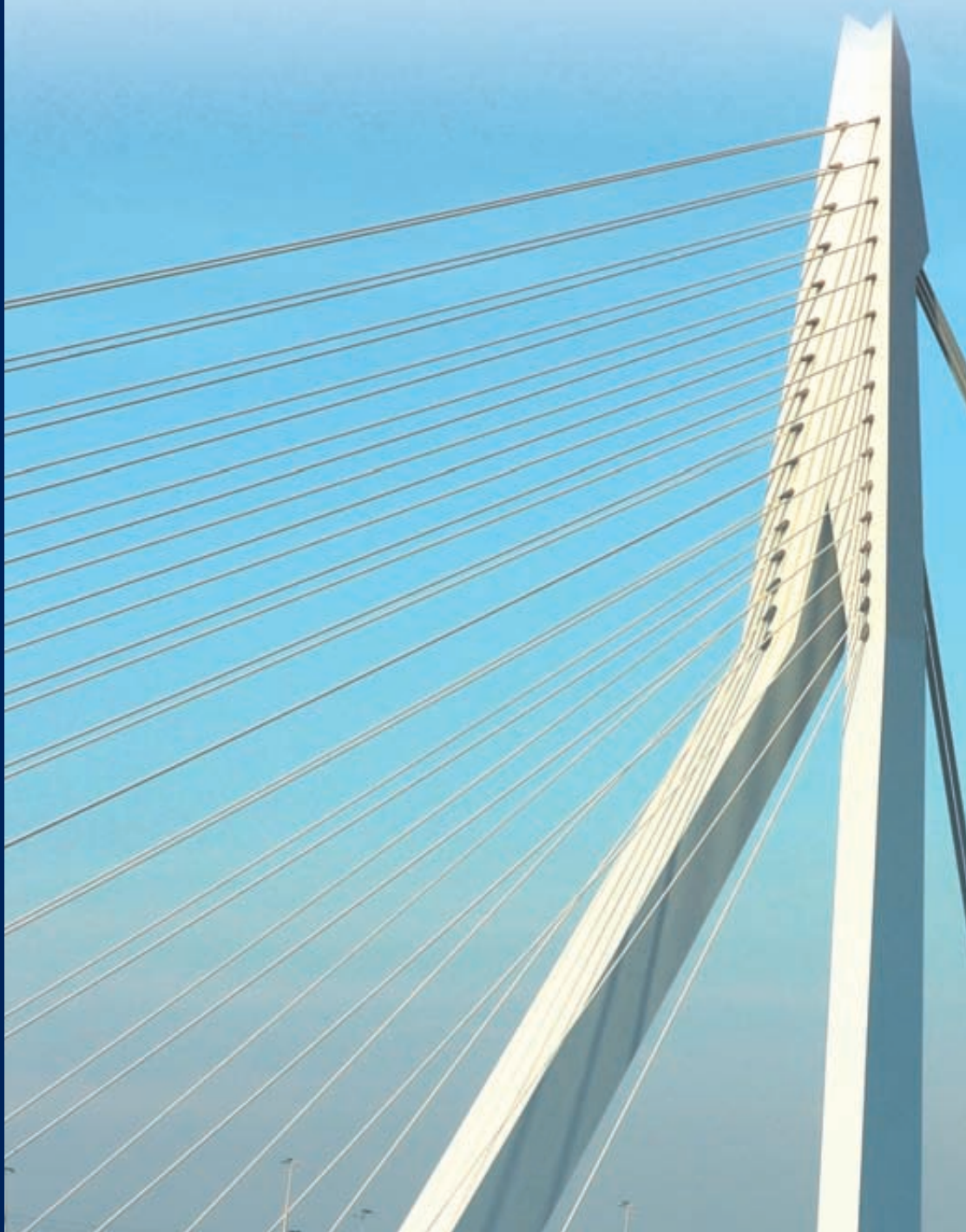
MICHIEL NIJDAM

Leader Firms

The Value of Companies for the Competitiveness of the Rotterdam Seaport Cluster



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De waarde van bedrijven voor de concurrentiekracht van de Rotterdamse havencluster

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Preface

Looking back, it is both a coincidence and at the same time makes perfect sense that this PhD is about the port and maritime industry. My brother and I are named after the famous Dutch naval officers Maarten Tromp and Michiel de Ruyter. My father worked on merchant ships for many years (and is still full of stories about that time) and at the age of six I had the vast ambition to become a boatbuilder. Such ambitions vanish over time and when I had to choose a study my interest in economy led me to the Erasmus University Rotterdam. However, for my specialization the very interesting lectures given by Peter de Langen and Harry Welters were the reason I chose port economics, bringing the maritime world back on my path.

There are two persons who deserve many thanks, because without them I would never have started and finished my PhD. Peter de Langen, for offering me a job at the university ten years ago and being an inspiring colleague for seven years; without his enthusiasm for research and port economics I would probably never have started a PhD thesis, and my promotor, Rob van Tulder, for taking the risk of accepting me as an external PhD candidate, but most of all for his motivating support. Our discussions about my thesis always led to a significant increase in my motivation; his broad view on almost everything was sometimes confusing but always inspiring. His efforts to bring researchers of many kinds together to discuss, learn and enjoy research on the Friday afternoon Researchers sessions have also contributed greatly to my research.

This book is the result of a rather a-typical PhD trajectory. It did not start with a thesis plan, but is rather the logical result of several research projects carried out over the past eight years in the port of Rotterdam and the maritime industry. I'm grateful that many managers from port and maritime companies made time available during these projects and shared their knowledge about the industry with me.

The project that was the starting point for this thesis, leader firms in the Dutch maritime cluster, benefitted greatly from the support of Niko Wijnolst. After some preliminary work and the choice to focus on the role of firms, a discussion with him really was the boost that was needed to get the research going. Niko's willingness to include the research results in the 'Nederland Maritiemland' series of books and the support we received during the research proofed to be highly important for the successful completion of the research.

The second research project that forms an important building block for this thesis, leader firms and innovation, was supported by the Port of Rotterdam Authority, Deltalinqs and the municipality of Rotterdam (OBR). From the Port Authority I especially thank Kees Joosten who kept on stimulating the research on leader firms and who organized several events where my research findings where 'tested' in practice and where I could find new ideas and contacts for further research. This also resulted in the third part of the research, about leader firms and suppliers.

Working on these and other projects over the last years has been a very rewarding job, for a large part because of the people I worked with. Thank you Peter, Larissa, Martijn, Désir, Ariane, Wouter, César and Bart for being excellent port economists and such fun to work with. Also my other colleagues at RHV make working at the university a great job and discussions about research at the lunch table sometimes gave surprising insights and ideas that proved very useful for this thesis. Thanks also go to our director Leo van den Berg, for creating an organization where hard work, fun and academic growth go hand in hand.

Writing a PhD thesis in a situation where it is strictly speaking not part of your job means you have to be flexible and accept that there is often no clear distinction between work and private life. I am lucky that my wife was both very supporting and interested in the content of my research. I even recall going over the planning sitting in the shade of an olive tree on our honeymoon. Mirjam, thank you for all those years of support and for being the best life-partner I could ever wish for.

Also my friends and family indirectly contributed to the process of writing my PhD. Some of them I'd like to thank explicitly. My son Jasper, without knowing it as he is three years old, gives me so much joy that he makes it easy to forget about work when I come home and gives me enough energy to continue work after his bedtime. A PhD takes a bit of stamina, a virtue I certainly learned from my mother with her never ending energy, thank you Nils. I also thank my father Henk, for sharing a practical and historical view on the maritime industry. Finally, I thank my parents-in-law, Flip and Wil, for their continuously expressed interest and trust in the completion of my thesis.

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1 Introduction

The Port of Rotterdam is a large complex of companies active in cargo handling, logistics services, maritime industry, and includes manufacturers that are dependent on deep water access and all companies that supply to these industries. Throughout the development of the Rotterdam port, individual companies have played an important role. The famous 'Havenbaronnen' (Port Barons) of Rotterdam helped built Rotterdam into the largest port in the world. From Anthony van Hoboken, the Rotterdam based largest ship-owner in the Netherlands, at the end of the 18th century and Van Beuningen, Van Ommeren and Verolme at the beginning of the 20th century who built large trading, shipping, shipbuilding and stevedoring companies in Rotterdam. The leading role they had gradually diminished in the 20th century. Nowadays, the competitive field for seaport regions is more complex than ever; the growth of the world economy, globalization of production and the emergence of international investment funds dispersed the economic power over more parties with lesser ties to the local business community. Still the role of individual companies is of great importance for the competitive position of the whole port cluster but this is often overlooked by both policy makers and researchers.

In this thesis the gap in research and policy is filled by an analysis of the value that leading firms have for the competitive power of the Rotterdam port cluster. The leader firms are identified and their role in the port and maritime industry is analyzed. Conclusions are drawn about the value of leader firms in the port cluster and recommendations for business and policymakers are formulated.

1.1 The competitive position of Rotterdam

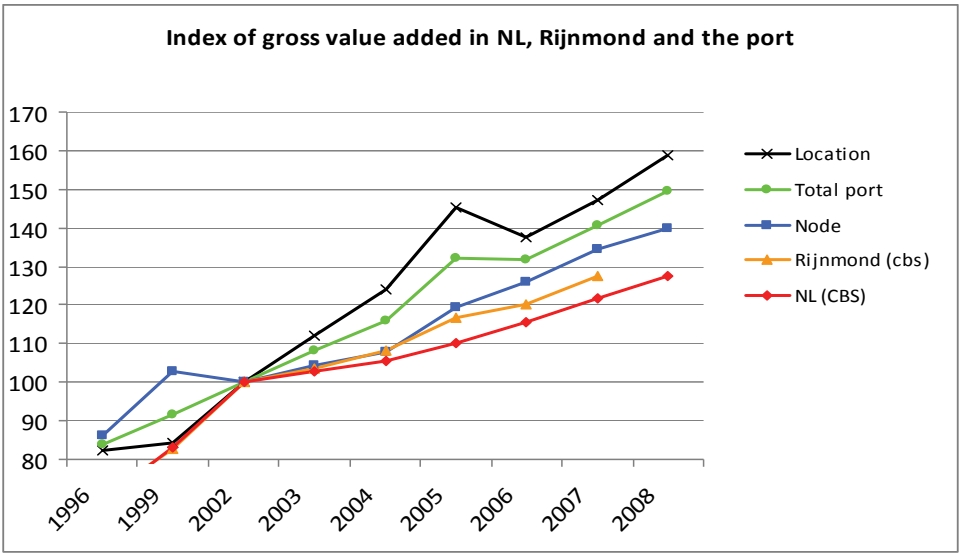
The port of Rotterdam fights competitive battles with other ports, for ships, for cargo and for the location of industries. In the next paragraphs the current economic value and three major problems for the port of Rotterdam are sketched; the declining market share in cargo throughput, the declining role in the maritime industry and the relative low dynamism in port businesses.

Added value in port activities

The value added produced in the port of Rotterdam is a good indicator of the economic development; it shows the value of total production in the port. Since 1996, the value

added produced in Dutch seaports is measured every year separately for the port's nodal functions, such as transport and stevedoring and for the port's location function, such as petro-chemical production and shipbuilding. Figure 1-1 shows an index of the value added for these two functions and for the port as a whole, compared to the development of value added in the Netherlands and the Rijnmond region. This shows that in ten years the value added in the port grew faster than the Dutch and Rijnmond economy. Further, the value added of the location activities -production- developed faster than the nodal -service- activities in the port.

Figure 1-1: Index of value added in the Port of Rotterdam



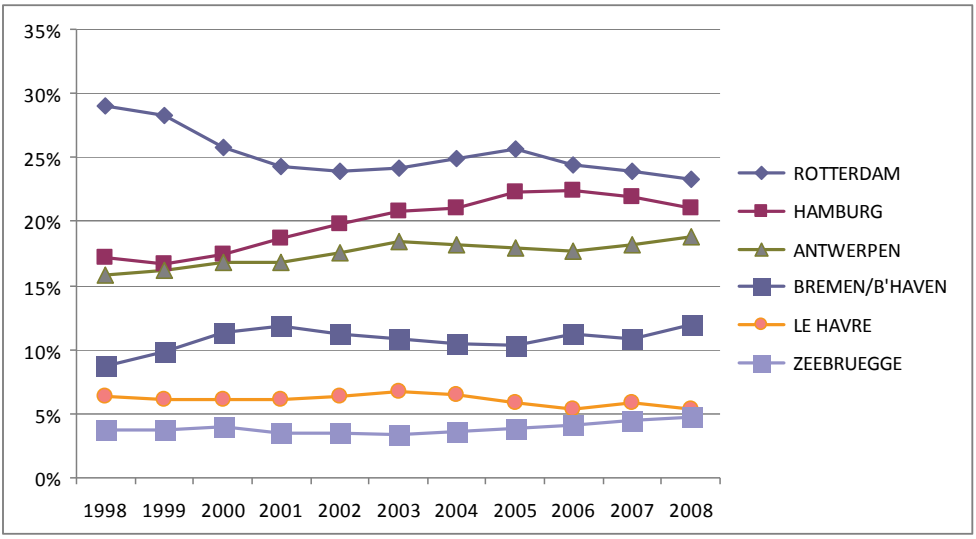
Source: based on: CBS (1996-2008), Ecorys (1996-2002), Rebel (2002-2007), EUR (2008)

Judging from the development in value added the port is outperforming the rest of the economy in productivity. This has both a volume and a value component. The throughput volume increased with 44% from 292M tons to 421M tons, while the value added increased by 78% in the same period. Indicating more value per ton was created in 2008 than in 1996. It also reflects the capital intensive nature of the port industry; in economic boom periods, like 2004-2008, the utilization rate of equipment rises rapidly, leading to a strong increase in added value.

The competitive battle for cargo

From the added value produced one might conclude that the port of Rotterdam is doing extremely well. However, compared to other ports in Europe this is not the case. At the start of the 21st century the port of Rotterdam is not in the favorable position one might expect. Still being the largest port in Europe, but losing business to the two main competitors, Antwerp and Hamburg, quickly. Especially in the booming container market, where total throughput of containers more than doubled between 1998 and 2008, the market share of Rotterdam declined in this period to the benefit of the two most important competitors.

Figure 1-2: Declining market share for Rotterdam

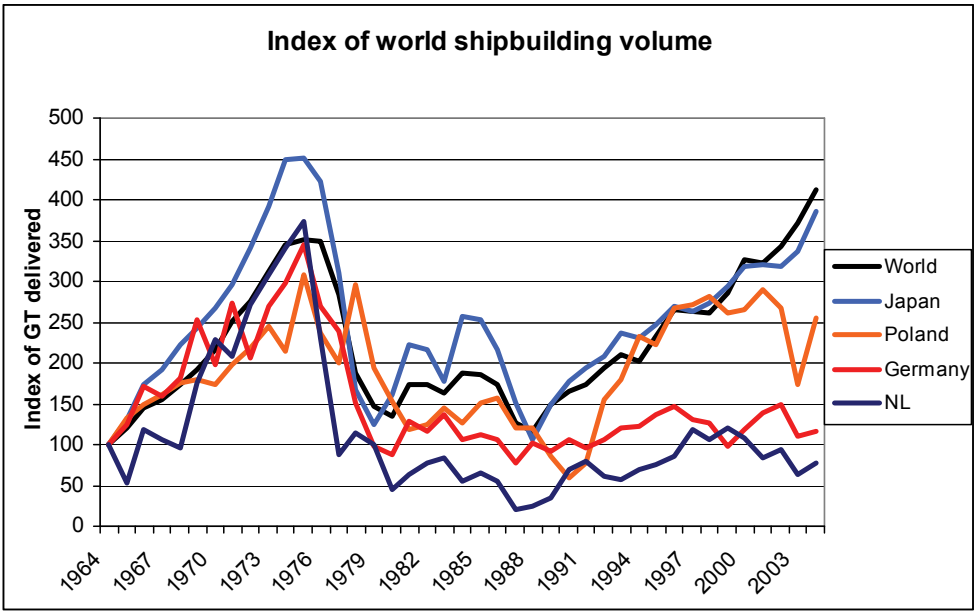


Source: Calculations based on Hafen-Hamburg, World container throughput

Downturn in maritime industry

The industry in the port performed rather well as the increase in value added shows. However, this increase is mainly due to the petrochemical industry and to some extend the food industry in the port. Other industries show a much weaker development; for example the shipbuilding industry. The once substantial shipbuilding and repair industry in the region declined and struggled with competition from other -often low cost- countries. Figure 1-3 illustrates the development of shipbuilding in the Netherlands and selected other countries.

Figure 1-3: Development of shipbuilding in the Netherlands and selected countries



Source: author calculations based on Lloyd's register

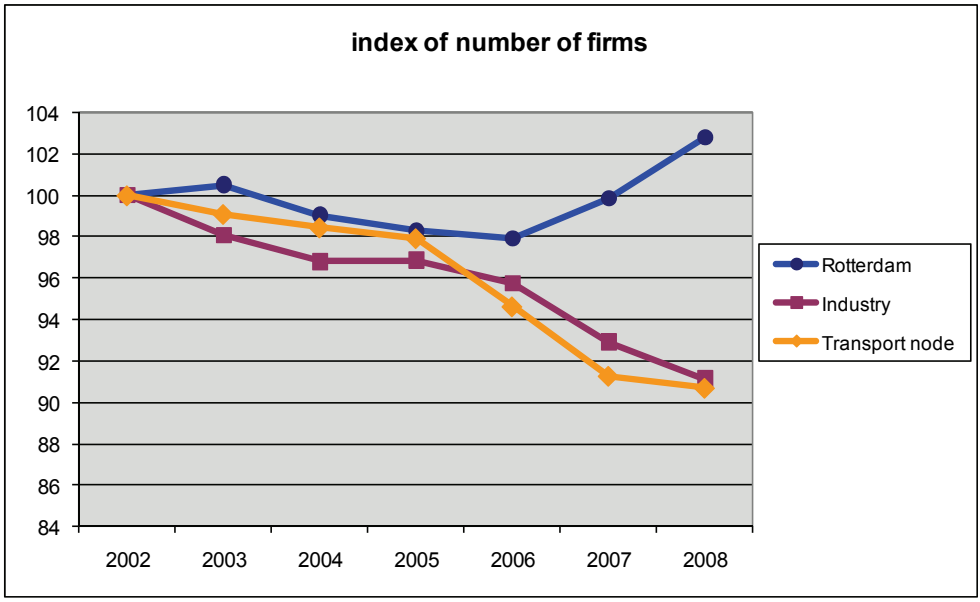
After the collapse in shipbuilding in the second half of the 1970's, The Netherlands never recovered. While for example Japan has always grown at the same pace as total world shipbuilding. Although the fastest growing shipbuilding nations are now low cost countries such as China, the example of Japan shows that it is not only labor costs that count; at least since the 1980's the labor costs in Japan have been on the same level as in the West, and currently are higher than in some western countries. Within Europe, Germany is performing better than the Netherlands and Poland is outperforming the Netherlands substantially.

Lack of entrepreneurial spirit

The dynamic of a cluster is shown by the variation in number of firms. In a thriving cluster the number of startups is relatively high because entrepreneurs like to start their businesses in a place where they can benefit from the fast economic development (Staber, 1996). At the same time the number of firms going bankrupt or leaving the cluster should be relatively limited as a result of the favorable economic conditions in a successful cluster. When taking a closer look at the dynamics of firms located in the Rotterdam port, we see

that the number of port related firms in Rotterdam declined since 2002 but that the overall number of firms grew.

Figure 1-4: Development in the number of firms



Source: calculations based on: COS-Rotterdam, Ecorys (1996-2002), Rebel group/ Buck (2002-2007), EUR (2008)

The Rotterdam port cluster is apparently less dynamic than the rest of Rotterdam's economy. The growing value added in the port is not reflected by a growth in the number of businesses in the port.

