813	1941	1800	1629	1571	1513
Re-lion	100,00%	6	8	9	10	10	0	0
DaisyData	0,00%	0	0	0	0	0	0	0
Ten Cate Advanced Composites B.V.	50,00%	76	82	85	89	77	73	78
Ten Cate Thiobac B.V.	50,00%	144	139	130	127	139	133	133
Ten Cate Protect B.V.	100,00%	157	158	156	180	184	231	232
Ten Cate Koninklijke Ten Cate N.V.	50,00%	5	5	2	2	2	3	2
Demcon Advanced Products	15,00%	3	1	3	3	1	1	1
Inertia Technologies	60,00%	0	0	0	2	3	7	7
Benchmark	5,00%	377	417	389	382	386	387	294
Demcon production	100,00%	1	2	5	4	1	2	9
Demcon Advanced Mechatronics	100,00%	29	41	45	43	52	69	79
Electromach	100,00%	123	130	143	162	140	172	173
Sensata	15,00%	250	227	359	236	241	241	250
TKH Group N.v.	18,00%	0	0	0	0	0	0	0
THOLE toegangssystemen bv	100,00%	9	16	18	18	18	18	18
Wardenburg Beveiliging bv	100,00%	37	50	48	48	48	48	48
Hitec Power protection	100,00%	107	131	158	158	158	158	158
Europe Security	100,00%	3	5	5	5	4	6	6
Lammerink Beveiligingstechnieken B.V.	100,00%	11	13	15	14	16	16	16
Van der Molen beveiligingstechniek	100,00%	20	21	26	27	27	25	30
Voskamp solutions center	100,00%	15	20	26	25	25	29	29
Klein Poelhuis Bedrijven	20,00%	0	0	0	0	0	9	8
Platvoet beveiligngssystemen Onderhoud	100,00%	17	17	18	15	24	26	24
Schaafstra Techniek B.V.	100,00%	0	0	0	0	5	10	10
Velco Brandbeveiliging	100,00%	25	30	30	29	28	28	39
Sigmax Law Enforcement B.V.	100,00%	0	0	0	1	30	30	29
Sigmax Mobile Products B.V.	50,00%	0	0	1	1	1	2	2
Voskamp toechanstechniek	100,00%	21	21	21	26	28	27	27
Xsens technologies B.V.	20,00%	17	22	29	32	61	58	65
Trumpf	5,00%	0	41	43	48	40	50	56
Ruko Design	30,00%	3	2	2	2	2	2	2
Wevotex	10,00%	4	4	5	6	6	6	8
Nijhof Safety	100,00%	0	1	1	6	6	3	2
TKH loghistics	18,00%	0	0	0	20	65	106	104
Controllab	100,00%	1	1	1	1	0	1	1
IACT	20,00%	7	8	8	10	10	11	11

Phoenix	25,00%	7	7	10	13	12	11	12
Recore Systems	100,00%	3	6	11	16	20	20	19
Sequrix BV	100,00%	0	0	0	0	0	0	0
Sigmax Field Mobility B.V.	20,00%	0	0	0	0	5	12	10
Sigmax Government Products B.V.	50,00%	0	0	0	0	0	0	0
Sigmax Mobile Solutions B.V.	50,00%	16	26	41	43	43	42	30
Stratech Automaisering	0,00%	32	37	40	42	52	70	43
Telecats	50,00%	19	21	23	28	28	28	28
Sterbon beveiligingsadvies	100,00%	0	0	0	0	0	0	0
Magenta Multimedia Tools BV	100,00%	5	5	4	4	4	4	4
Sigmax Mobile Holding B.V.	100,00%	16	26	41	43	43	42	30
Ten Cate Advanced textiles B.V.	50,00%	34	28	42	30	2	2	2
Ten Cate Nederland B.V.	50,00%	26	28	38	43	38	41	45
Ucare4	100,00%	0	0	0	0	5	7	7
FIGO B.V. (Doorstart WMC)	100,00%	0	0	0	0	0	0	0
KITT Engineering	0,00%	3	4	5	3	8	9	9
Nieuwenhuijse arends B.V.	100,00%	0	0	0	0	1	6	7
Norma MPM B.V.	20,00%	0	0	0	236	206	196	154
AVIV	100,00%	9	9	9	10	10	9	10
Service2Media B.V.	10,00%	5	14	24	24	61	75	90
Maser engineering	0,00%	0	0	38	35	32	34	37
Demcon Advanced Products	15,00%	3	1	3	3	1	1	1
Steray	10,00%	2	2	2	2	2	3	4
3T	10,00%	30	32	39	49	41	44	47
Acmaa Almelo B.V.	0,00%	8	10	10	0	0	0	0
HILT Services	0,00%	0	0	0	0	0	0	0
Bluemark Innovations B.V.	0,00%	0	0	0	0	0	0	0
A.J.S. Security	100,00%	1	1	1	1	1	1	1
AE Beveiliging	100,00%	0	0	0	0	0	0	0
Detrax B.V.	100,00%	2	2	2	1	3	3	3
G.S.B. Security	100,00%	8	2	6	6	5	3	5
GGE Bedrijfsdiensten B.V.	100,00%	0	0	0	0	1	1	1
GHL Security	100,00%	1	1	1	1	1	1	1
Grande Security B.V.	100,00%	0	0	0	0	0	0	0
GS4 Security & Consulting	100,00%	0	0	0	0	0	0	0
H&S Horeca Security	100,00%	1	1	1	1	0	1	2
HvS Protection & Safety Reponse Team	100,00%	0	0	0	0	0	0	1
Iseti	100,00%	0	0	0	0	0	0	0
Jan Hooiveld Safety & Security Consultant	100,00%	0	0	0	0	1	1	1