1.2 The strengths and weaknesses of Rotterdam

The situation sketched above shows a port that is doing well in some respect; it is growing and responsible for a substantial part of the value added in the region. However, the competing ports, although smaller, seem to outperform Rotterdam in some markets. At the same time the business development in port related industries is not at the level one might expect in a successful cluster. The reasons for this suboptimal performance might be explained by looking at the strengths and weaknesses of the Rotterdam port. Throughout the years several scholars analyzed this for the Port of Rotterdam.

In earlier days the main task of the Rotterdam port was shipping cargo in and out to support mainly the Dutch and German export and imports for industry and consumers. The focus of the port was on the number of ships that could be handled in a year (Backx, 1929). In later stages of development, the cargo that was brought in received more attention, resulting in more cargo related activities in the port, such as blending and trading and some manufacturing. In recent decades the manufacturing task of the port area expanded and today encompasses production of gasoline, plastics, off-shore equipment and foods.

In 1995 Van Klink analyzed the position and the development of the Rotterdam port from a network and a life cycle perspective. His first conclusion is that the development of the port of Rotterdam since 1872 (the opening of the New Waterway) is for a large part fueled by external economic developments. Anticipating action was taken in the development of the chemical production complexes in Botlek and Europoort, which was the first internally organized large scale business development in the port. However in a later stage, in the 70's and 80's the Port of Rotterdam found itself in the position that the development of distribution activities related to the booming container transport were more and more taking place beyond the borders of the port, leading to a "divergence between the administrative scale of the port and the spatial reach of the distribution function resulting in conflicts" [p. 86]. Overall the position of the Port of Rotterdam in 1995 can be summarized as follows. It is an important part of the Dutch economy, but the Rotterdam region has less economic gains from the port; it hardly contributes to the creation of new jobs. Transshipment, port related industry and distribution are sectors under pressure. Positive developments could be seen in transport intermediaries and port related services. The strengths and weaknesses identified by Van Klink (1995) are shown in Table 1-1.

Table 1-1: Strengths and weaknesses of the port of Rotterdam

Strengths	Weaknesses
Maritime accessibility: deep draft, direct sea access	**Land availability**: in and around the port and
Industrial structure: complete petro-chemical complex	**Labor climate**: conflicts, low performance, hindering innovations
Frequency of transport services: maritime and barges connectivity is unmatched by other ports	**Landside access**: road congestion, railway capacity and organization
Reputation and know how: largest port in the world, logistic, trade and transport know-how	**Enforcement of rules**: strict and no room for flexibility, bureaucratic organization
	Quality of life: housing, environment and culture are relatively unappealing

Almost ten years later, in 2004 the Dutch government presented its vision on the development of the Dutch seaports. Included was an analysis of the strengths and weaknesses of the ports. Next to the strengths identified by Van Klink, strengths were found to be the independence of the port authority, the ICT-infrastructure and input-output relations with firms outside the region. Weaknesses identified were inflexibility of labor, high port dues, closeness to densely populated area, road congestion and limited rail links. Apparently, in ten years the port managed to work on two strengths, the IT-infrastructure that was developed mainly by the port authority in the form of a port community system (portinfolink), and the relations with the rest of the economy relative to other seaports.

Jacobs (2007) identified factors, both internal and external to the port, which explained the loss of market share in the container market. A changing organization of international maritime networks, with more ports-of call for every ship, led to a diminishing role of Rotterdam as a hub-port. Internal factors include the monopoly position of the local container terminal operator that was practically enforced by the port authority, poor customs procedures, unrealistic pricing policies and neglect of the customer. Van Klink and De Langen (1999) identified six principles that are leading in decision making in the port of Rotterdam (examples in brackets):

1. Investing in efficiency (automated vehicles)
2. Space as a competitive asset (Maasvlakte expansion)
3. Orientation on stevedoring (2nd Maasvlakte and Betuwe-rail to facilitate throughput)
4. Port as source of regional prosperity (industry and distribution in the port)
5. Reduce labor through mechanization (automated terminals)
6. Stability as a growth condition (ECT in Dutch ownership)

These principles can be categorized as a Fordistic view on port development, with little eye for flexibility and very much geared towards scale economies resulting in a monopolistic structure in many segments. The result of this particular focus is that the port is unable to service its clients that demand a dedicated treatment and flexibility in operations. It also hinders the development of the port by creating a closed business community and reducing labor to a cost-factor instead of an asset necessary for knowledge and development.

De Langen (2004) analyzed the performance of the Rotterdam port cluster and compared it with two other large ports. On the following characteristics -important for the performance of a port cluster- Rotterdam scores significantly worse or better than its competitors.

Table 1-2: Positive and negative characteristics of the Rotterdam port

Significantly worse than competition	Significantly better than competition
The level of land prices and office rents	The diversity of the cluster population
Quality of collective action regimes	The presence of customers and suppliers
Presence of labor force	The presence of knowledge spill-overs

After comparing the Rotterdam port's performance with these strengths and weaknesses, De Langen concludes that the weaknesses mainly had their influence on the total throughput in the port, but that the strengths of the port have led to a relative improvement in the value added per ton in the Rotterdam port cluster compared to its biggest competitor Antwerp. Apparently some change took place in the port decision-making process; the volume orientated principles in the 90's gave some room to the value oriented decisions in the 21st century.

Innovation climate

For any economic development innovation is a necessary condition. Innovation brings new techniques and organization structures that improve the resources to production ratio. An assessment of the innovative power of the Rotterdam port (De Langen, Van Klink and Nijdam, 1999) resulted in the identification of seven obstacles for innovation.

Table 1-3: Obstacles for innovation in the port of Rotterdam

Critical demand of shippers does not reach the port companies
The product portfolio gives insufficient ground for innovation
Access to international knowledge is weakly developed
Little maneuvering space in political and societal arena
Insufficient possibilities for the location of startups
The Rotterdam business culture is very conservative, based on traditions and routines
Firms have little room for experiments to try out new concepts

These seven obstacles link with the weaknesses defined in other research; at the turn of the century there was a need for a more open business structure with room for new activities, new firms and firms that brake with the traditional network structures to increase the awareness of customer demands, improve the knowledge-base and build room for innovation.

In the first years of the 21st century, the innovation climate in the port of Rotterdam seems to have improved since both the Port Authority and the municipality of Rotterdam have put policies in place to facilitate innovation. The corporatization of the port Authority was an important step in that process. It reduced the local focus of the decision makers in the port and gave more freedom to the port to develop its own profile and make decisions about the economic development without strong influence of the city (Jacobs, 2007).

In general, the Rotterdam area and the port are still lagging behind in innovative developments (Nijdam and De Langen, 2006). Private investments in R&D are lower than average for the Netherlands and the number of innovations in the port area is lower than might be expected based on the structure of the port industry. Furthermore the number of patents registered by port related firms in Rotterdam is very low compared to other industries. Of the top 15 patent holders in the Rotterdam area only one firm is port related, ranked number ten.

1.3 Problems and solutions

The sub-optimal performance of the port cluster has not stayed unnoticed, and is widely discussed. In the course of years several business reports and scholars pinpointed specific issues in the port of Rotterdam.

One of the most prominent discussions in the last decade was the choice between volume and value orientation of the port. Klink and De Langen (1999) describe the tension in the port between the volume and value orientation. Traditionally the port was focused on maximizing volume but in the plans in 1999 (Portplan 2010 & National Spatial Economic Policy) the aim was to create more value in the port. According to Van Klink and De Langen the plans presented were far from enough to make a transition towards a value oriented port. Policymakers failed to combine volume and value measures into coherent policy. Most obvious examples of this are seen in the relation between large scale infrastructure and environment. Infrastructure is essential for the volume-model, while 'quality of life' a very relevant factor in the value model.

In this discussion, the business community primarily focused on the infrastructure. According to Mr. Boer, director Uniport container stevedore (1998): "*The competitive position of the Rotterdam port is in danger because of the congested roads, you can build beautiful large scale terminals, but you'll never get the containers passed the bottleneck Rotterdam*[1]". Four years later a joint statement of a yearly round table of executives reads: "*The competitive position of the Rotterdam port is at stake because of the poor infrastructure to the hinterland*" [2]

The volume orientation has been the issue of more discussions, Oosterhaven (1999) for example stated, after researching the intercompany sales in the Netherlands that the linkages between the port and the rest of the economy were overestimated by most policymakers and that the relations did not justify large investments in infrastructure. In reaction on this Bosch en Heldweg (1999) claim that the role of the port is to lower transaction (transportation) costs and that these benefits are not included in an input-output analysis. Moreover they state that the (petro)chemical complex in Rotterdam shows that these linkages are very important for the importing and exporting businesses[3].

[1] *Nieuwsblad transport, 21-11-1998, Uniport investeert ruim vijftig miljoen*

[2] Nieuwsblad transport, *4-10-2002, Conclusies E&Y havenavond*

[3] The fact that Oosterhaven did not include the chemical industry in his definition of the port and Bosch uses this industry as an example of how large the economic effects of a port can be shows that there's not only a problem in answering the question "what is a seaport?" but also shows that the answer can be found by analyzing the economic behavior of individual companies on more levels than only business-transactions.

In the volume-value discussions about the port's future other authors contributed, including Kuipers (2000) who analyzed four alternatives that were proposed to develop the port into a value oriented port: 'selection at the gate', only allowing high value transport through the port; 'Netherlands as orchestrator', controlling logistics without all the cargo movements; 'from mainport to brainport', develop knowledge intensive activities related to the large volume distribution; and 'e-distribution', instead of maximizing the logistic sector aim at maximizing the environmental efficiency of the European distribution function. Kuipers concludes that most alternatives do not recognize the path-dependent development of seaports due to infrastructure investments and a stronger focus should be placed at combining efficient (scale) and intelligent (scope) logistics. In the line of the discussion Kuipers stated: "*levels of service, safety and quality of the port should be maintained, it's not bad to loose the finite label 'big'."* (ESB 87, 4345, p83, 1 Feb. 2002)

Nevertheless, a strong emphasis was placed over the years on the expansion of the port. Hans Smits, Director PoR (2006) "*The port is operating at maximum capacity. It's making the most of the space we have. Only when the large scale expansions of the port are ready, like the EMO coal terminal and the Euromax container terminal, it is possible to grow faster*"[4] and linking it to the competitive position of the port "*If we want to maintain our competitive position, the first ships have to moor at the second Maasvlakte by 2013"*[5]

In the course of years the attention for the role of individual firms in the overall development of the port grew slowly in the business community. Not only having eye for the issues within their company walls, but also looking at the whole cluster. This is illustrated by Jan Westerhout, director ECT (2007) when discussing the issue of congestion, a physical problem, and proposing an organizational solution: "*Every day we run the risk that shipping lines move their business to Antwerp or Hamburg [...] I'm afraid that we will face large scale congestion earlier than everybody now thinks [...] ECT can not solve the problem on its own, nobody can. It would already make a huge difference if we would start to talk with each other instead of about each other, fortunately that is increasingly the case, I have high expectations of it.*"[6]

[4] Nieuwsblad transport, 29 december 2006, Magere groei in overslag Rotterdam

[5] Nieuwsblad transport, *6-09-2006,* Havenbedrijf optimistisch over besluitvorming Maasvlakte 2

[6] Nieuwsblad transport 2007, dossier congestie in de haven

Also, John Verschelden, director of the future APMT-terminal on Maasvlakte II, stresses the importance of business dynamics for the competitive position of the port: *"Rotterdam has excellent accessibility with its 22 meter deep draft, moreover, the port will have two instead of one suppliers of container stevedoring, which will increase service-levels and thus the competitive position of the port."* (NT, 28 August 2009)

The port authority

The port authority is the organization that has the incentive to act on behalf of all port stakeholders. The ultimate goal of the port authority should be maximizing the performance of the whole port cluster (DeLangen, 2004). The issues brought forth by the port authority can thus be interpreted as leading in the development of the port. The annual reports of the port authority give a good reflection of what themes have been centre stage for the port management. Every year in the 'word from the executive directors' the main subjects, developments and plans are discussed. The following table summarizes the themes per year.

Table 1-4: Main issues in the PoR annual reports

YEAR	THEME	EXPLANATION - SPECIFICATION
2000	Human resources in the port	Training and education, attracting new generations to the port
	Land acquisition	Need for more space
2001	Internationalization of port business	Take-overs and investment by international companies in the port
	Hinterland connections	Improvement of rail is necessary
2002	Port restructuring	Port & city relationship, port expansion MV2
	Level playing field	Competition is 'disturbed' by legislation
	Safety and security	As a reaction on terrorist attacks NY
2003	Port expansion	Maasvlakte 2, city-port development
	Change to a public limited company	More decision power for the port authority
2004	Infrastructure development	Seeking innovations in cooperation with universities
	Hinterland connections	Traffic on highway 15
2005	Business investments	Investments are a good indicator of competitiveness
	24-hour economy	Necessary for higher utilization of port infrastructure
2006	Clients	For every decision, value for clients is the leading principle
	Quality of infrastructure	Improving quality is as important as new expansions
2007	Space	Both expansion and intensification of use are important
	Cooperation	It's necessary to look beyond Rotterdam
	Accessibility	Modal shift and location of activities are key in improving accessibility
2008	Space for growth	Restructuring, intensification and new development
	Accessibility	Port is part of supply chain, solutions might lay outside Rotterdam
	Sustainability	License to operate and license to grow

The first hint to the importance of individual companies was made in 2003 when port management stated *"The aim of the port management is to bind companies, cargos and added value to Rotterdam to the greatest extent possible by creating optimal conditions."*

An interesting conclusion from the quotes is that throughout the years executives in the port are concerned about the physical infrastructure and access to the port, no quotes were found linking the competitive position directly with knowledge or broader socio-economic factors. While accessibility is obviously important for any seaport, it is not enough to make the port region a competitive region. For that, also intellectual infrastructure, quality of the environment, international knowledge networks etc. are crucial. A focus on physical infrastructures also means a focus on cargo throughput in the competition with other ports. This might make a port the largest in terms of throughput; it does not mean that it is the most competitive port-cluster, which includes a much wider set of companies and a greater geographical area. A port cluster also competes with locations worldwide for manufacturing and trading companies and with other regions on the continent for logistics. To be competitive on that playing field a more firm-minded strategy is vital. In the port authorities publications a shift can be noticed from 2005 onwards to more attention to the port as a complex, to companies and investments instead of only cargo throughput and to other ways to improve the port than only by expansion.

1.4 Dealing with challenges

The challenges for the port of Rotterdam have been, and still are, numerous. These challenges have not been without response. The Port authority, the municipality of Rotterdam and the national government have tried to mitigate the threats and build on the strengths of the port.

Land and infrastructure

In 1991 the port plan 2010 was presented, showing the ambitions and proposed strategies of the city and the port. In this plan infrastructure was centre stage, the notion that Rotterdam should remain the 'mainport' of Europe was leading. For this ambition more space and infrastructure was said to be needed. Next to infrastructure, the strategy laid out in the portplan 2010 involved the 'capturing of cargo' to increase the value added activities in the port; assembly, manufacturing, storage and distribution were planned to make up a substantial part of the port activities. These activities could bind the cargo flows to the port

because it increases the switching costs for shippers when a switch to another port also means a change in distribution and manufacturing systems.

Both the soft part of the port -knowledge and management- and the hard part – infrastructure- received attention in the plans. The features of the port were developed according to the 'mainport' and 'brainport' strategy. The mainport concept includes a vision on the port as an important element in the national economy.

The brainport concept is about trying to link knowledge intensive activities to the physical activities in the port. In practice this includes an active policy to attract research facilities, headquarters, administrative and call centre functions of port(related) companies and improve the logistics profile of the port, "not only move boxes, but add value to the cargo and control cargo flows from Rotterdam, maybe even without these cargo flows using the port of Rotterdam."

Overall this strategy proved rather difficult, successful examples are Eastman Kodak and Lyondell that respectively moved their call centre and headquarters to Rotterdam. The development of the logistics function has taken place through the construction of distribution centers. The results of the logistics strategy are mixed, there are successful value added operations in the port area, and several logistics companies have some control functions located in Rotterdam. However this strategy also brought problems; locating logistics activities in the port proved to be a strategy increasing congestion on the highway because VAL activities involve the handling cargo that is almost exclusively transported by truck, while containers that stay unopened can easily be shipped by barge or train. The result for the control function in logistics are meager, most logistics headquarters are located in the ports hinterland in Germany. The port did not prove to be the main 'player' in the decision making about cargo flows, nor the ideal location for logistics headquarters.

New policies

The Portvision 2020 (PoR, 2004) and the business plan of the port authority for the years 2006-2010 show some changes compared to the older policies. There is more attention for the role of the port in the logistic network and the focus on only regional economic effects is less profound. This new policy brakes away from the previous policy to develop distribution related activities in the port area related to specific cargo flows, such as fruit and consumer products. In general the port is focusing on two elements. First, the port should be an efficient node in the transport chain. Second, the port should accommodate more knowledge intensive activities. If and how this policy will bring about a more

thriving and innovative port business community remains to be seen. There are many obstacles to overcome, both in the competition with other ports and in creating a more innovative port.

Another recent development at the port authority is the formulation of an R&D agenda in which the broader port cluster is included as the relevant setting. It has the ambitious motto, "together we'll make Rotterdam the smartest port in the world!" This illustrates the shift in approach of the port's management towards the competitiveness of the port. Knowledge gets a far more important place in the strategy and the way to develop knowledge is cooperation between the port authority, knowledge institutions and firms.

1.5 Firms as part of the solution

The situation discussed above -slow development of value added, losing market share in container throughput, declining shipbuilding industry and limited innovations- raise the question, why does the largest port in Europe, with potential enormous cluster benefits, have such troubles to stay competitive in port industries, let alone improve its position?

One possible answer is that there were not enough parties to provide the cluster benefits. Some benefits, such as agglomeration effects (transportation costs) obviously did exist, but the more complex cluster effects were not showing to the extend one might expect (De Langen, 2004). Knowledge spillovers do not emerge out off nothing, it takes a source to provide the knowledge and only then can other companies benefit from being located in the cluster. In other words, a new form of the 'havenbaronnen' might be important in port clusters; *leading companies* that add positive effects to the cluster by doing business in such a way that also the local business community benefits from their presence.

Another issue is the complex governance structure of the port cluster. The port cluster includes several municipalities, so no local government is able to develop policy for the whole port. The port authorities do 'manage' the port area but not the whole cluster; they only have jurisdiction in the area that is directly accessible by water and only have direct relations with the companies that are located on the land that is exploited by the port authority. The lack of a cluster wide organization increases the importance of leading actors that invest in the quality of the cluster governance.

Part I: Theoretical exploration

2 Analytical approach

In economic theory several observations have been made in the business community and many ideas have developed about the structure of economies and the behavior of firms. In this chapter some perspectives are discussed that are relevant for the role of leader firms in the port of Rotterdam.

Economic development is often linked to characteristics of the local business environment. In studies about Industrial Districts, Clusters and Regional Systems of Innovation the physical closeness of companies is one of the core elements of the theory. Studies in these fields show that the closeness brings more knowledge spill-over and more cooperative innovations, resulting in a better position on the international market.

Since the 19th century, economists have studied localization of businesses and found advantages for companies to locate in each other's vicinity (Marshall 1896). In more recent years the clustering of specific sectors has been the object of study and proposed as an explanation of regional economic prosperity (Porter, 1989). More specific studies show that clustering primarily is beneficial for the competitiveness of a region through increased knowledge exchange (Krugman, 1995).

Over the years, many cases of -mostly successful- clusters have been analyzed, ranging from Biotechnology in Boston and ICT in Silicon Valley, to furniture design and production in Italy. Martin and Sunley (2001) noticed that the success of a region is not always rightfully brought in relation with clustering of specific sectors and more specific research on cluster dynamics should give insight in the 'real' contribution of clustering to economic prosperity.

Also seaports have drawn attention as an example of spatial concentration of related business (Fujita and Mori, 1996). The port of Rotterdam is a clear example of such a cluster, with numerous service and production firms centered on cargo handling, shipping and port related production.

The success of the port cluster is for a large part dependent on the governance structure of the cluster (De Langen, 2004). This structure consists of the port authority, (local) government, branch organizations and the individual companies. The role of these individual companies in cluster governance might differ substantially. Some firms invest heavily in the quality of the cluster while others only scarcely contribute to the collective investments. The firms that have an important role in cluster governance are termed *leader firms* by Albino et. al. (1999) and De Langen (2004). The behavior of the individual firms

is thus important for the competitiveness of seaports. However, there is very limited research addressing the role of these individual companies in seaport clusters.

2.1 Port studies

Seaports have drawn attention as an object of study for researchers in economics and management. One of the first studies into the economics of ports is done by Bakx (1929). In his study he emphasized the role of ports in the development of the national economy. From that day many scholars followed resulting nowadays in several bodies of literature.

A recent investigation by Pallis et al. (2009) showed a growing number of publications in port economics and management from several research groups around the world. 395 papers about ports were published in 51 journals between 1997 and 2008, of which 48% was published in the last third of this period. Notable is the relative isolation of both the subjects and the research groups. Cooperation between research groups is limited and researchers often apply their techniques to their 'home case'.

Table 2-1: Number of papers on port studies 1997-2008

Port Studies 1997-2008 Category	Total Number of Papers	2007-2008	2002-2006	1997-2001
1. Terminal studies	40	10	22	8
2. Spatial analysis of seaports	40	11	15	14
3. Ports in transport & supply chains	56	22	20	14
4. Port policy & regulation	67	19	24	24
5. Port planning & development	57	10	24	23
6. Port governance	61	15	23	23
7. Port competition & competitiveness	74	22	43	9
Total	395	109	171	115

Source: Pallis et al 2009

For all seven categories the focus is very much on the transport issues. In none of the categories, the 'port as an economic system' is taken as an important starting point for analysis. This is a striking conclusion in the light of the huge body of literature in regional economics and economic geography on spatial clustering. While the large seaports in the world can be characterized as a complex of companies, governments and other

organizations that interact and are (partly) dependent on each other's performance, a regional economic analysis is seldom used. However some shift can be recognized. Pallis et al. (2009) state that research in ports has gone through a metamorphosis and that multidisciplinary studies have come somewhat to the foreground, regarding the methodology used they conclude: "In many cases, tools of strategic management are deployed to give an extra dimension to port studies (e.g. port clusters, competitive advantage etc.)" (p. 25).

Port-clusters

The conception of the port as a complex of various companies is still only seen in a limited number of studies referring to the cluster theory of Porter (1989) and new economic geography of Krugman (1992). Table 2-2 shows an overview of studies about seaport clusters.

Table 2-2: Studies in maritime journals[7] about (port) clusters (2000-2009)

Content	MEL	MPM	total
'Cluster' in text	25	31	56
'Cluster' and 'port' in text	13	16	31
Port cluster as unit of analysis	1	4	5

The term port cluster has been adopted by some researchers to point out that their study includes more than just cargo handling.

A good example of cluster analysis in ports is from Haezendonck (2000), who used Porter's Diamond to analyze the competitiveness of the Antwerp port cluster. De Langen (2002) analyzed the maritime cluster in the Netherlands and in a later study focused on the governance of seaport clusters (De Langen, 2004a). The most comprehensive study on ports as clusters is in De Langen's (2004) PhD thesis. He defines the port clusters primarily based on activities. All activities that are related to or dependent on deep water access and cargo handling are included in the cluster. The geography of the cluster follows the spread of the activities. This leads to a very broad and large port cluster.

[7] In 1973 the journal 'Maritime Policy & Management' started and was the first journal with a maritime and port focus in applied economics. Today, this journal together with Maritime Economics and Logistics, is still the leading journal in port studies.

Studies that take port clusters a starting point tend to focus on the governance aspect of clusters (De Langen, 2004; Brooks and Pallis, 2008) or are a description of a cluster structure. The role of the individual company is not often addressed. De Langen (2004) found that *leader firms* are important in the cluster governance. Although, in a later publication De Langen (2005) concluded that the lack of leader firms is the main reason for poor performance of the port cluster around New Orleans, he did not research their role or the effects of leader firms in port clusters empirically. To this date no further studies took place into the role of the individual company for the performance of port clusters.

The lack of insight in the role of the individual firm in port studies could be compensated by other studies about clusters that do include the role of the firm. The question is: 'are these cluster and network studies useful in a seaport setting?'.

The widely cited studies by Michael Porter (1990) on clusters identify clusters by starting with export data, when a country has a relatively large export of a certain product, there probably is a successful cluster in that country related to that product. Not surprisingly Porter mainly finds clusters for so-called traded industries (Porter, 2003), industries whit products one can sell anywhere in the world, like software or automobiles. Geography dependent clusters, such as seaports, are not represented in these studies.

In the 'traditional' clusters, Silicon Valley being the prime example, firms emerge or locate because of the knowledge availability and possibilities for creating a local knowledge network. In an infrastructure bound cluster, firms locate because of the geographical situation; the knowledge availability is only a secondary factor. As De Langen (2004) showed, the main cluster issues in seaports are collective action regimes in the field of marketing, port accessibility and the labor market.

Markusen (1996) described different sorts of clusters, based on the business population and the relations between businesses. The clusters are a collection of smaller firms, hub and spoke networks, satellites of foreign companies, or state-controlled centers of economic activities. The port seems to combine elements of all four sorts of clusters, making research into this cluster particularly challenging.

So we can place ports in the cluster literature, but how can we define the role of individual companies in port clusters? There are some bodies of literature identifying the economic[8]

[8] Not including the social role, discussions on corporate social responsibility are not included here.

role of the individual firm in its environment which are explored in the following paragraphs.

Internationalization, ownership and control

Studies focusing on individual port firms and their interaction with the environment often deal with internationalization. In seaports and seaport related industries the growing internationalization and concentration is a reality (Robinson, 2002; Notteboom, 2008). Stevedoring is in almost all segments internationalizing fast. The container terminal operations in the major ports around the world are done by international companies and sometimes conglomerates (Olivier and Slack, 2006). The large companies, such as PSA, Hutchison Whampoa, Ceres, Dubai ports, are still increasing their world network of terminals. Also the shipping lines are increasingly building a worldwide network of terminals, with Maersk as a frontrunner in this division. In other segments, such as liquid and dry bulk, concentration and internationalization is common as well, large operators such as Vopak, Noble, and Odfjell control large parts of the liquid bulk flows in ports all over the world. The dry bulk terminals are often owned by large industrial conglomerates or sometimes investment companies such as HAL-holding that owns majority shares in most large bulk terminals in Western Europe.

For any industry the question "who is the owner and where is he located?" is of importance. For ports this question is even more important. Decisions made by port companies about investments or service levels have a great impact on the rest of the economy. Typically port services are instrumental for the rest of the economy; stevedoring and transport facilitate trade. An efficient port and transport system make both import and export cheaper and local products more competitive on the world market.

In port businesses the emergence of networked companies with rather small subsidiaries is likely. A feature of ports is that it is a geographically bound service. This implies that it cannot be stored or moved, it has to be performed at a certain place at a certain time for a certain client. A stevedoring company thus quickly reaches the limits of its growth; the local market is only as large as the regional demand for transport services. Companies that do want to grow will have to invest in other ports and set up a network of terminals.

The effects of internationalization on regional development is researched for various cases, however the outcomes are inconclusive. In a research on foreign direct investment (FDI) in the UK, Girma et al (2001) find that foreign firms have a higher productivity, leading to a higher GDP, but that there are no intra-industry spillovers associated with FDI. Dimelis

(2002) on the other hand found higher production efficiency in foreign owned firms in Greece and spillovers from foreign minority holdings. Aitken and Harrison (1999) report two effects; foreign participation in firms is positively correlated with productivity in the own company but at the same time reduces the productivity of domestic firms because the market is 'over-contested'. The two effects result in a very small positive net effect of foreign investments. The mixed results from different countries and different industries call for more research in even more industries and countries. This justifies research into the local effects of foreign investment in the port of Rotterdam. The internationalization process and its effects are described for the case of worldwide container terminal operating companies by Olivier and Slack (2006) and Olivier et al. (2007). The effects on the whole port cluster of the two trends are not described yet.

The question that is relevant in the current research is whether the internationalization and concentration of firms is beneficial for seaport-regions? Is there a benefit because international knowledge comes to the port, or is there a drawback because control of the companies is no longer local? These questions remain unanswered in the current body of literature on port economics.

2.2 Exploration of relevant concepts

From the analysis of studies in port economics the conclusion is that the cluster concept is useful for analyzing the role of companies in ports, but that there is a lack of understanding regarding the role of leading firms in port clusters. In this paragraph, an exploration of the leader firm concept is made. The aim is to identify which concepts, theories and research findings are relevant for the study of leader firms in the setting of a port cluster.

Remarks on the theoretical exploration

The aim of this study is to assess the role of individual firms in enhancing cluster performance. This automatically leads to a diverse theory base. The cluster concept is already studied in different schools, ranging from geography to economy. On the role of the individual firm the research base is even more diverse, the role of firms in industries, clusters, networks and buyer-supplier relationships is relevant.

Building on such a multiform set of theories has implications for the research. Different research schools use different assumptions on which they base the theory. Therefore the aim of this chapter is not to develop an overall theory of the leader firm that incorporates

all insights of the relevant schools. Rather it is meant to give an overview of concepts that add to an economist view on the role of firms in clusters.

Exploration of relevant academic fields

The aim is to find which academic fields use the concept of a *leading* firm. This can be leading in many ways, but the central theme should be that a firm has some sort of control or effect -positive and negative- on other firms in its environment.

The first step is to define what being a leader means. Roughly there are two types of leaders that are common in everyday language; one being the leader that points others in a certain direction by giving orders, advice or incentives. The second, is the leader of a race in the sense of doing something first, better or faster. The term *leader firm* has a hierarchical connotation, 'if there is a leader there is also a follower'. In micro economic studies the hierarchical approach is often used to describe the market behavior of firms. In this sense the leader firm is the one setting the example in price or market development which later induces a reaction from the follower firms.

In the search for relevant literature one can expect to find many references to the above mentioned type of leaders. The second type of leader obviously is of less interest for this study, because of its solitary character. Only when this type of leader causes others to 'run faster' it's a leader that is interesting in a regional business setting. Articles are therefore relevant when they focus on companies that are a leader of the first type. Or when they focus on companies that are a leader of the second type in a regional or network setting, thus inducing effects on other companies. The search for relevant articles consists of the following steps:

1. Identifying relevant synonyms for 'leader firm'
2. Finding articles in which these terms are used
3. Judging what type of leader is researched
4. Identifying the environmental setting
5. Identifying the relevant fields of leadership

The synonyms for firm are company and enterprise. These three words are used as a search term. Synonyms for leader are more divers, especially in a business context. Off-course leading firm and lead firm, but there are more terms that are used in a business context. Synonyms for leader firm can be thought of by starting with the nature of these firms. They

are *Central* in a network setting and can function as a *Focal* point for other firms. In a more regional setting they can be the *Core* of an industry or a *Flagship* for that industry.

The search for relevant articles is done by search queries in the full-text databases of peer-reviewed articles that are accessible through the Erasmus University Library. Being the prime library for business literature in the Netherlands, this access point is the most reliable. The terms are searched within the article title, the abstract and full text (if possible).

By analyzing the results of step two the articles are judged on their relevance by reading the abstract. In the abstract some reference has to be made to a regional or network context. This excludes all articles where the leading company is only used to indicate a front runner without paying attention to the effects it has on its environment.

From the identification of the environmental setting we can also identify what kind of literature is relevant for the leader firm concept. It shows in what settings leader firms are mostly identified. This will broaden the exploration to more academic fields, and give a change to do an inside-out and an outside-in analysis of the leader firm concept.

A study of the literature in these academic fields leads to more synonyms for central actors in a regional business setting. Adding these new synonyms to the initial list broadens the search, eventually leading to a complete list of all concepts that are related to leader firms.

The search for articles is done in 7 databases with the following characteristics:

1. Abi/inform global; online database containing more than 1100 peer reviewed business and economy journals.
2. Business source premier; provides full text for more than 7,400 scholarly business journals, including full text for nearly 1,100 peer-reviewed business publications.
3. Emerald; Emerald full text is a collection of over 100 management journals.
4. Jstor; There are forty-six titles in the Business Collection. The collection brings together titles in economics and finance. The database contains articles of 5 years and older
5. Kluwer online; Database including all 650 peer-reviewed publications of Kluwer publishers. Including 120 business and economic journals.
6. Science direct; Database with 1800 journals of Elsevier science, including more than 200 economic and business journals.

7. Swetswise; Database with Swets & Zeitlinger publications. Including 60 peer-reviewed journals on economics.

The tables below show the number of articles found. The first number in every field indicates the number of articles that combines one of the terms referring to a leading company and a regional or network setting. The number between brackets shows the number of hits on the search terms.

Table 2-3: Articles about leading firms

Term	# articles
leader firm	8 (24)
leading firm	12 (263)
Lead Firm	12 (130)
focal firm	16 (136)
flagship firm	4 (4)
nodal firm	0 (0)
central firm	2 (21)
hub firm	3 (8)
core company	8 (32)
key firm	2 (24)

Year	# articles
2009	3
2008	10
2007	7
2006	6
2005	0
2004	4
2003	5
2002	4
2001	3
2000	2
1999	3
1998	2
older	18
Total	**67**

The difference between the two numbers is mostly for two reasons. First, the term is used arbitrarily, only stating that the researched company is important, or the first to do something. It does not research the leading role of the company nor does it give a definition or clear description of a leading company. Almost in all the cases where leading firm was used this was arbitrarily. Second, the terms accidentally match such as when 'central' is the last word of a sentence and 'firm' is the first word of the next.

Furthermore, some terms have specific meanings. The term 'leader firm' is used in Micro-economic research where the term leader firm is used to describe the first company that takes action in a game-theoretic setting - also called a Stackelberg leader. The term focal firm is often used in a context where the focus is on this firm, not because it's the largest, first or best, but simply because it is the object of research. The terms 'central firm', 'nodal firm' and 'hub firm' are solely used in network settings, and are only used by a few authors. The terms 'flagship firm' and 'core company' refer to a regional element and are only used by two authors. The term 'core firm' on the other hand is specifically used in

network settings to identify a central and controlling actor in the network. Overall 'company' is only limitedly used, in almost all research 'firm' is the more common term.

Most articles that do describe a company as leading but do not have a regional or network context are found using the term 'leading firm'. In most cases this was a reference to a large company that was used as a research case. To indicate that the case has some relevance the researched company is called a leading firm in the industry or a country. Often there is no evidence to call this firm a leader. When there is evidence of a leading company it is in most cases the size of the company and in some cases the innovativeness that is shown by the number of new products that are produced. The most notable literature that includes the role of the individual firm is the work on Industrial Districts, Clusters, Networks, Supply Chains and Innovation.

2.3 Industrial districts

The first theories on geographical concentration of economic activities are based on the work of Marshall (1896). Marshall identified concentration of economic activities based on three arguments; the availability of a specialized labor force, the possibility of scale economies in capital and services, and the facilitating of information flows and technology spill-over. This forms the base of most other research on industrial districts. Nowadays the industrial district literature develops a focus on the importance of regions for firm competitiveness and the existence of informal networks that foster trust. In industrial districts the focus is on central firms that have a number of suppliers located around them. The role these central firms have is that of a production chain leader (Lazerson and Lorenzoni, 1999) or 'helper' of the suppliers in internationalization (Albino et al, 1999).

Industrial district characteristics

In industrial district literature the district is often seen as a rather tightly interwoven set of relatively small firms with artisan-like production systems, often with a substantial element of design and therefore not competing with mass-producing companies (See Prior and Sable, 1984; Brusco, 1982).

In the search for business models where regional conditions lead to superior company performance, industrial district scholars identified 'new industrial spaces' (Piore and Sable, 1984). These industrial spaces owe their performance to small, smart businesses that can be innovative due to the regional setting.

A derived concept is the neo-Marshallian node. Amin and Thrift (1992) introduced this concept to describe regionally clustered industries by means of the 'institutional thickness'. A distinct feature of the neo-marshallian nodes, as opposed to industrial districts, is that they are explicitly considered to be part of the global economy. They are nodes in global economic circuits, because they have a unique set of arrangements, conventions and shared rules. With this view Amin and Thrift try to combine globalization, the influence of multinational companies and regional success factors.

Markusen (1996) tried to identify industrial districts in the United States and concluded that no model could describe all the cases. She identified four types of industrial districts: First, Marshallian industrial districts, which are the combination of many small firms enjoying the Marshallian benefits of geographical concentration; second, Hub-and-Spoke districts. These districts are characterized by one or several large companies that are surrounded by suppliers, leading to a more outward orientated district. The third is the satellite platform district. Here the business structure is dominated by large, externally owned companies. The headquarters of these companies are located outside the district, causing less commitment and interaction in the district. And, finally there is the state-anchored industrial district that is centered on governmental institutes, such as military bases or in national capitals.

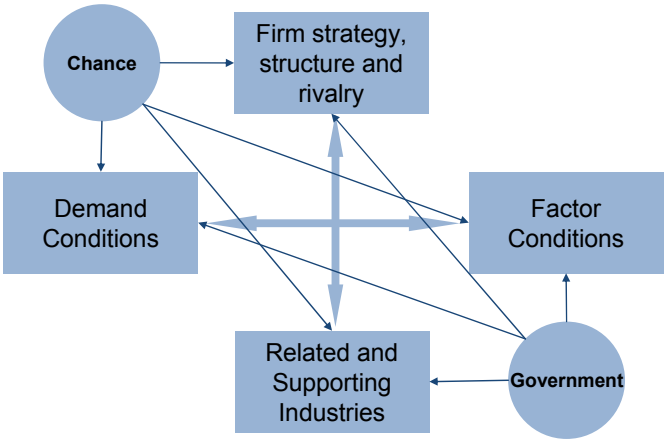
Lazerson and Lorenzoni (1999) also add ideas to the traditional view on industrial districts. They identify four 'misconceptions'. First, industrial districts are mostly seen as the result of endogenous factors that lead to a path-dependent development of the district. The external influences on a districts development is neglected in most cases while these might be the most important forces that determine a firm's success and failure. Second, industrial districts are often interpreted as a set of small firms that together compete with one or more larger firms. Instead of this view, Lazerson and Lorenzoni state that most districts benefit from the presence of a large firm through the transfer of knowledge, subcontracting and company spin-offs. Third, industrial districts do not consist of a homogenous set of firms. Rather, most firms have specific structures that are not easily transformed. Fourth, the role of development agents is widely overestimated. The focus on local municipalities and other public agencies as the force behind economic development has diminished the attention for the role of the entrepreneur.

2.4 Clusters

In recent years the cluster concept has gained enormous popularity as a tool for analyzing the role of location in the economy and for explaining regional economic success. The cluster concept is often used by scholars, managers and policy makers alike. However, the concept is not always clearly defined and interpreted in different ways.

The popularity of the cluster concept is for a great part due to the work of Porter. In his *Competitive advantage of nations* (1990) he gives a model for analyzing a country's economy. With this model he argues that the economic success of a nation can be measured by the export of the firms in that nation. How successful these companies are depends on four sets of factors: firm strategy, structure and rivalry; input factor conditions; demand conditions; and supporting and related industries.

Figure 2-1: Porters diamond



The productivity of firms is considered dependant on the quality of these four factors. Because these factors are for the greater part based on interaction, the level of interaction explains the success of the concerning firms. The rationale behind clustering is that interaction is enhanced when firms are geographically concentrated, or clustered.

The diamond model of Porter has some clear links with the Industrial District concept and is based on the external factors that Marshall identified as reasons for firms to concentrate geographically. The factors that Porter adds are mostly related to interaction in the business environment other than competitive behavior of companies. By doing this, he adds insights from other scholars, and takes another viewpoint than in his earlier work on competition: a shift from a static to a dynamic view on competition.