JF beveiliging	100,00%	0	0	0	0	0	0	0
Logistiek Centrum Hengelo Transport B.V.	100,00%	0	1	1	1	1	1	1
Max Security	100,00%	1	1	1	1	1	1	1
OZ Security	100,00%	0	0	0	0	1	1	1
Platvoetr beveiligingssy=stemen Meldkamer	100,00%	0	0	0	0	0	0	0
Pro-Dogs Total Security	100,00%	0	0	2	2	2	2	2
QSS Security	100,00%	14	16	11	20	20	20	15
RDS Beveiliging	100,00%	1	1	1	1	1	1	1
Regionale Toezichthouders Groep B.V.	100,00%	0	0	0	0	0	8	8
RJ Safety & Security	100,00%	22	35	47	129	163	214	221
RWV security	100,00%	0	0	0	0	0	0	1
S.H. Beveiliging	100,00%	0	0	0	0	1	1	1
Sa-Int Security B.V.	100,00%	0	0	0	0	0	0	0
Schroduer Security	100,00%	2	2	2	2	2	2	2
Select Security	100,00%	4	1	2	2	2	2	2
Thema Beveiliging B.V.	100,00%	0	0	0	0	0	10	21
Tijink Security Systems	100,00%	1	1	1	1	1	1	1
Traffic Security Nederland B.V.	100,00%	0	0	0	1	0	27	32
TSS Twente Security Service	100,00%	0	0	0	0	0	1	1
TVO-Security	100,00%	0	0	0	0	1	1	1
Veiligheid Almelo B.V.	100,00%	45	32	30	30	33	28	28
W.E.B. Security V.O.F.	100,00%	0	0	0	0	0	0	0
Wering Service & Advies	100,00%	0	0	0	0	0	1	1
YSC Yska Security Company	100,00%	0	0	0	1	1	1	1
All Four One Security	100,00%	0	0	0	0	4	5	5
B.T.V. Techniek	100,00%	0	0	0	0	0	0	0
Benelux Vision	100,00%	0	0	0	0	0	0	0
Central Alert	100,00%	0	0	0	0	0	0	0
Fair Bewaking B.V.	100,00%	59	59	50	40	63	63	40
Luka Beveiliging en Bewaking	100,00%	47	50	52	47	17	19	16
Nijkamp Veilig Wonen	100,00%	0	0	0	0	0	0	0
Securion	100,00%	7	7	7	15	14	14	14
VASP	100,00%	0	0	0	0	0	0	0
Auspective	100,00%	0	0	0	0	0	1	1
G4S	100,00%	0	0	0	0	0	0	0
Excellent Drive Security	100,00%	1	1	1	1	0	1	1
DBS Technology B.V.	100,00%	1	1	1	1	1	1	1
JS Security & Driving Service	100,00%	1	1	1	1	1	1	1
Guard-Elite	100,00%	0	0	0	0	0	0	1