Static and dynamic competition

The development of the cluster model by Porter shows a shift from a focus on static to dynamic competition. In previous work, the main concept was competitive advantage of the firm. This competitive advantage should be developed, nurtured and protected against other parties and external influences. In the cluster model, Porter introduces several concepts that promote a more open way of looking at development. This is in line with the Schumpeterian view on economics where development is seen as the result of innovative behavior of firms.

More specific, Porter discusses the benefits of relations with customers, suppliers and competitors. These relationships lead to new insights and the development of new products and markets. In all economic cluster literature these elements are discussed and often seen as the source of success. Mostly, the positive effects of relationships are considered to be more widely present when the actors involved are geographically concentrated. Table 2-4 shows the most important elements of static and dynamic competition.

Table 2-4: Static and dynamic competition

	Static	**Dynamic**
Customers	Have expensive wishes and demand low prices	Force innovations and show future developments
Suppliers	Try to raise profits at the expense of their costumers	Are a source of new ideas and possible partners in development
Competitors	Reduce profit and should be avoided	Are a stimulus for renewal

Types of clusters

Porter defines clusters as ”Geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate” (porter, 1998, p.197)

This definition does not give a clear answer to questions where the boundaries of the cluster lie, economically, functionally and geographically. A definition of clusters is given by several other authors. All have the same basic factors: geographical proximity and relatedness of firms and other organizations. These definitions lead to the identification of a variety of clusters, ranging from a cluster in one city, to a cluster comprising a whole country. What is lacking is some sort of indication of what kind of mass a set of companies should have to be called a cluster.

In many cases the proposition is that related companies are significantly more concentrated in a certain region than in higher-order geographical levels. For example: to identify a cluster in Miami, there should be a greater concentration of a certain activity in that city than in Florida. To identify a cluster in the Netherlands, there should be a significantly greater concentration of that activity than average in Europe.

Gordon and McCann (2004) distinguish three cluster models; pure agglomeration economies model, industrial complex model and the social network model. The agglomeration economies model is a cluster based on the triad of Marshall's economic location factors. In the industrial complex model a cluster is a group of companies that is located relatively close together for minimizing transaction costs. In this way, clusters are a geographical expression of regional input-output models. The Social network model views clusters as the result of personal relations in a strong local network were trust and 'routine practice' are the central forces. According to Gordon and McCann every cluster has a dominant structure which should be identified before conclusions can be drawn about the performance of a cluster. There is however, no indication how a cluster should be assessed and the authors state that most clusters contain elements of all three types.

One of the few studies on the development of clusters is conducted by Pouder and St. John (1996). They constructed a model that explains the development of firms that are clustered and firms that are not clustered. They argue that the same mechanism that drives firms together eventually makes clusters to 'blind spots' where the focus of firms is limited to the cluster itself. Initially clustered firms show a high degree of innovativeness, but over time these firms get constraint by the ruling views, opinions and routines in the cluster. Non-clustered firms are expected to be more flexible in adopting to change. The arguments are very similar to those used by Whitford (2001) in analyzing the 'over-embededness' over certain firms in industrial districts.

Cluster analysis

There is a very wide range of approaches in analyzing clusters, all different in the scale that is used, the number of activities that are included and the economic and geographical borders. Martin and Sunley (2002) argue that the way most scholars look at clusters is too limited. They found that most cluster research starts with identifying a cluster and then analyzing that cluster separate from the relevant business environment. Nevertheless, the concept is still widely used.

Martin and Sunley (2002) give three explanations for the success of Porter's cluster concept. First they state that Porters focus on competitiveness is more appealing to most of the audience than the more theoretical focus of other scholars. Second, the aim of Porters work is to form a bridge between theory and practice, which makes it more usable for policymakers. Third, the generic character of Porters cluster concept allows it to be used on almost all economic grouping and specializations.

2.5 Networks

Network is the broad term with which many economist and business scholars describe the (mainly) commercial relations a firms has. The bottom line in much research on networks is that companies can be more competitive when they arrange their network well (McEvily and Zaheer 1999). Combining the resources and expertise of different companies in the network leads to more renewal and innovation (Haakanson 1993).

The difference between networks and the other two concepts -clusters and industrial districts- is that there is no geographical component in the network concept. Another difference is that networks are constructed by a company. Every company can choose whether it wants to be part of a certain network and if it wants to expand the relationships. The way a firm fits in its environment and how it manages its partners in the network are considered important factors for success. (Commandeur, 1994)

Networks are 'systems' with relatively tight relationships with often a specific goal attached to these relationships. Goals such as knowledge exchange, product development and marketing are common in most networks. Network relations can be vertical (supplier and customer) as well as horizontally (branch members). In the first situation the aim of the network partners is often coordination of production. In the second case the common goal is most likely joint marketing or product development. Besides the interfirm networks, many other organizations can be part of a network, such as governments, trade organizations, and knowledge institutions.

According to most economic studies a company chooses consciously to be a member of a network. Williamson (1975) distinguishes several factors that make a firm decide whether or not to be part of a network. Williamson states that networks are the intermediate form of organization between markets and hierarchies. He thereby reduces a network to the result of a make-or-buy decision by a company. The most essential factor, according to Wiliamson, is the transaction costs. The higher the transaction costs, the more likely it is

that a firm will 'make' instead of 'buy'. These transaction costs are dependent on the characteristics of the transaction, mainly the de frequency of the transaction and the specificity of the assets that are involved.

Network relations

Beije, Groenewegen and Nuys (1993) expand Williams' analysis. They identify four factors that describe the firmness of a network, assuming that a firmer network has more characteristics of a hierarchy and a loose network is more like a market. The factors are: the nature of the transactions, the direction of coordination, the stability of the relations and the rules of the network.

The nature of the transaction shows the importance this transaction has for the firms involved. A transaction related to vital R&D, production or distribution leads to a closer relationship. As opposed to Williamson where the specificity of the assets is a central element, here the specificity of the relationship is the discriminating factor.

The direction of coordination determines to what extend power is an issue in the relationship. When there is a vertical relationship (buyer-supplier) it is likely that there is a balance of power with resemblance of a hierarchy. In a horizontal relationship, the power is presumably more evenly balanced.

The stability of the relationships gives a dynamic view on the network. When relationships in the network change often, there are probably too little structural reasons to maintain the network. The whole network is more likely to resemble a market like structure.

The rules of the network refer to the formal and informal rules that influence the firmness of a network. Contracts that have been made in the past can keep relations intact while there is no economic reason for this relationship anymore. Informal rules, such as loyalty can make a network firmer than could be expected on basis of the structure.

2.6 National and regional systems of innovation

In the long run innovation is the main driver of economic growth. A country that inhabits several strong clusters will thus show a stronger economic growth than other countries (Porter, 1990). This explains the prominent position of innovation as a theme in research on clusters, regions and industrial districts. A school of research that explicitly combines innovation with a regional component is the 'National systems of innovation' (see:

Lundvall, 1992; Nelson, 1993; Edquist, 1997, 2005) and 'Regional systems of innovation' school (see: Cooke et al., 1998)

Regional systems of innovation are defined by Evangelista et al. (2002, p 174) as: "A localized network of actors and institutions in the public and private sectors whose activities and interactions generate, import, modify and diffuse new technologies.".

Next to individual expenses of companies, especially the cooperation between firms and knowledge institutes is of importance. RSI's can be described according to the following characteristics (Iammarino, 2004; Howells, 1999)

- *Internal organization of companies,* to what extend are they aimed at creating and processing knowledge.
- *Relation between companies,* more divers and more intense relationships bring more possibilities for innovation.
- *Role of the public sector,* the commitment of the public sector and the degree to which formal policies and informal conventions between companies converge.
- *Institutional setting of the financial sector,* the availability en accessibility of local financial means.
- *R&D intensity and organization,* the extent to which R&D is coordinated in the region.
- *Regional institutions for coordination and control,* the administrative, legal and fiscal frame of the region.
- *Structure of the industry,* the level of competition, size of companies and willingness to cooperate are important factors.
- *Spatial structure,* the closeness of buyers, suppliers and the existence of sub-clusters.
- *Openness for the international economy,* can companies make efficient use of external resources.

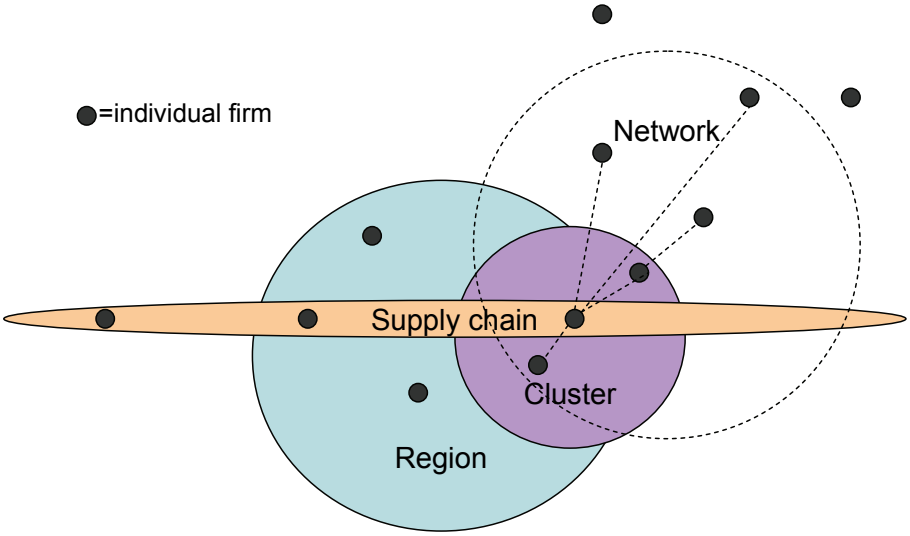
Within RSI's sometimes central players are recognized that have a frontrunner role in creating innovations. Based on a study of 5000 firms in the UK Geroski et al. (1997) conclude that only a few companies are truly innovative, but they also found that these companies continuously are the innovators. For a period of 40 years there was virtually no change in the innovation patterns, new products were developed by the same companies that had a leading position for the whole period. However, the characteristics, linkages and the reasons for the lasting innovative behavior are not analyzed.

The leader firms in a regional innovation system seem crucial for the quality of the system. Therefore it can be argued that mainly in the field of innovation, it is of importance to know who the leader firms are and identify their local links for innovation. In this light it is somewhat surprising that the body of literature on RSI's pays relatively little attention to the role and behavior of these leader firms. Leaving the firms out of the equation leads to a strong emphasis on the institutional variables, such as financial markets and regional institutions. Lundvall, as one of the founders of the NSI school of thought, in a later publication (2007) recognizes that the core of innovation lies with the firms. However, this notion is not always followed by other researchers and policy makers.

2.7 Inter-firm relations in different settings

Within networks, clusters and industrial districts several inter-firm relations exists. The common denominator in all three fields is the structured relations between several parties who are somehow dependent on each other. The differences between the three fields are mainly in the geographical scale and the nature of the relations, as shown in Table 2-5. The difference between networks on the one hand and clusters and industrial districts on the other is the absence of geographical concentration in networks. This makes networks and cluster complementary concepts. Industrial districts and clusters are more similar; they both emphasize the geographical concentration of activities. The difference here is more in the nuances. In most cases clusters are more broadly defined and constructed around an activity or common technology. Industrial districts are used when there are (very) local concentrations of firms that are involved in making the same product. In most cases the relationships within industrial districts are described as 'closer' than in cluster. The relation between the regional concepts of cluster/industrial districts, networks and the more production related concept of supply chains is shown in Figure 2-2

Figure 2-2: Relation between clusters, networks and supply chains



The borders of a region are defined by governmental jurisdiction, physical structure and broad economic relations. Clusters are a set of companies, organizations and institutes that are centered on a specialization –such as the port cluster- in a geographical area. A region can contain multiple clusters and a cluster can overlap more than one region, but will not encompass all companies in a region. Supply chains are formed by companies that are part of one production chain. The companies can be located all over the world and are linked in a linear way by contracts. Networks are looser forms of organization between companies, often driven by a common goal such as knowledge development companies team up in a network. Relations can be formal and informal and span the globe.

The following table summarizes the characteristics of the different setting in terms of the relations between companies, the physical distance and the organizational distance in each setting. The organizational distance refers to what extent organizations have the same goals, nature and preferences.

Table 2-5: Differences in geography and relations between clusters, networks and industrial districts

	Geographical Size (aprox.)	Population size	Relations	Physical distance	Organizational distance
Region	< 100 KM	Large	Mostly informal or non-existent	Close	Close – great distance
Industrial District	< 50 KM	Small	Mostly chosen	Close	Close
Cluster	< 100 KM	Medium	Formal and informal, latent relations	Close	Close - medium distance
Supply chain	Worldwide	Small	Chosen – formal	Divers	Close
Network	Worldwide	Small	Chosen- formal and informal	Divers	Close

2.8 Research outline; the individual firm as missing link

The literature on ports focuses on efficiency studies, the stevedoring function and policy matters. The port as an economic entity is far less studied. There are some academic fields where valuable insights for the analysis of the role of individual companies for competitive advantage of seaport-clusters can be found.

The literature on clusters is focused on exporting industries that are strongly knowledge driven. Clusters are seldom identified based on physical location factors, such as infrastructure, but mostly on 'soft' factors, such as knowledge. From the cluster literature the value of proximity and cluster governance issues can be used in the analysis of seaports.

The industrial districts literature deals with production chains, more than service industries. The role of the individual firm is recognized in these studies providing some starting points for an analysis of firms in ports, mainly in the coordination of production and knowledge development in the local business network.

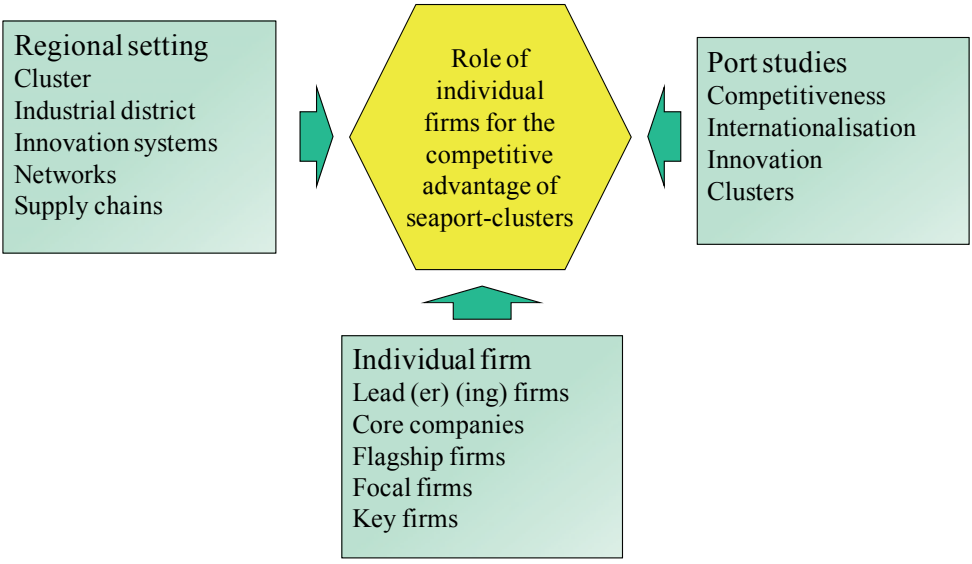
The network literature analyses knowledge creation in networks, and addresses the role of the individual firm in this process. The networks are however not localized and often have a single purpose character such as market entry or product development. From the network

literature, mainly the business to business relations is a topic to incorporate in the study of leader firms in seaports.

The literature on regional systems of innovation focuses primarily on the institutional setting and structure of the industry, and seldom includes the role of a leading company in the equation. However, from this research field the notion of a geographical component to innovation is of importance to the present study.

None of the fields, accept the cluster concept, have been used to analyze seaports, and never has the role of the individual firm in the development of seaport cluster received attention of scholars. Figure 2-3 shows why the individual firm is a useful angle to analyze seaport cluster.

Figure 2-3: The missing link in seaport research: the individual firm



Research goal and questions

The goals of the research are as follows:

- Categorization of firms in the Port of Rotterdam regarding leader firm behavior
- Develop insight in the practices and motives of leader firms
- Identify important conditions for leader firm behavior in port industries

The research addresses the following research questions:

Theoretical questions

1. Which theoretical concepts can help to understand the role of individual firms in developing localized sectors such as seaports and seaport related industries?
2. In what ways can individual firms help the development of clusters?

The answer to this question is worked out in chapter 3 where the relevant academic fields are discussed that provide insights into the role of individual companies in their business context.

Empirical questions

3. What kind of leading behavior can be expected from port and maritime firms?
4. What is the contribution of individual firms in the Rotterdam port region to the economic development of the port cluster?
5. How developed is the local business and innovation network of the leader firms in the port of Rotterdam and how are core companies and suppliers connected?

In part II and III of this thesis these empirical questions are answered by selecting and analyzing leader firms in the Dutch maritime industry and the port of Rotterdam. Particular attention is paid to innovation and buyer-supplier relations.

Analytical question

6. What characteristics make a leader firm successful?
7. What can leader firms, government and the port authority do to improve the competitive power of the port cluster?

Part IV provides answers to these, more analytical questions. An analysis is made of the relation between firm characteristics and leader firm behavior as an outcome of these characteristics.

Relevance

Companies in the Rotterdam Port Cluster can use this knowledge to develop their relationships and possibly improve efficiency and create opportunities for innovation. Furthermore, the examples of leader firm initiatives can inspire other companies to develop a strategy that includes leader firm behavior.

For economists and policy makers the study gives insight in the structure of production and innovation between leader firms and other companies in the Port of Rotterdam. This will

enhance the possibilities for tailor made policies aimed at improving the innovativeness of the cluster.

Methodology

The divers and complex nature of the study -with multiple research subjects, a continuous changing context, multiple research levels and wide variety of academic concepts- demands a combination of research methodologies. Every method is discussed in detail in the relevant chapters. In short, the used methods are shown in Table 2-6.

Table 2-6: Methods used

Research part	**Method**	**Means**	**sources**
Literature review	Systematic categorization	Journal databases	Academic journals
Leader firm selection	Database analysis	Expert Interviews / database software	Business databases / national statistics
Ownership structure	Database analysis	Database software	Ownership database (BvDijk)
Identifying leader firm behavior	Case study of individual firms	Manager interviews	Secondary sources / newspapers
Analyzing the effect of leader firm behavior	Qualitative Comparative Analysis	Manager interviews / QCA software	Business databases /secondary sources

The use of multiple methods in the research ensures the construct- and the internal validity of the research. The leader firm selection process includes both expert interviews and data analysis that are based on a theoretical framework and increases the construct validity; it measures what we want to measure.

The study of the leader firms is carried out with the use of several techniques. The variables that can be expressed quantitative are collected through databases and the more qualitative variables are collected by interviews and secondary sources. Testing of the variables is done with a technique that makes it possible to combine quantitative and qualitative variables increasing the internal validity of the study.

The limitations of this research are mainly found in the delimitation of the research area, a specific industry in one country/region and in the methodology used. Both limitations decrease the generalization of the research results. The findings are in many cases context

dependent, one cannot be sure whether an individual company would act in the same way in a different cluster. The limited number of leader firms that are present in the port of Rotterdam, and probably in any cluster, limit the possibilities to make comparisons with very strong conclusions. Unfortunately there is no way two mitigate these limitations other than extend the research to a multitude of port and maritime clusters.

3 Concepts of leading firms

The previously discussed literature on cluster, industrial districts and networks focuses on the meso level. A group of companies is taken as a starting point and the analysis includes the effects a company experiences as a result of being part of the group. That body of literature does not include the question "where do these effects stem from?" It seems that the assumption is that these effects are just there or at least a logical consequence of interaction between firms. In the study at hand the focus is on the origins of the cluster- and agglomeration effects. Partly, effects may occur naturally when two or more companies work together or are locate in each other's vicinity; however the magnitude of the effects is largely a result of the actions of individual companies. For example, there is a great difference in effects when companies have policies to keep knowledge and development in-house compared to companies that try to innovate in joint-ventures or even broader networks.

This chapter discusses the role of the individual firm in creating externalities with benefits to other members of the group and has a leading role in the cluster, district or network. In the following paragraphs the different kinds of leading firms are discussed. Attention is paid to the academic field in which the concept is used and what sorts of issues are associated with leader firms.

3.1 Industrial district school

The term leader firm is often used in the literature on industrial districts and is the only body of literature where the term is used literally. Many scholars use the concept of Industrial Districts to explain the clustered industries in a country (Markusen 1996, Godon and McCann 2000). A large part of these studies concern Italy and focus mostly on textile or furniture industries. In these studies often reference is made to one central firm in the districts that has a leading role in the development of the district, and is the focal point for all the small and medium sized suppliers in the district.

Albino et al (1999) use the term leader firm for the central company in an industrial district and particularly focus on the role the leader firm has in *knowledge dispersion*. They define a leader firm as a company that '[…] considers local factors as strategic resources in the global competition and tends to reinforce the local inter-firm relationships, in particular

along the supply chain.' (p.57) In this perspective, the two most important functions of a leader firm are *management of inter-firm relationships* and *enhancing the knowledge transfers* in the district to make better use of the local factors and actors. In the discussion about the sharing of knowledge, Nonaka's (1991) argument that the level of codification of knowledge determines how easy knowledge can be shared plays in important role. Albino continues this reasoning by adding that a leader firm wants to make its knowledge transferable but does not want its competitors to benefit from this. As a result a leader firm might reduce the number of suppliers to enhance its control over the knowledge transfers. Based on the number of possible knowledge transfer channels and the speed of this transfers three types of leader firms are identified.

The district firm, which is a central firm in a district with many information connections due to specialization and socialization, which are based on tacit knowledge and thus have a low transfer speed. *The high hierarchy firm*, in a district with a high speed of the knowledge transfer, this firm develops dedicated supplier relationships to limit the number of knowledge transfer channels. *The virtual firm* does not limit the transfer channels but controls, through market mechanisms, a large set of specialized production companies and is the interface with the final market.

Albino et al. (1999) also stress the importance of a leader firm for the international development of suppliers and customers in the cluster. Leader firms can be enablers for the *internationalization* of other firms in the clusters. On the basis of 'many cases', they argue that 'leader firm internationalization can be considered the main impulse for district internationalization' (p57). The internationalization of leader firms enables other firms in the cluster to internationalize, because leader firms act as 'launching customers' for the internationalization of their suppliers. The development of small firms is also found to be dependent on a larger firm with strong co-ordination skills by Kaufmann (1995) and Lazerson (1999).

Following the notion that several Industrial Districts in Italy are evolving in different ways, Carbonara (2002a) researched '[...] the increasingly important role of large firms with a leader position within the ID and the development of more structured and formalized inter-firm networks' (p230). Leader firms are defined as firms that have a *dominant position* in the competitive scenario, *adopt original strategic behavior*, and have developed a range of *superior competences*. Furthermore they have greater *contractual power* due to their *economic condition*, *technology, expertise and trust relationships*.

Carbonara distinguishes between leader firms that focus on internal growth and those who focus on external growth. Internal growth leads to vertical integration of the firm and results in more formal relations in the district, based on contracts. Leader firms that are focused on external growth lead to an expansion of relationships and growing dependence of suppliers, resulting in a wide network based on trust and accepted authority of the leader firm. Four cases of industrial districts in the Italian furniture industry illustrate that in both internal and external growth situations the result is that the leader firm is presuming a more dominant role in the district. In further studies (Carbonara et al, 2002b) leader firms are found to develop production activities beyond the national level and give guidelines on purchasing, manufacturing processes and production planning to other companies in the district. Finally, the leader firms appear to codify their knowledge, in particular their technical knowledge, to a great extent for education purposes.

In another case study, Carbonara (2004) tested whether there are different learning mechanisms in three different types of industrial districts, one of them being a district with a leader firm, or meta-manager, that coordinates inter-organizational and innovation processes. Leader firms, in this context are defined as 'business units with a leader position in their markets as well as in the cluster in which they are located.' (p 21). The leader firms appeared to develop more structured relationships over time with a high degree of dependency, because the leader firm gains control over resources, activities and flows in its network of subcontractors. Also they increase the sophistication of knowledge in the production process -including suppliers- by investing in R&D, the acquisition of knowledge and participating in international informal networks.

Across all studies Carbonara continues to define a leader firm as a central company with strong control over other companies in the industrial district, especially the suppliers. The industrial districts that are analyzed often comprise more than one leader firm. Consequently the districts are viewed as a collection of supply chains, each of which is controlled by one leader firm. The limitation of this view is that it excludes the possibility of suppliers having a central position in a district by being an important player in several supply chains. This makes the theoretical insights from the studies only partly applicable to other districts or cluster than the traditional Italian districts that mostly involve craftsman-like consumer products.

Lazerson and Lorenzoni (1999) use key firms as an analytic method to explain the formation and evolution of industrial districts. Lazerson and Lorenzoni argue that the rather static view on industrial districts does not explain why some districts prosper while

others decline. They state that a focal firm in a district is decisive in developing new technologies, organizational skills and markets. These focal firms are "Firms that occupy strategically central positions because of the greater number and intensity of relations that they have with both customers and suppliers" (Lazerson and Lorenzoni, 1999, pp 362). The most prominent outcome of this position is the role these focal firms play in *innovation.* Key firms frequently *organize production among groups of smaller firms*, *introduce technological innovations* and *expand existing markets*.

Boari (2001) uses the term focal firm to describe the function of a leading firm in industrial districts. These companies help the district 'grow and diversify through technological and managerial spillover effects, the provision of purchase orders, and sometimes through financial links.' (Boari 2001, p. 1)

In a longitudinal study on Italian eyewear industry Camuffo (2003) researched the development of the district. This study demonstrates that locally embedded networks of small firms no longer represent an organizational structure as stable as in the past. Under influence of globalization a configuration characterized by the presence of leading firms and moderate hierarchy developed. The inability among the small businesses to develop new, common, innovation- and global market strategies led to the emergence of four larger companies in the district that vertically integrated. The fear of these firms integrating at the expense of the richness of the district did not prove just. Instead of the development of a 'fordistic' business model, the new leading firms set up a more complex business structure but at the same time maintained "the value system, cultural identity and entrepreneurial management style." (p.398)

3.2 Network school

Studies on economic networks contribute to the comprehension of the characteristics of leader firms. The terms *nodal firm*, *focal firm* and *hub firm* are often used in network analysis. Here the focal firm is the central firm in an industry network that is the main object of research. In most research this firm is the 'leading' firm in the network. Generally the term focal firm is used for any research focusing on a particularly firm. In these cases the focal firm is not considered a 'leading' firm. The *Hub Firm* is discussed by Jarillo (1988) as in important actor in the development of business networks, mainly because of its coordination skills.

Nodal Firm

Kothandaraman and Wilson (2001) point out that all companies belong to some value-creating network, in which some companies play important roles and have influence in shaping the networks, while other play only minor roles. These different roles in networks have been discussed by several other researchers (Doz and Hamel 1998; Jarillo 1988), referring to the central actor by the terms hub-company and nodal firm. Strikwerda (2000) uses the term nodal firm to describe the company that has the central role in an alliance for the cooperative development of products.

Kothandaraman and Wilson (2001) state that firms usually do not think about network positions, but rather how to compete against similar firms. Their model of 'value-creating networks' emphasizes on how a nodal firm can use its core capabilities and relationships to enhance customer value. The degree of value creation is influenced by the core capabilities of the participating firms and the relationships they have. According to the authors, the level of customer value that is desired determines the participating firms' core capabilities. These capabilities are valued by the other participants based on the contribution they make to the customer value.

Furthermore, the creation of customer value is influenced by the nature of the inter firm relationships. Therefore, any shifts in the relationships affect the value creation capabilities of the network. The role of the nodal firm is to maintain the quality of the network by enhancing the relations that are beneficial from a customer's perspective and constrain the development of the network when it leads to diminishing customer value.

Hub Firm

Provan (1993) focuses on cooperative network relations and ads to the common assumptions in the transaction costs economics view on network relations. The level of embeddedness in an interdependent buyer-supplier network proves to be a strong predictor of opportunistic behavior. High levels of embeddedness lead to low levels of opportunistic behavior despite high asset specificity.

Jarillo (1988) uses the concept of strategic networks as a tool to understand cooperative relationships. He stresses the difference between using the network concept as a way to describe business transactions, and describing a network as a 'tool' that entrepreneurs use to obtain a competitive advantage. The first mentioned way of using the network concept is based on Williamsons approach (1975) where networks are seen as an intermediate organizational mode between hierarchy and market. The second way of using the network

concept is based on what Jarillo calls coordination through adaptation. The transaction costs that are considered the cause of using a network or hierarchical structure by Williamson can be influenced by an entrepreneur. In that way, a firm is capable of enhancing its network, and using it as a competitive tool.

"Essential to this concept of strategic network is that of 'hub firm', which is the firm that, in fact, sets up the network, and takes a pro-active attitude in the care of it." (Jarillo 1988: 32) The 'hub firm' decides which activities of its value chain it will subcontract within the network. The firm creates a competitive advantage by having lower transaction costs than its competitors. As a result, the firm can externalize activities that competitors are forced to internalize because of their high transaction costs. The relationships in a network should be looked at as valuable because of future, unforeseen, developments. In approaching new markets or developing new products, the hub firm can use its network relationships. This is the strategic element in the network concept of Jarillo.

Core Company

Van Tulder et al (2001) provide a definition of *core companies*. Apart from their size, core companies are identified by their international position (market access), are focused on the value chain, and are principal firms in their supply chain and network. They often owe their position to their core technologies and are both users and producers of these technologies.

The term core company is often used in business, popular and scientific literature to identify the leading company in a network. Generally a core company is regarded as the company that is the largest firm in a certain industry. Core companies are often identified based on their sheer size. Van Tulder et al (2001) provide a more precise definition of core companies.

"A core company can be characterized by its large production and technological activities and its ability to position itself in the core of networks of supply and distribution, thus playing a leading role in the creation of added value and in restructuring. Core companies are spiders in an industrial web" (van Tulder, van den Berghe and Muller 2001:p16)

With this definition, the focus is again on the coordinating role a central firm in a network can play. They to acknowledge the influence this behavior can have on added value for other companies in the network. The difference with other definitions is that there is more attention for the ability a firm has to be 'the spider in the web'.

Apart from its size, core companies are identified by their international and market position. A core company should have direct access to all relevant markets and be in control of its own trademark. Furthermore the company should be relatively independent from other actors in the supply chain.

The focus of the management is on the value chain, and the company functions as the focal point for other actors in the value chain. The core technologies and the financial power a company has are the basis for this independence. Finally, the core company should have a central position in both buying and supplying new technologies.

3.3 Cluster school

Another body of literature that refers to the role of a central company is the literature on economic clusters. Building on the cluster idea, some concepts of central firms in these clusters have developed, such as flagship firms, central firms and key firms, all referring to the role of a single firm in a geographically defined set of companies and other organizations.

Flagship firm

Rugman and D'Cruz (2000) identify *flagship firms,* these are firms that are central in a local network and function as a flagship for other companies in their network. The main point is that MNE's can only compete successfully when they use cooperative relationships with others in their network.

Rugman and D'Cruz (2000) use a cluster concept that revolves around a central firm. Based on their empirical research in Canada they identify several clusters of economic activity. A strategic cluster is defined as a group of firms within a small geographic region, all of which participate in the same industry or a closely related group of industries. Each cluster includes a flagship firm that plays a dominant role in exports from the cluster, as well as a number of other firms that participate in business dealings with the flagship firms. The main focus of this concept is to analyze how firms can improve their competitiveness by cooperating with their environment.

Whit this view they are one of the few that take the enterprise as the starting point for a cluster analysis. A flagship firm is a multinational enterprise at the hub of a business network. Such multinationals provide the strategic direction to other members of their cluster and at the same time compete with other multinationals that do the same for 'their'

cluster. All the firms in the network benefit from such coordination. They function as a flagship for other companies in their network.

The main point is that MNE's can only compete successfully when they use cooperative relationships in the 'five partner' model that consist of the flagship firm, key suppliers, key customers, competitors and 'non-business infrastructure'. Firms within the network agree to *align and harmonize their competitive strategies* for mutual advantages.

Whalley (2004) defines Flagship firms as follows: "Flagship firms are multinational enterprises that co-ordinate the investment and operational activities of other companies within their business network." (p.164) Research on two telecom companies in the EU showed that there are six issues that are important for the competitiveness of a flagship firm.

- The establishment of contracts with suppliers on different organizational levels
- The role of some national operating companies as a 'test bed' of products, services, software etc. before their introduction elsewhere.
- The multi-faceted role of global contracts that contribute to enhancing the competitiveness of the flagship firm through equipment standardization, reducing costs and quickening the pace of market entry.
- The asymmetrical nature of the relationship between the flagship firm, its subsidiaries, and their suppliers.
- The use of exclusive contracts by the flagship firm in its dealings with its suppliers.
- The re-branding of national subsidiaries by the flagship firm to create a common pan-EU brand.

In these issues the following characteristics are recognizable: the flagship firm has a *central position*, is *dedicated to improvement and development* and has an *integrating function* in the supply chain.

Core and Central Firms

Often cited in the cluster literature are Lorenzoni and Badenfuller (1995). They define leader firms as 'strategic centers with superior co-ordination skills and the ability to steer change' (p147). They distinguish four ways in which a leader firm contributes to the competitiveness of their partners: through *strategic outsourcing*, the *sharing of knowledge*, by *forming a bridge between different networks*, and by *focusing on competition on a value*

chain or network level rather than on firm level. This attitude contrasts sharply with most organizations, which according to the authors, view their joint-ventures and subcontractors as existing beyond the boundaries of their firm. The focus on the value chain or network as the competing unit is new in the approach of these authors.

When a company views the supply chain or the network as the competing unit, this firm will also have the incentive to make investments in a broader context. If there is believe that a strong network or supply chain is eventually the key for good performance then it makes sense to invest in the network structure or even in individual companies within the network.

Interesting implication of this view is that companies should not only be concerned with who their suppliers and buyers are but also with the whole chain of individual suppliers and buyers. Harland et al (2004) build a conceptual model for the creation and operation of supply networks. They conclude that nine activities are central in the creation and the operation of supply networks, ranging from the selection of the partners, activities to develop value in the network, such as knowledge sharing and the integration of resources, to the motivating structure in the network.

Anastasios and Karamanos (2003) study the results of the network embeddedness of a firm in terms of value for the firm. The conclusion from this research is that two processes lead to value from the network in knowledge-intensive exchanges. The learning bandwagon and the fad bandwagon. Value from a learning bandwagon process is enabled by the normative and cognitive proximity of network partners. The embeddedness in a dense network is a key element for creating value in this process. Value from a fad bandwagon process is based on the firm's status in the network, measured by the centrality of the firm's network partners. The centrality mainly creates reputation value.

Baum et al (2003) discuss the 'small world problem' of companies that are linked together in small often locally clustered sub-networks, that are only sparsely connected with other networks. The ties that do exist across cliques are formed in three ways. First, the formation of links between firms in different cliques by chance. Second, the formation of links by insurgence of outside firms that want to improve their own network position and destabilize the existing network. Third, by core firms that partner to control the network and their own position by maintaining the network status quo. In an empirical study Baum found all three scenarios to exist, with the first two reasons playing a greater role. Interesting enough Baum et al. do not analyze the possibility that core firms partner with outside firms to improve the quality of the network.

Performance of companies in clusters

McNamara (2003) researched the performance of clustered companies. Both the difference in performance between but also within the cluster was analyzed. Performance differences within the cluster prove to be larger than across groups. Secondary firms in a cluster perform better than the core company in a cluster and better than solitaire firms (companies that are not part of a strategic group). McNamara suggests this is the effect of secondary firms being able to "effectively balance the benefits of strategic distinctiveness with institutional pressures for similarity." To be different and to be the same simultaneously as Deephouse (1999) stated in his theory of strategic balance. Different enough to have a competitive advantage, and similar enough to be accepted in the group and by customers will lead to superior performance.

3.4 Definition of leader firms

There are various fields of research where a central or leading firm is explicitly taken as the object of research. From the theory on networks, clusters and industrial districts the concepts shown in Table 3-1 can be identified.

Table 3-1: The leader firm concept and related theories

Concept	Academic field	Related themes
Leader Firm	Industrial districts	Internationalization / innovation
Flagship Firm	Clusters	Coordination / innovation
Core company	Networks / Globalization	Internationalization
Nodal Firm	Networks	Coordination
Hub firm	Networks	Coordination
Focal firm	Networks / Supply chains	Coordination / technology

There is however a lack of theoretical underpinning of the concept of leading firms. More often a company is called a leader based on an assumption, or on one specific feature. Only some exceptions, such as Albino (1999) and Lazerson and Lorenzoni (1995), van Tulder (1995) and Rugman and D'Cruz (2002) are found. Here attention is paid to the question 'what makes a firm a leading firm?'. Only the latter two start with this question and try to establish a view on leader firms separated from the context. The others start from a certain context (i.e. an industrial district) and try to explain developments in the context by

analyzing the leader firm. From the body of literature some conclusions can be drawn to identify the characteristics of a leader firm.

Leader firms are important drivers of the development of clusters. The investments of leader firms can encourage innovation, enable internationalization of other firms in the cluster and improve the internal coordination in the network, cluster or industrial district. In these ways, leader firms contribute to the competitiveness of other firms in the cluster and, as a consequence, the cluster as a whole. In the current research leader firms are defined as follows:

"Leader firms are firms in a cluster that have -because of their size, market position, knowledge and entrepreneurial skills- the *ability* and *incentive* to make investments with positive side-effects for other companies in the cluster."

Positive side-effects, or externalities, are central in the definition of leader firms. Externalities are all those effects of (firm) behavior that are not included in a price. In principle *all* investments that increase the competitive position of a network have positive externalities. Apart from these *network* externalities, *cluster* externalities (also termed agglomeration –or localization- economies, see Krugman, 1991) exist. Cluster externalities differ from network externalities because all firms in the cluster benefit from these externalities, not just firms included in a relatively closed interfirm network.

3.5 Spillover effects and externalities

The main theme in Cluster and Industrial District literature is the benefit a firm has by being present in a cluster. Being located in the cluster area and being active in a cluster's economic specialization, gives some specific benefits for a company. These benefits are termed spillover effects, or in general micro-economic theory, externalities. In this paragraph, spillover effects and externalities are discussed in more detail.

Externalities

Economic activities, whether from an individual or a company, is valued at a certain price. In microeconomics this price is said to be the results of supply and demand. In every situation with a given supply and demand for a product or service an equilibrium price exists. In the First Welfare Theorem all resources are assumed to be efficiently allocated resulting in pareto efficiency and thus maximizing total welfare.

Externalities are a widely acknowledged economic effect. Externalities are effects that occur as a result of economic behavior but are not the goal of this behavior. Furthermore, these effects cannot be incorporated in the price of services or products. Both positive and negative effects exist. Externalities are defined as (Katz and Rosen, 1998): 'A direct effect of the actions of one person or firm on the welfare of another person or firm, in a way that is not transmitted by market prices.' From the microeconomic viewpoint an externality leads to economic inefficiency. It affects welfare of persons or firms but is not expressed in a price. It thus brings the economy off the equilibrium.

Different viewpoints add to the understanding of externalities. The most straightforward reason for the existence of externalities is the absence of markets because there is no ownership of a certain resource. Classic examples are clean air or silence. When there is no one who can claim ownership of the clean air, it is impossible to charge a price for polluting this air and no market will emerge. A second reason can be the impossibility to charge a price. A city with beautiful architecture is more pleasant to live in and it attracts visitors. However these individuals are not likely to pay for the view at a building. No willingness to pay leads to a less than optimal supply of a certain good, in this case there is no reward for the construction of beautiful buildings.