Total Security Oost	100,00%	2	2	2	5	2	2	2
Certafix B.V.	100,00%	0	0	0	0	0	0	1
RM-Vision	100,00%	0	0	0	0	0	2	2
Fireflash	100,00%	10	8	8	8	8	8	1
Veilig werken Nederland	100,00%	0	0	0	0	0	0	2
VVCR Europe	0,00%	7	2	2	0	0	0	0
Aeronamics	0,00%	0	0	0	0	0	0	1
DaToCam	0,00%	0	0	0	0	0	0	0
Ten Cate Technical Fabrics B.V.	0,00%	0	0	0	0	0	0	0
T-Xchange	100,00%	0	0	0	0	0	4	13

Rosen Europe B.v.	10,00%	141	155	165	230	232	251	210
Enrichment Technology	10,00%	401	486	525	585	725	867	788
Stork Plastics Machinery B.V.	10,00%	136	128	123	128	134	130	127
Stork Thermeq B.V.	10,00%	175	164	175	211	257	270	290
Nederlands-Duitse Internet Exchange B.V.	0,00%	0	2	3	10	8	9	10
DGB-Earth Sciences B.V.	100,00%	14	13	11	11	11	11	11
Demcon BUNova B.V.	10,00%	8	9	9	9	9	8	8
Imotec	10,00%	4	5	2	3	3	5	10
Tebodin (Vestiging Twente)	20,00%	121	121	127	116	102	113	121
USE system engineering B.V.	100,00%	6	5	4	9	12	15	14

Switch	5,00%	8	8	8	9	9	9	5
BT Computer Service	100,00%	4	5	6	6	6	6	6
Ovsoftware B.v.	10,00%	44	38	58	53	50	71	82
The Backbone B.V.	10,00%	6	8	11	11	11	11	10
Caase	10,00%	25	43	29	30	33	33	21
Groupsecure B.V.	100,00%	0	0	0	0	1	2	3
Security Matters B.V.	100,00%	0	0	0	0	2	2	2
Coblue Cybersecurity BV	100,00%	0	0	0	0	0	0	0
Cigma Automatisering B.V.	100,00%	2	3	3	3	3	3	3
Rineca IT & VOIP	0,00%	0	0	0	0	0	0	0
Echelon BV	100,00%	10	7	9	9	9	9	9
ICS Computers	100,00%	1	1	1	1	1	1	1
DD&H Digital Communication B.V.	100,00%	7	8	9	9	9	9	9
NovaSystems B.V.	100,00%	1	1	1	1	1	1	1
Sigmax ICT Specialisten B.V.	100,00%	9	13	18	18	18	18	18
Quarantainenet B.V.	100,00%	6	7	9	9	9	9	9
Impulse Software	100,00%	7	9	10	10	10	10	10

TNO Informatie- en Communicatie Technologie	100,00%	9	10	10	10	10	10	10
Atricom B.V.	100,00%	1	7	5	5	5	5	5
Virtu Secure Webservices (equinix)	100,00%	12	18	24	30	30	28	27
Novay	20,00%	100	110	105	105	65	65	60
Integrity Technology Solutions	0,00%	0	0	0	0	0	0	0

Concept tp Volume	10,00%	16	15	15	17	18	19	18
Ostendum	100,00%	0	0	0	0	0	0	0
panalytical	10,00%	358	359	354	354	360	435	515
Uniqkey Biometrics	100,00%	2	2	2	2	1	1	0
Forensica	50,00%	0	0	0	0	0	0	0
Prio Bedrijfsrecherche B.V.	100,00%	0	0	0	0	0	0	0
The Investigator	100,00%	0	0	0	0	0	1	1
Paalman/De Roy van Zuydewijn Recherche	100,00%	2	3	2	2	2	2	2
De Hoop Recherche	0,00%	0	0	0	0	1	0	0
Nationaal Forensisch Onderzoeksbureau B.V.	0,00%	0	0	0	0	0	0	0

Stratech opleiding en advies	0,00%	11	12	20	13	16	0	16
Hofman veiligheidsopleidingen	100,00%	0	0	0	0	0	0	1

Saxion(Academies)	5,00%	1111	1183	1256	1256	1256	1256	1256
Universiteit Twente (Academies)	5,00%	2722	2678	2684	2684	2684	2684	2684