The previous two examples illustrates that the absence of a market leads to more than optimal use of a good in the case of a negative externality and less than optimal supply of a good in the case of a positive externality.

Positive externalities

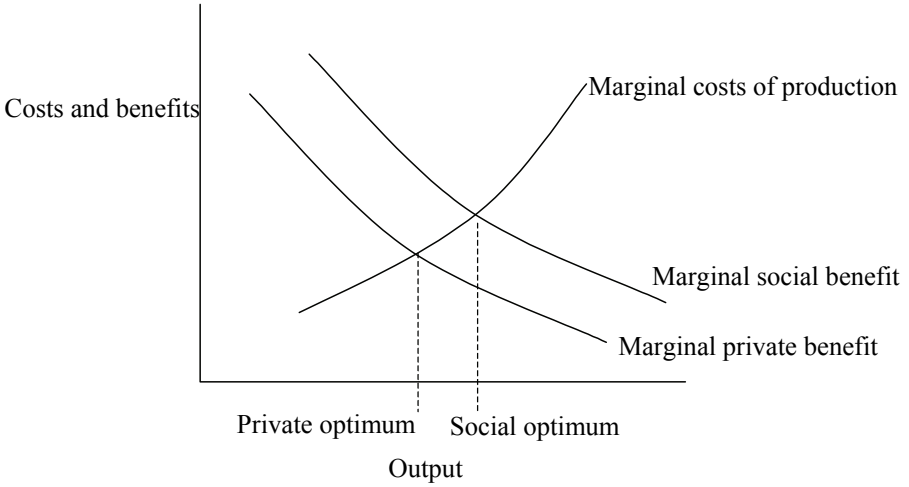
Positive externalities are the difference between marginal *social* benefit of production and marginal *private* benefit of production. Many economic activities can generate positive externalities, for example training of employees improves labor productivity and can reduce the costs faced by other firms. Growth of productivity allows more output to be produced from a fixed amount of resources and thus improves the living standard. In general, a well-educated labor force can increase efficiency and produce other important social benefits.

Furthermore, research into new technologies can be disseminated for use by other producers. These technology spill-over effects reduce the costs of other producers and cost savings might be passed onto consumers through lower prices

Positive externalities from technological spillovers

In Figure 3-1 the benefit of a positive externality in the form of a technology spill over is represented in higher social benefits. The availability of a new technology or product (i.e. a new machine or software) has lowered the costs of other producers. Therefore, the socially desired level of output is higher than the output produced by the firm. Social benefit of the product is higher than the private benefit and output of the product should be encouraged towards a higher level.

Figure 3-1: Marginal benefits of technological spillovers



There are certain actors that can benefit from eliminating the externalities by internalizing the externality in a price. Negative externalities can be eliminated by charging a price for the use of the (generally) public good. Positive externalities can be internalized by rewarding the producer of these positive effects.

Externalities of investments

One particular field of research that focuses on externalities is the school around the endogenous growth theory. Externalities are viewed as the result of an investment in physical capital. The endogenous growth theory predicts positive externalities and spill-over effects. The main points of the endogenous growth theory are:

- The rate of technological progress is not a given

- There are potential increasing returns from higher levels of capital investment
- Private investment in R&D is the central source of technical progress
- Protection of property rights and patents can provide the incentive to engage in R&D
- Investment in educating and training of the workforce are an essential ingredient of growth

The role of an industry leader in R&D in the endogenous growth model is researched by Segerstrom and Zolnierek (1999). They discuss why industry leader firms often devote substantial resources to R&D activities. They find that industry leaders can improve their products more easily than other firms can, and draw the following conclusion: "When industry leaders have R&D cost advantages, it is optimal for the government to subsidize the R&D expenditures of all firms, subsidize the production expenditures of industry leaders, and tax the profits of new industry leaders. Without government intervention, market forces generate too much creative destruction." (p. 745)

Spillovers

Spillovers are mostly associated with knowledge and innovations. A spill over exists when knowledge and innovations, developed within one company, find their way to another company without a compensation being paid by the latter. Measuring spillovers means measuring the surplus benefit a company has from an innovation done by another company. The character of spillovers makes it by definition a difficult task to measure it. Not only does it depend on the type of knowledge, but it also depends on how the knowledge is used. There are however some indications for measuring and categorizing spillovers. Levin (1988) distinguishes seven ways in which a company can acquire technological knowledge about a product.

1. Licensing technology; a technology license does not imply a technological spill over because there is a compensation paid for the use of the knowledge. However, there still is a benefit for the licensee. He acquires knowledge for a lower price than developing it by independent R&D, so there is some synergy in the development of knowledge leading to an external benefit.
2. Patent disclosures; Patents are meant to prevent others from using knowledge in a commercial way, and in that way try to prevent knowledge spillovers. However, several researches prove that the citing of a patent is a strong indication of

knowledge spillovers, and that geographical localization of knowledge can be evidenced by citations. (Keller 2002, Jaffe et al 1993, 1999)

3. Publications and meetings; Exchange of knowledge between technicians in publications and during technical meetings lead to acquiring knowledge without a substantial compensation being paid. In this sense there is a knowledge spill over, it is however not an unwanted exchange of knowledge. The one publicizing or presenting on a meeting is in control of the amount of knowledge that is exchanged. In that sense it's not a pure spill over but merely a voluntarily contribution to the knowledge of others.
4. Informal exchange of knowledge between employees; The informal exchange of knowledge between employees of different companies is one of the clearest cases of knowledge spillovers. Especially in settings where companies are located in each other's vicinity occasional spill over of knowledge is likely to occur due to a higher level of interaction.
5. Hiring employees from an innovative competitor; by hiring employees from an innovative competitor a company can acquire knowledge that is tacit. By doing this a company benefits from the investments another company makes in educating its personnel and indirectly acquires the knowledge that is common in the company of origin, for example about the way of production.
6. Reverse engineering of a product; Reverse engineering cannot be considered a pure spill over because it requires a substantial effort to acquire the knowledge that is tacit in the product. There are however some indirect effects due to the accelerated diffusion of the knowledge through the product. The costs of acquiring the knowledge are lower than in the case of independent R&D. The difference between the costs levels could be considered as a spill over in the broad sense.
7. Independent R&D; Research and development done in-house leads to new knowledge for a company and can only be the source of spillovers, not an effect of spillovers.

In conclusion, technological spillovers and externalities are identified as the driving force behind the clustering of economic activity. However the concept of spillovers is interpreted in cluster theory more broadly than in neo-classical economic theory. Because the current study focuses on benefits generated by companies in a cluster, the broader definition of

spillovers is used. Not only the pure spill over of knowledge that occurs unwanted by the originator but also other non-compensated benefits and synergetic effects are considered relevant.

Part II: Identifying leader firms and leader firm behavior

4 Empirical exploration of the leader firm concept

In this chapter the leader firm concept is explored through empirical research. The explorative research took place in the Dutch Maritime Cluster (DMC). The first paragraph describes how Leader firms are identified in the Dutch maritime cluster. Further, results of case studies on leader firm behavior are presented. The chapter is finalized by a categorization of leader firm behavior.

4.1 Identifying leader firms

Identifying leader firms requires the selection of firms that posses characteristics that could predict leader firm behavior. In this research leader firms are identified in two steps. First, apply selection criteria for leader firms based on firm characteristics on the population. Second, closer examination of the list of potential leader firms based on expert opinion and professional literature. The expert opinion is very context dependent and will differ per cluster.

In the preceding chapters different academic fields are explored to get a grasp of what leader firms (and related concepts) are. From this exploration several characteristics of leader firms can be derived. In the definition of leader firms size, market position, knowledge and entrepreneurial skills are distinguished as relevant. There is reason to be aware for over-simplifying regional business structures (Markusen, 1996). Especially the role of central players can differ in every district. In the empirical research a close distinction should be made between firm characteristics and actual leader firm *behavior*.

Size

The size mainly indicates a firm's ability to make investments with externalities for other companies. It can also predict the incentives a company has to make these investments. Size can be measured financially and physically. Financial size is predominantly found in turnover, and total equity. Physical size is measured in number of employees, and number of locations.

The financial size should be measured by both turnover and equity because turnover does give an indication of the economic impact a firm has but it does not exactly describes its size. Total equity gives an exact figure about the financial size of a company; it does not show what is done with this size. A trading company for example does have a high turnover but presumably a low total equity. It is however possible that this trading

company has a very important role in a district or cluster. Turnover and equity should therefore be used simultaneously in the selection of leader firms. A high value of one of these indicators should be sufficient for the selection.

The number of employees is an important measure for leader firm potential. First, because it shows the size of a company and the ability to invest manpower with possible positive effects for the environment. Second, because a large number of employees gives a greater incentive to invest in collective action. A large employer is more likely to invest in education infrastructure, because it is the one that benefits the most from this investment.

Market position

The market position of a firm is of importance because it determines which (potential) relations a firm has that can be useful in promoting leader firm effects. Both in cluster and in industrial district literature the relations of a company are the key element to a leading position of a firm. A leader firm should therefore have a large number of suppliers and / or a large number of customers. A leader firm should have a leading position in its market; otherwise, it will not be the focal point of the suppliers, customers and competitors.

Knowledge

Innovation is one of the most recognized fields in which leader firms play an important role. Innovation is the result of the knowledge a firm has and the ability to use this knowledge. Innovation studies often assume the closeness of firms an important factor in the success of innovation. Porter's cluster theory for example relies heavily on the expected knowledge spillovers from related industries, competitors and suppliers in a cluster. These spillovers have been identified in studies by Krugman (1991) and Romer (1986). And already in the work of Marshall (1920) knowledge spillovers where assumed to be geographically bounded. Resulting from these findings is the expectation that in a cluster with firms that cause knowledge spillovers the overall level of innovation is higher. Audretsch and Feldman (1996) researched the spatial distribution of innovative activity and found, for the US situation, that "…after controlling for concentration of production, innovative activity tends to cluster more in industries where knowledge spillovers play a decisive role" [pp 631]. These industries are assumed to be the industries with high R&D expenditures and a large number of high skilled workers. Companies that invest in R&D and have a high skilled workforce are thus likely to produce more knowledge spillovers and attract other innovative activities. Following this reasoning, in identifying innovative

leader firms, R&D expenditure and education level of the company's workforce should be a factor.

R&D expenditure gives an indication of the effort a firm makes to develop knowledge but, because this is an input variable, it does not fully predict the knowledge 'production' of a firm. Therefore it should be combined with an output variable. The number of patents can be used as a complementary indicator for knowledge. This indicator shows that a firm possesses unique knowledge that a firm wants to protect.

Firms with big R&D expenditure and a large number of patents are probably more likely to be leader firms in the field of innovation, but it cannot be a necessary condition in the selection of leader firms.

Entrepreneurial skills

The entrepreneurial skills of a company are probably the most 'vague' and therefore hard to measure. It refers to the mentality of the general management and its ability to run a company well and to create positive externalities for their environment.

Most evidence for entrepreneurial skills is anecdotic, but not less relevant. Anecdotic evidence of leader firm behavior can be retrieved from news sources in some cases, such as industry magazines. The most important source of anecdotic evidence can be obtained by interviewing industry-experts. When carefully selected, these experts can provide valuable insight in the industry and the behavior of the firms. The experts should be very knowledgeable and have a central position in the industry.

Location

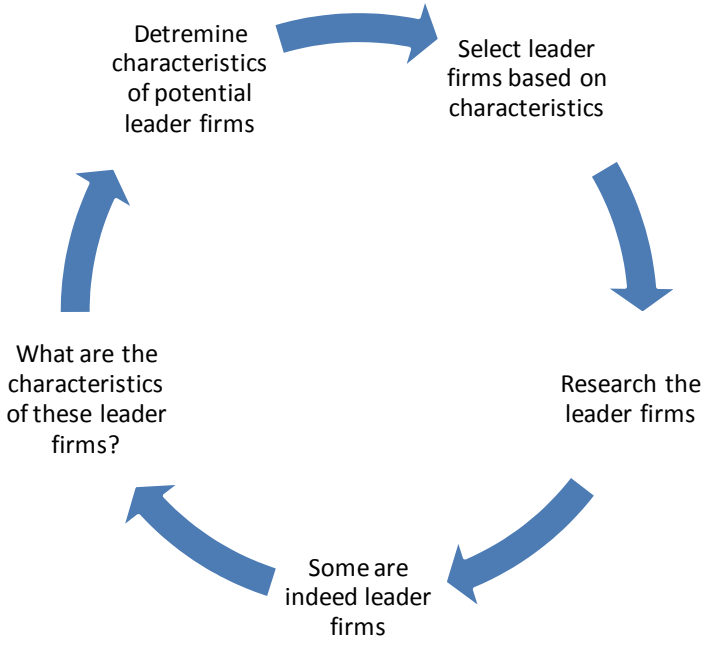
Next to the above-mentioned factors that determine the leader firm, location of the firm is of importance. Most literature on leader firm behavior is from the academic fields on clusters and industrial districts, that both have location and proximity as key elements. The influence a leader firm has is stronger on firms located in the same region, district or cluster. The location of a firm is important in order to identify where the effects of a leader firm are present. Clearly, these effects can only be generated if a firm has a decision centre at a certain location. Only from a decision centre the relations to foster innovation, internationalization can be managed. For this reason the presence of a production facility or sales office is not a sufficient condition for leader firm behavior.

Being and behavior

The characteristics discussed above describe leader firms as companies with distinct features that have a leading position in some way. For the eventual identification of leader firms it is not only important to take these features into account. Most characteristics show the potential of being a leader firm. Being a firm with many employees does give the incentive to invest in education, but a firm can still choose not to make this investment. Likewise a high turnover or profitability does give a firm the means to be a leading company but it still has to use its entrepreneurial skills to make its central position meaningful for the rest of the cluster. Therefore the selection has to incorporate both factors that show the potential of a company for being a leader firm and the actual behavior of the firm.

Figure 4-1 represents the total research cycle in identifying leader firms, ultimately resulting in a better understanding of the characteristics that make a core company into a leader firm.

Figure 4-1: Research cycle



4.2 The DMC as object of study

For the empirical exploration of the leader firm concept the Dutch maritime cluster is taken. It gives broader results than only analyzing the port of Rotterdam but still is representative for the port because all maritime industries are also present in the port. It's therefore likely that a leader firm effect found in the maritime industry somewhere else is also present in the port of Rotterdam.

In the Dutch maritime cluster many interrelations between different maritime sectors exist. A closer examination of the cluster shows that the position of many firms is not restricted to one supply chain and many vertical, horizontal and lateral relationships exist. The hypothesis therefore is that there are certain firms that have a leading role in more than one supply chain. Furthermore, the strong linkages and presence of many central firms make it likely that spillover effects are created and leader firms are present.

There is relatively much information available on this cluster. The main reason for that is the existence of 'Dutch-maritime-network', a cluster organization that represents the interests of the maritime industry in the Netherlands. They have commissioned several studies on the structure and dimensions of the Dutch maritime cluster.

The Dutch maritime cluster

The total added value produced by maritime industry in the European Union is € 70 billion. 10 % of the European value added is generated in the Dutch Maritime Cluster. The share of maritime activities in the national product in the Netherlands is twice as high as the European Union average (Policy Research, 2001). This shows the Netherlands is specialized in maritime activities.

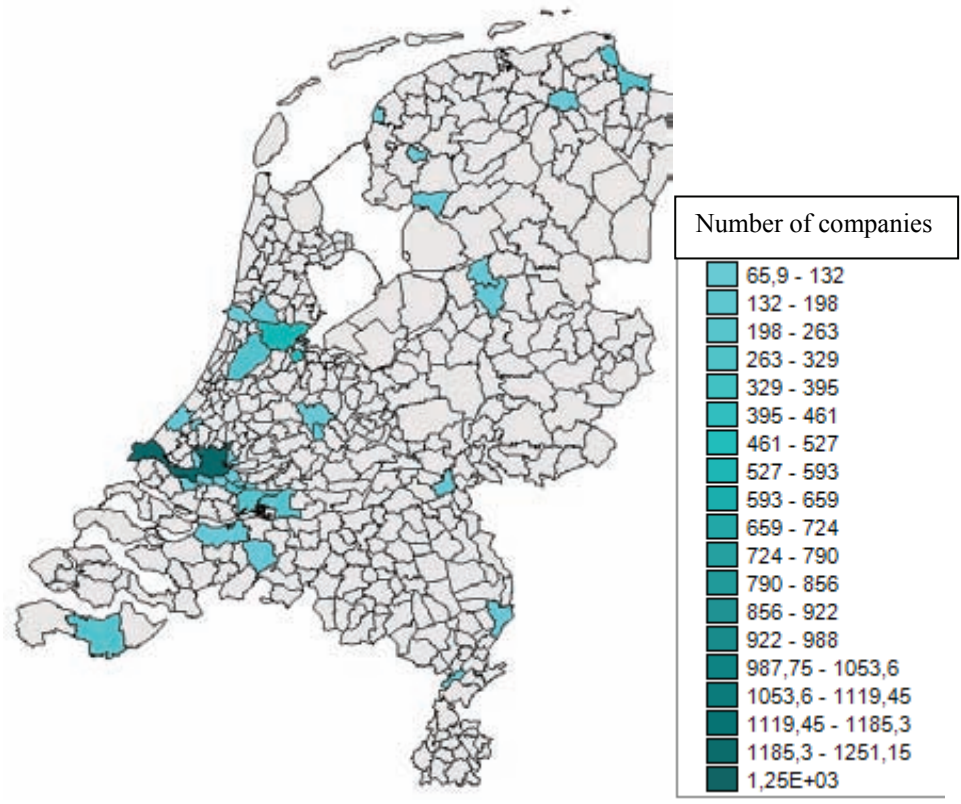
Location of maritime (and related) activities in the Netherlands

In this paragraph the spatial dispersal of activities in the Netherlands is discussed. Activities that are included are the maritime activities shipbuilding, (inland) shipping, dredging and off-shore, and the category services to transport which includes stevedoring, ship agents and expedition[9]. Figure 4-2 shows that maritime companies in the Netherlands

[9] The services to transport category gives some distortion because also non-maritime related expedition companies are included, this results mainly in an overestimation of activities in the Amsterdam region, where airport related transport companies are present.

are spread throughout the country, with high concentration of maritime activities in the main port areas, Rotterdam and Amsterdam and secondary centers in Groningen, Zeeland and Drechtsteden. Also some areas in the corridor between Rotterdam and Germany locate concentrations of companies related to the transport of maritime cargo.

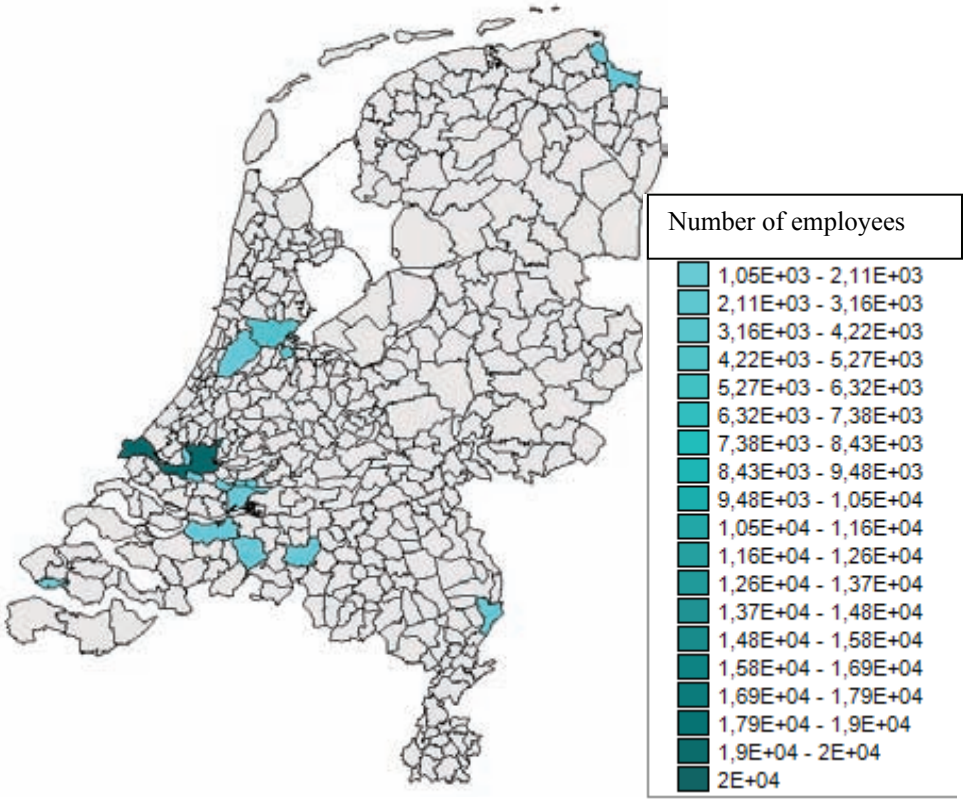
Figure 4-2: Maritime and service-to-transport companies in the Netherlands



Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

Figure 4-3 shows the division of employment over the Dutch Municipalities. Employment in the maritime industry appears more concentrated than the absolute number of companies. Reasons for this are that large firms are more concentrated in the main port areas than the smaller firms and the more labor intensive activities show a more concentrated location pattern in the seaports Rotterdam and Amsterdam. The labor intense nature of logistics shows in the concentration of employment in Southern Netherlands.

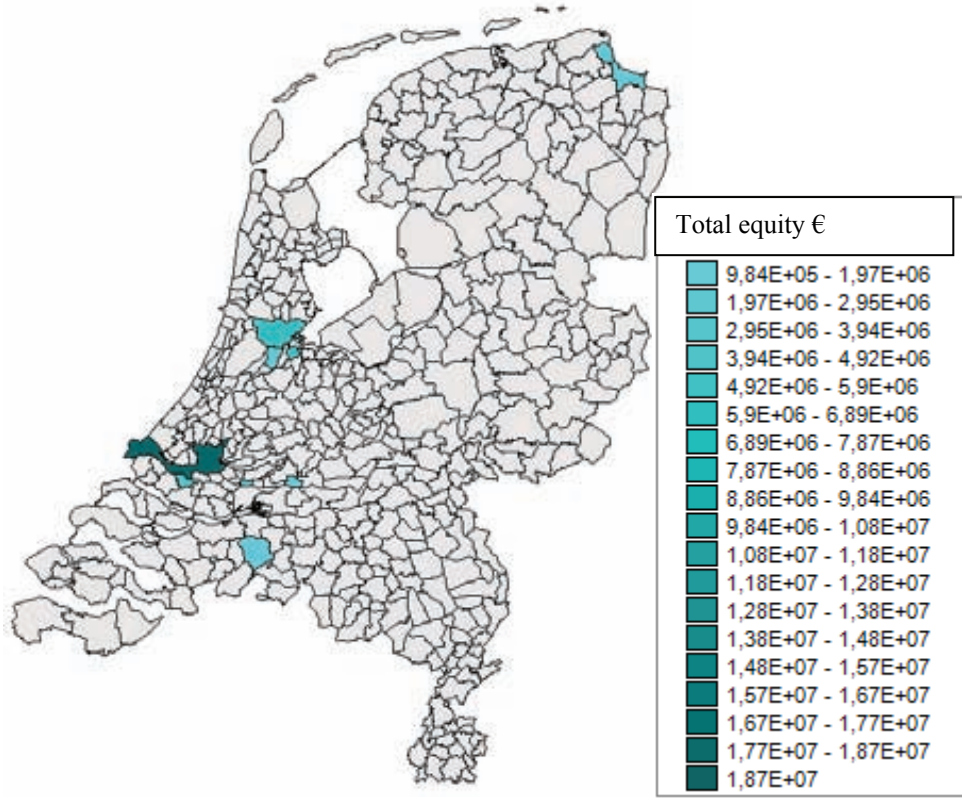
Figure 4-3: Maritime and service-to-transport employment in Dutch municipalities



Source: Authors calculations based on database of companies in the Netherlands by BvDijk

When we focus on the control over maritime and transport assets the concentration of companies becomes even more apparent. Controlled assets are calculated based on the total equity reported in the annual reports of companies. National subsidiaries are included in the equity of the parent company. The control over maritime and transport assets is clearly concentrated in Rotterdam and, to a lesser extent, in Amsterdam. Concentrations of secondary importance are found in Delfzijl (shipping), Papendrecht (dredging and shipbuilding) Gorinchem (Shipbuilding) and Breda (logistics and off-shore).

Figure 4-4: Maritime and service-to-transport assets in the Netherlands



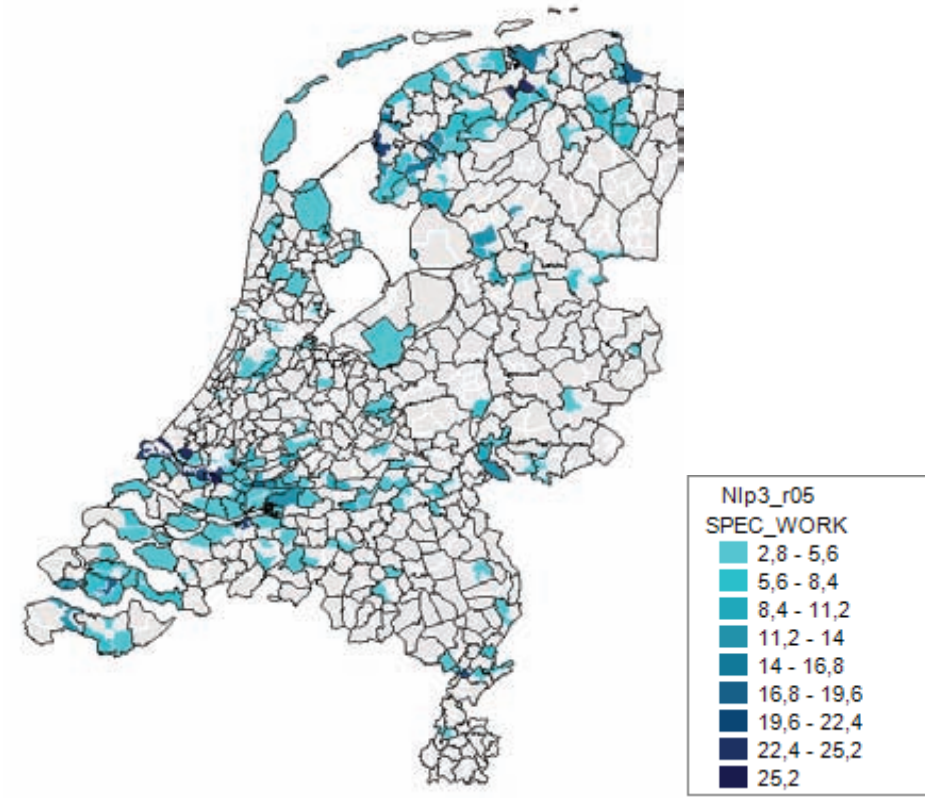
Source: Authors calculations based on database of companies in the Netherlands by BvDijk

Next to the absolute number of firms and employment, for a cluster analysis it's also of interest to check the specialization rate of different regions. The specialization rate is expressed in the percentage of firms/ employment in a certain area (defined by postal codes) that has a maritime nature. In terms of specialization we see a much wider spread throughout the Netherlands. Areas specialized in maritime activities not only found in the port areas, but also along the main rivers and in area's that specialize in water recreation such as Friesland in the North and Zeeland in the Southwest. Specialization in employment is more common than specialization in number of firms. This indicates that maritime (related) companies are relatively large in number of employees.

Comparing absolute numbers with relative specialization, the conclusion is that absolute number of firms and employment give a better indication of locations of clusters on a

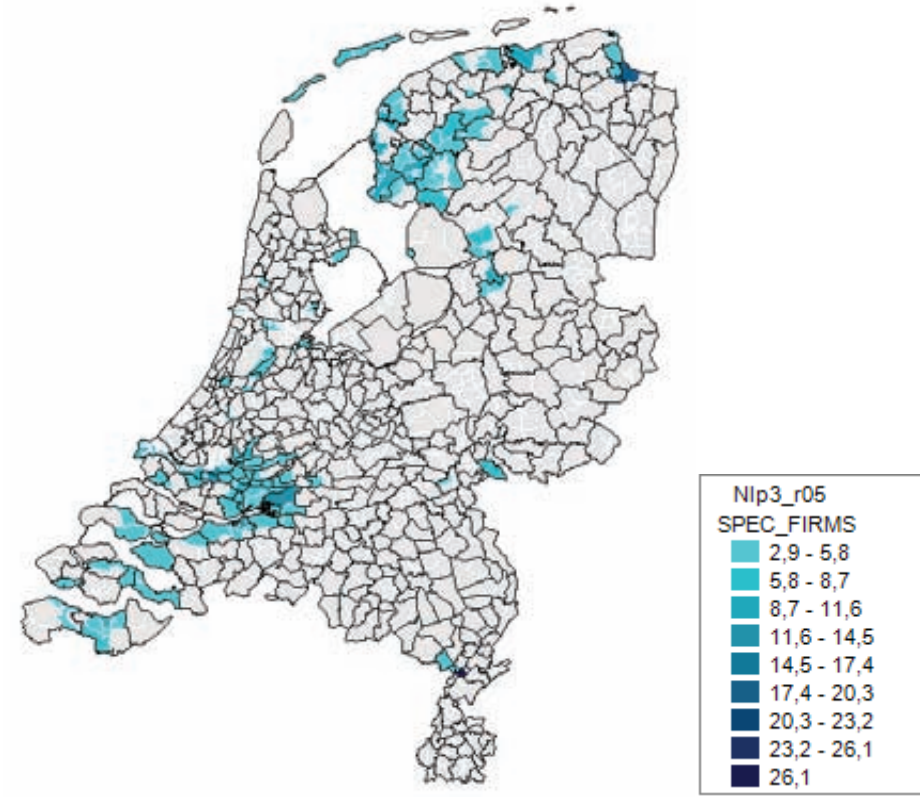
national level. On the other hand the specialization rate of areas is a good way to determine the borders of these individual clusters.

Figure 4-5: Specialization in maritime employment (% of total for pcode 3 positions)



Source: Authors calculations based on database of companies in the Netherlands by BvDijk

Figure 4-6: Specialization in maritime firms (% of total for pcode 3 positions)



Source: Authors calculations based on database of companies in the Netherlands by BvDijk

Size and structure of the DMC

The Dutch Maritime Cluster (DMC) is extensively documented by studies commissioned by the 'Dutch Maritime Network'. Peeters et al (1999) identify eleven maritime sectors that make up the Dutch Maritime Cluster. Figure 4-7 shows the sectors that form the DMC.

Figure 4-7: Sectors included in the Dutch Maritime Cluster

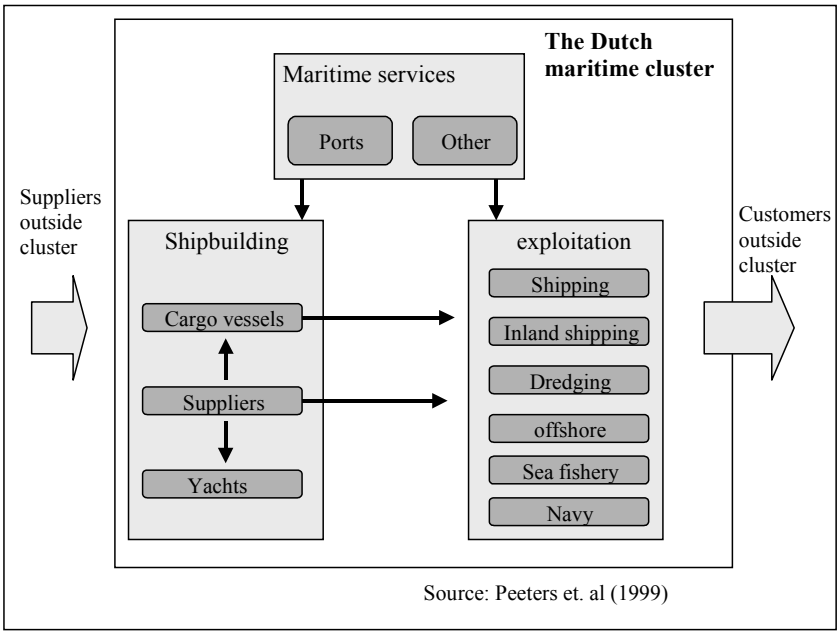


Table 4-1 shows the number of firms in the eleven sectors that make up the DMC and shows the relative importance of these eleven sectors, in terms of value added and employment.

Table 4-1: Economic size of the 11 sectors in the Dutch Maritime Cluster (2005)

	Production (mio euro)	Value added (mio euro)	Employees	% of DMC production	% of DMC VA	% of DMC employ.
Shipping	4.137	1.077	6.140	18	11	5
Shipbuilding	2.325	694	10.090	10	7	8
Off-shore	2.765	1.143	18.750	12	11	14
Inland shipping	1.248	704	11.500	6	7	9
Dredging	1.412	587	5.100	6	6	4
Ports	4.106	2.884	27.130	18	29	20
Marine	1.385	713	14.500	6	7	11
Fishery	445	226	5.190	2	2	4
Maritime services	1.121	683	9.550	5	7	7
Yachts	1.705	781	16.040	8	8	12
Maritime suppliers	1.969	548	10.090	9	5	8
Total	22.618	10.040	134.080	100	100	100

Source: based on Peeters (2006)

The port sector is the largest sector in the maritime cluster. 29% of the value added and 20% of the employment is generated in the port industry[10]. The fishery sector is the smallest sector in the DMC. Data from Peeters et al. (1999 and 2006) allows an analysis of the relations between the sectors. Table 4-2 shows –per sector- the percentage of output supplied to other sectors in the cluster, the percentage of input sourced from other firms in the cluster and the number of sectors with which commercial relations exist. The rightmost colon shows the percentage of the turnover that is exported, indicating the international competitive position of the sectors.

[10] In fact, these figures underestimate the economic impact of seaports, since a number of port activities is not included in the DMC (RMPM, 2001).

Table 4-2: Economic relations in the DMC

Sector	Output to DMC, as % of turnover	Input from DMC in % of prod value	Number of connected sectors[11]	Export as % turnover
Maritime services	20%	4%	8	60%
Maritime suppliers	39%	9%	9	51%
Shipbuilding	45%	24%	10	51%
Waterworks (dredging)	11%	30%	8	65%
Ports	8%	5%	9	65%
Shipping	5%	23%	8	93%
Offshore	12%	22%	7	56%
Inland shipping	9%	37%	9	50%
Yacht industry	3%	4%	4	49%
Royal Navy	0%	12%	7	0%
Fishery	1%	24%	3	84%
Average	12%	18%	7	57%

Source: based on Peeters (1999-2006)

Table 4-2 shows the central position of shipbuilding in the DMC. Shipbuilding is directly related to all ten other sectors of the DMC. 45% of its output is supplied to other firms in the cluster, and more than 20% of its input is sourced from firms in the cluster. The relatively small percentage of output supplied to firms in the DMC in the sectors ports, maritime service, shipping and waterworks shows the international character of these sectors. The yachting industry and fishery are the sectors that are least embedded in the cluster. Both have relations with only a few other sectors and supply limited amounts to other sectors in the cluster.

[11] Based on direct financial relations.

Table 4-3 shows some characteristics of the firms in each of the eleven sectors that make up the Dutch Maritime Cluster.

Table 4-3: Characteristics of sectors of the Dutch Maritime Cluster

Sector	Number of firms	Average annual turnover in 1,000 €	Average number of employees	Average turnover per employee in 1,000 €
Maritime services	690	1.687	14	122
Maritime suppliers	750	4.017	18	229
Shipbuilding	85	29.188	119	246
Waterworks (dredging)	275	5.695	19	307
Ports	600	7.093	45	157
Shipping	380	11.182	16	692
Offshore	340	9.647	55	175
Inland shipping	3.400	404	3	119
Yacht industry	4.250	419	4	111
Royal Navy	1	1.385.000	14.500	96
Fishery	730	611	7	86

Source: Calculations based on Peeters 2006, Bureau van Dijk, 2008

The Royal Navy is by far the largest (public) company in the cluster. Other large companies include Vopak, Boskalis, IHC, Fugro, Smit-Internationale and ECT. Apart from the Royal Navy, the ship building industry is the sector with the largest average company size. Both the turnover and number of employees are twice as high as in any other sector. This stems from the capital-intensive nature of the industry and the relatively large 'minimum efficient scale'. The shipping industry is a capital-intensive sector: it has the highest turnover per employee. Inland shipping and the yacht-industry are characterized by a large number of small firms.

4.3 Identification of leader firms

The identification of leader firms is based on two methods. First, experts were asked to identify leader firms. Second, firm data was analyzed. Firms that are identified as leader firms by *both* methods are 'classified' as part of the leader firm set.

Expert identification

Executives of trade associations that are part of the Dutch Maritime Network, such as the dredging association and the port association were asked to identify leader firms. These experts have knowledge about the market-conditions, the member-companies and the relations between these companies. After explaining the leader firm concept, they were asked to identify the leader firms in their industry. The ten experts that were interviewed represent all maritime sectors[12].

Firm characteristics

The second method to identify leader firms is on the basis of firm characteristics. There is no single indicator of the ability and incentive of firms to make investments with positive externalities. Four characteristics of firms are relevant in this respect. For each of those characteristics, a criterion is required.

First, *firm size*, measured by turnover and number of employees is relevant. In general, larger firms have both more incentives and are more able to make leader firm investments. Firms with over 200 employees *and* firms with over € 5 million match this criterion.

Second, the number of *foreign subsidiaries* is relevant. It indicates the ability to enable the internationalization of other firms in the cluster. Firms with at least one foreign subsidiary match this criterion.

Third, the *number of patents* indicates the role of firms in knowledge networks and their ability to innovative. Firms with at least one patent registered in the last ten years match this criterion.

Fourth, The *number of association memberships* is relevant. This is a proxy for the involvement of a firm in the governance of the cluster. Firms that are members of at least two associations match this criterion.

Thus, five criteria are identified. The more criteria a firm matches, the more likely it is this firm behaves as a leader firm. Table 4-4 shows the number of firms in the DMC that meet one of these criteria.

[12] The eleventh sector, the Royal Navy, comprises only one 'firm'. Furthermore, given the special status of this firm, it is not included in this study. The role of the Navy as a leader firm is discussed in Policy Research Corporation (2003).

Table 4-4: Number of firms that meet a criterion

Criteria	Number of firms
Foreign subsidiaries	92
Patents	27
Employees >200	91
Turnover > € 5M	115
Membership	140

Firms that meet at least two of these criteria are regarded as leader firms on the basis of the second method (firm characteristics).

Firms are regarded as leader firms when they are identified on the basis of both methods: firms have to be identified by the experts *and* on the basis of firm characteristics. The set of leader firms and the distribution of leader firms across the sectors are shown in Table 4-5.

Table 4-5: The leader firm set

Sector	Firm characteristics	Expert identification	Included in leader firm set
Maritime suppliers	15	9	8
Inland shipping	8	5	5
Shipbuilding	11	5	5
Maritime services	20	3	3
Offshore	9	10	8
Dredging	14	3	3
Shipping	29	6	6
Ports	48	4	4
Yacht industries	2	3	2
Fishery	2	2	2
Royal Navy	1	1	1
Total	159	51	47

Table 4-6 shows the relation between the number of criteria that firms match and the identification of firms by the experts. The figures show that the firm characteristics are consistent with the expert identification.

Table 4-6: Number of firms that meet criteria compared to the expert opinion

Firm characteristics	Number of firms	Of which: Identified by experts
5 criteria	7	7
4 criteria	9	9
3 criteria	19	12
2 criteria	124	19

The identification on the basis of expert opinions is more selective: the majority of firms that match only two criteria are not regarded as leader firms by the experts. This is plausible: for instance, large firms with over 200 employees and a turnover of over € 5 million are not necessarily leader firms. All firms that match four or five characteristics are identified by the experts as well. This shows both methods are complementary and increases the validity of the expert opinion: they did not 'miss' a firm whose characteristics strongly indicate it is a leader firm.

4.4 Results of the case studies; nine forms of leader firm behavior

In this section, the results of 26 case studies of leader firm behavior and the results of a survey among leader firms are discussed. Case studies of 26 of the 47 identified leader firms were made, on the basis of desk research and an interview with a senior manager, mostly the CEO. The case studies were 'checked' by these senior managers. The case studies revealed nine forms of leader firm behavior. Some of these forms of leader firm behavior were addressed in the survey; some others were identified in the case studies. The case studies are not discussed in particular, only the general forms of leader firm behavior found in these cases are presented.

1. Coordination of production networks

A first form of leader firm behavior is the coordination of production networks. Leader firms invest in the coordination of this network. As a consequence the whole network becomes more competitive. In most industries examples of network coordination were found, ranging from building ships 'in series' at different shipyards to the formation of partners in response to specific opportunities.

2. Role as lead user

By expressing a 'critical demand', a more sophisticated demand than that of other firms in the market, leader firms improve the innovativeness of their suppliers. Several offshore and dredging companies in the DMC have a leading position in the world market. Their sophisticated demands motivate local suppliers to innovate. As a result several maritime suppliers in the cluster have a strong position in international markets, based on their advanced systems and technologies. The survey showed that 95% of the leader firms is conscious of this role and actively uses it to stimulate innovations.

3. Creating standards

Leader firms set new standards, for instance of safety and pollution prevention. Other firms, especially suppliers that are confronted with such standards in an early stage, benefit. Several cases of new standards were found. For example a more accurate dynamic position system for ships that was designed by several leader firms in a cooperative setting. Another example is found in the development of a new shock resistant hull. The hull limits the risk of spills in case of an accident to a minimum, and is now the standard for new inland gas and oil tankers.

4. Creating 'new combinations'

Leader firms have a central role in creating *new combinations* of previously unrelated technologies. The combination of such technologies leads to new products. Other firms in the production network benefit from this product development. The presence of a heterogeneous set of companies in the DMC often leads to the creation of new combinations. Examples can be found in offshore construction, were a company specialized in heavy lifting and a dredging company cooperatively designed a new way to install offshore windmill parks.

5. Improving the transfer of knowledge

A fast diffusion and transfer of knowledge adds to the competitiveness of a cluster. Because of the knowledge they possess and their central role in knowledge networks, leader firms improve the transfer of knowledge in the cluster. Several cases were found of informal networks were technicians from leader firms shared their knowledge with colleagues from other companies. Other examples are companies that have such a central

position in the cluster that their large number of (commercial) contacts automatically leads to the diffusion of knowledge. These cases are mainly found in the dredging industry.

6 .Encourage and enable internationalization

Leader firms compete on international markets. They can start production in other countries and urge or encourage firms in the cluster to internationalize in order to supply them in these countries. Many leader firms lower the barriers to internationalize by letting suppliers use their international network or by guarantying a long-term contract for production facilities abroad. One company was found that actively managed their international sales agent network and encouraged other companies in the cluster to use the same agents.

7. Creating reputation

Leader firms engage in projects at the frontier of what is possible. Such projects are widely known in the industry and contribute to the reputation of the cluster as a whole. A clear case is the raising of the Russian submarine Kursk. For this job new techniques were developed to make a fast salvage operation possible. The alliance of two Dutch maritime companies that was responsible for this operation clearly enhanced the reputation of the Dutch Maritime Cluster.

Another reputation effect that occurs is that leader firms openly advertise their Dutch roots. An example is found in the yacht building industry were the largest company presents itself as a Dutch company. Other Dutch yacht builders benefit from this reputation, the addition 'Dutch built' now is a strong marketing argument.

8. Improving the labor market

The quality of the labor market is important for the competitiveness of the cluster. Leader firms invest to improve the quality of the labor market. Leader firms are often found among the larger firms in a cluster. Clearly these firms benefit the most from a well-trained professional labor force. This gives them the incentive to invest in education projects. Many of the interviewed leader firms invest in public education projects, resulting in better-educated employees for the leader firm, but for other maritime companies as well.

9. Organizational infrastructure

Leader firms play a role in creating and maintaining the organizational infrastructure in the cluster. Such infrastructure is an important condition for effective cluster governance (De Langen, 2002). The Dutch Maritime Cluster is an example of a strongly organized cluster. There are associations per industry and a cluster-wide organization in which all industry-associations participate. The interviewed firms indicated that these associations are of importance to them in order to maintain a 'broad' network. They also invest in education through the cluster organizations.

Not all leader firms demonstrate all forms of leader firm behavior. Table 4-7 shows the results of the case studies. For reasons of 'confidentiality', no company names are given.

Table 4-7: Forms of leader firm behavior in 26 cases

Activity of leader firm	**Form of leader firm behavior**								
	1	2	3	4	5	6	7	8	9
Dredging									
Firm A	*	*	*	*	*		*	*	
Firm B	*	*	*	*	*			*	
Inland shipping									
Firm C		*	*		*				
Firm D			*		*				*
Marine services									
Firm E					*		*	*	*
Marine suppliers									
Firm F		*	*	*	*	*		*	
Firm G			*		*			*	
Firm H	*				*				
Firm I			*		*				
Firm J						*			
Firm K				*	*		*	*	
Offshore									
Firm L		*	*		*				
Firm M	*	*	*	*	*		*		
Firm N	*	*		*	*		*		
Firm O	*	*	*	*	*	*	*	*	
Firm P		*			*			*	
Shipbuilding									
Firm Q			*	*	*	*			*
Firm R	*	*	*		*	*	*	*	
Firm S	*	*	*	*	*			*	
Ports									
Firm T	*								
Shipping									
Firm U		*							*

Firm V		*	*					*	
Ports and shipping									
Firm W	*	*	*	*	*	*		*	
Firm X		*	*	*	*	*		*	*
Firm Y	*	*	*		*				*
Yacht building									
Firm Z		*	*		*		*		
Total frequency	11	17	18	11	22	7	8	13	6

Table 4-7 shows that the vast majority of leader firms transfer knowledge to other firms in the cluster. Furthermore, the majority acts as a lead user and creates new standards. Only a limited number of leader firms invest in the organizational infrastructure, enable internationalization of other firms in the cluster and contribute to the reputation of the DMC.

4.5 Leader firm behavior in the Dutch Maritime Cluster; survey results

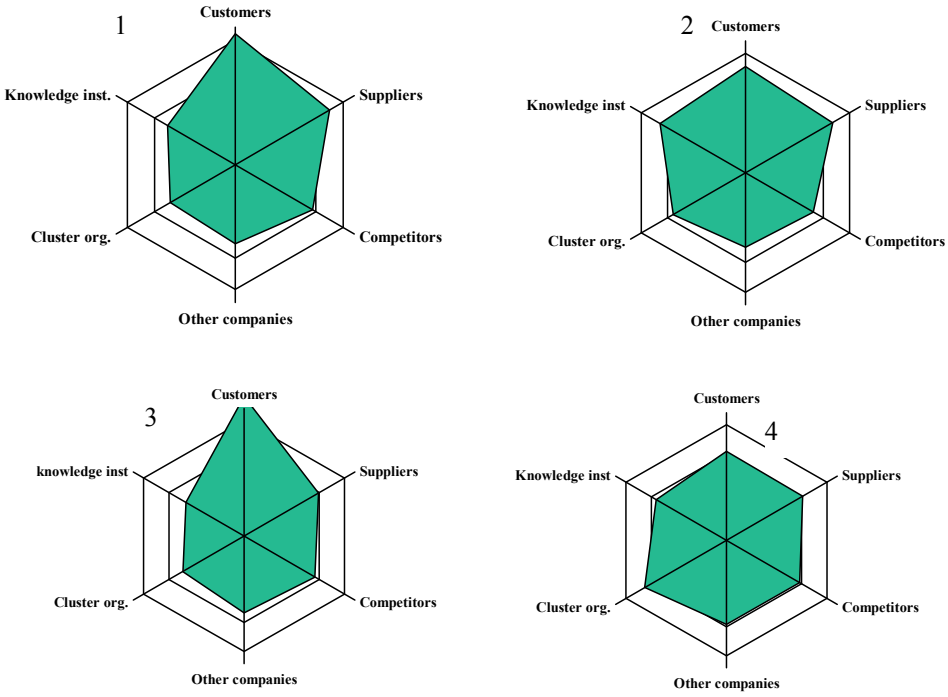
The senior managers of the 26 leader firms that participated in this research were asked to answer a small set of survey questions. 18 of the 26 senior managers filled out the survey.

The networks of the leader firms are the starting point for the analysis of their role in the cluster and their impact on other firms. In general, the more a leader firm's networks are embedded in the DMC, the higher the impact of its investments. We distinguished four relevant networks: the production network, the innovation network, the internationalization network and the labor market network[13].

In these networks the partners are categorized in six groups: competitors, suppliers, customers, other companies, knowledge institutions and associations. The importance of these actors differs between the networks. Figure 4-8 shows the relative importance of actors in the different networks, according to the leader firms.

[13] This network contains the actors that are involved in the recruitment and education of employees and in promoting the maritime industry as a work-environment.

Figure 4-8: Relative importance of different actors in 1 production, 2 innovation, 3 internationalization and 4 labor market networks



Customers and suppliers are the most important partners in the production and internationalization networks. It is to be expected that these are the actors with whom the most interaction exists. Some remarkable differences can be seen between the networks. For example the role 'other companies' play in the networks. While the forming of new combinations, for which these companies are important, is a known source of innovations, the relative importance of these companies is the least in the innovation networks.

Cluster organizations are relatively the least important parties in most networks, except for the labor market network, where they contribute to education and promotion activities.

Not all these networks have the same geographical setting; some are more internationally orientated than others. The main difference was found between the production and innovation network. 50% of the surveyed companies indicate that their international production networks are equally important or more important than their local production network. The innovation networks are more locally embedded: 55% of the respondents

said their innovation network is strongly embedded in the cluster, 40% indicate local embeddedness is moderate and 5% indicate this network is not embedded in the cluster.

The survey results show that the majority of the leader firms contribute to the innovative capabilities of other firms in the cluster. Table 4-8 shows how various leader firms encourage innovation.

Table 4-8: Ways of stimulating innovations

Act as 'lead user'	17 of the 18 LF's play this role
Share knowledge and innovation	17 of the 18 LF's play this role
Involve suppliers in innovation projects in an early stage	14 of the 18 LF's play this role
Providing finance for innovation projects	12 of the 18 LF's play this role
Management of innovation networks	11 of the 18 LF's play this role

Acting as a lead user and sharing information and knowledge are the two most common ways to stimulate the innovativeness of other firms. These are the least costly in terms of money and effort. The least used methods, financing joint innovation projects and managing these projects, are still used by more than 50% of the leader firms.

Suppliers benefit the most from innovative behavior of the leader firms. For the leader firms, innovative suppliers are important to maintain a high standard in the products and production.

The leader firms also encourage internationalization of other firms, again predominantly suppliers. Table 4-9 shows ways in which leader firms support internationalization of suppliers.

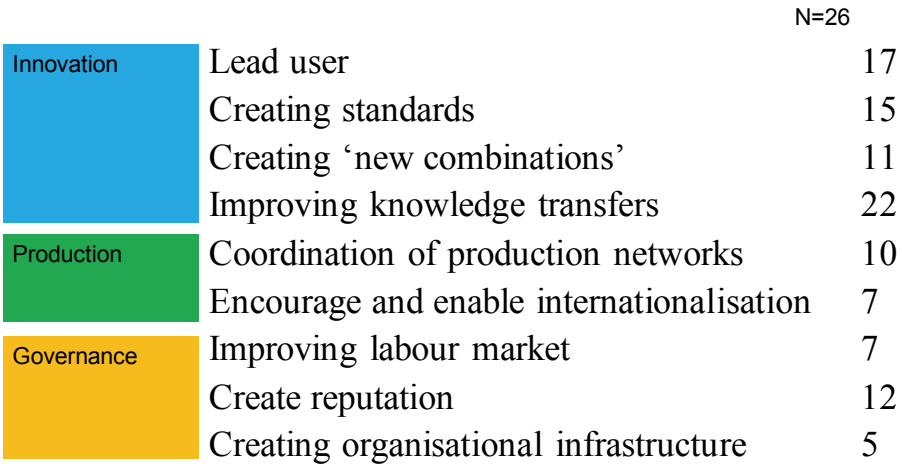
Table 4-9: Ways to support internationalization

Co-invest in foreign facilities	4 of the 16 LF's play this role
Offer location on-site	5 of the 16 LF's play this role
Act as 'matchmaker'	2 of the 16 LF's play this role

4.6 Conclusions

The case studies in the Dutch Maritime cluster lead to an overview of forms of leader firm behavior relevant for maritime companies in the Netherlands. Summarizing the results of the literature and explorative research nine forms of leader firm behavior are identified, that can be categorized in three themes. Most behavior can be termed innovation enhancing behavior. Two types of behavior are directly related to the production network. Three types of behavior have effects for the cluster as a whole and are part of the cluster governance.

Figure 4-9: Forms of leader firm behavior



Judging from the cases the most important function of leader firm behavior is enhancing innovation and the most important relation is the buyer-supplier relation. In the following chapters this function and relation are the leading issues for further analysis of leader firms in the Rotterdam Port Cluster.

5 Leader firms in the port of Rotterdam

In this chapter the business community in the port of Rotterdam is described and analyzed. First the definition and the boundaries of the port cluster are discussed. Second, the ownership structures in the port of Rotterdam are described. Third, the leader firms in the port of Rotterdam are identified.

5.1 Functional boundaries of the cluster

The functional borders of a cluster are defined by the activities of companies. In policy documents and some studies on seaports the port cluster is defined rather broad (see De Langen, 2004). This broad definition includes various manufacturing activities that are termed port dependent. It leads to four categories of companies:

1. Pure port companies: companies that can only exist in a port, such as stevedoring and maritime services.
2. Port related companies: firms that are related to the core port activities (shipping and stevedoring) but could also be located on a non-port location.
3. Port dependent companies: Companies that depend on deep draft water or direct sea access for their activities. These include companies in off-shore construction and shipbuilding.
4. Port using companies: Firms that use the port-area as location because they use a substantial amount of sea transport for their inputs or exports. These firms include chemical and steel producers.

Studies on port clusters that include all four categories take the viewpoint of port management (De Langen, 2004a, 2004b and De Langen & Visser, 2005). The fourth category is included mainly because these companies are located on land that is leased from the port authority and they have shared interest with other companies in the port, such as infrastructure and safety.

In the study at hand the level of analysis is that of interrelations between companies, and the port management is only of secondary importance. Furthermore, the interrelations between companies in category 4 and those in other categories are limited, both in commercial and in knowledge exchange. The choice of the relevant activities is therefore made differently. In line with the cluster study of De Langen (2004), but excluding the

(petro)chemical industry, the activities shown in Table 5-1 are considered port (related) activities.

Table 5-1: Activities included in the cluster delimitation

BIK-Code[14]	Industry
351	Shipbuilding and repair
6010	Rail transport
603	Transport by pipeline
6110	Sea transport
6120	Inland navigation
602	Road transport
63111	Stevedoring for Sea-vessels
631121	Stevedoring for inland navigation
631211	Storage in tanks
631221	Storage in cold stores
631231	Other storage
6322	Other services to transport over water
634	Forwarders and ship agents

5.2 The Rotterdam Port Complex

The Rotterdam port Cluster consists of all activities that are related to the handling of ships and cargo. The core is formed by the stevedoring activities; this activity is the geographical link to all other port related activities. The stevedoring function attracts other functions related to the cargo, such as logistics and trade. Te presence of stevedoring activities obviously attracts ships, which makes the port a good location for activities that are related to ships, such as repair and bunkering[15].

The total cluster consists of companies active in stevedoring, transport, logistics, manufacturing and trade. All stevedoring activities are included, as well as all transport and logistics companies that are located in the Rotterdam port region. Although some of

[14] `BIK codes are the classification codes used by the Dutch Chamber of Commerce

[15] Providing ships with fuel

these companies might not be (completely) port related, based on the enormous size of the port compared to the city this part is assumed very limited.

Manufacturing companies that are included are those companies that are dependent on deep water, making a port a logic place to locate, and produce port or maritime related products, making it likely that the firm is part of (knowledge) networks in the port cluster. Last, some trading companies are included in the cluster, mainly companies that trade in goods that are used by the maritime industry.

The selection of companies is made in the 'Bureau van Dijk Reach database of companies in the Netherlands', which includes al chamber of commerce data[16]. The activities of companies are registered as main or secondary activities; companies that report a 'cluster activity' as main or secondary activity are included in the research set. Further adjustments are made by hand by deleting companies that are included falsely (e.g.: a catering company that operates its own warehouse).

[16] This database does not include government services (such as police), but does include government owned businesses (such as the port authority)

Table 5-2: Activities in the port cluster

		Firms	Employees
Services to transport	Stevedoring	214	6.306
	Agents, forwarders and logistics	1.112	10.430
	Other services to transport	348	3.801
Transport on water	Sea	178	3.753
	Inland	1.316	5.377
Transport on land	Rail	11	276
	Road	1.087	9.616
	Pipelines	3	38
Production / industry	Shipbuilding	171	3.949
	Construction	6	213
	Production of machines	33	125
	Other production	24	106
Trade and Wholesale		204	880
(Advanced) producer services		105	935
Grand Total		**4.812**	**45.805**

Source: calculations based on: Bureau van Dijk, Reach database, 2009

5.3 The relevant cluster region

The geographical boundaries of the cluster are based on the size of the port related industries and specialization of the areas in the proximity of the port. Areas can be defined by legal borders such as municipalities and by postal codes. To make a judgment about the best level to define a port cluster both levels are analyzed. In cluster studies, sometimes the absolute number of firms is used as a measure, sometimes the specialization rate and sometimes the value of production in a specific industry. In this study for every area that

includes or borders the primary port activities and the connecting waterways[17] the following variables are calculated:

- The number of port firms
- The number of port related employment
- The specialization in port firms
- The specialization in port employment

Areas that show a relative high concentration of port activities, both absolute and relative, are included in the port cluster. The Dutch average is the reference for the level of specialization.

Table 5-3: Average specialization in maritime and port activities in The Netherlands

Total employment	Total firms	Port and maritime employment	Port and maritime firms	Specialization port employment	Specialization port firms
7.008.569	1.149.162	122.509	13.568	1.75 %	1.18%

The absolute amount of port activities and the specialization rate differ per area. This implies that a decision has to be taken about the appropriate measure. From an economic perspective the absolute number of firms is the most important, since cluster benefits are based on the number of related and supporting firms and are considered independent from activities in other clusters in the same region. However, the specialization rate is of importance from a governance and government perspective. An area with a high concentration of port activities is more likely to have a government that is also 'port minded' because the economy of the municipality is dependent on the 'well-being' of the port cluster. A measure of an area belonging to a cluster should thus include both elements size and specialization. For the Rotterdam port area this is calculated by multiplying the specialization rate in port labor with the logarithm of the number of employees[18].

[17] The delimitation is largely in line with De Langen (2004), although the port area of Moerdijk in North-Brabant is excluded because it has a different sea-entrance than Rotterdam and is focussed on chemical industry which is not included in this study.

[18] The natural log is taken because the number of employees is a scale with both small and very large numbers.

Port specialization of Municipalities

The concentration of port companies and employment per municipality is given in Table 5-4.

Table 5-4: Concentration of port activities per municipality

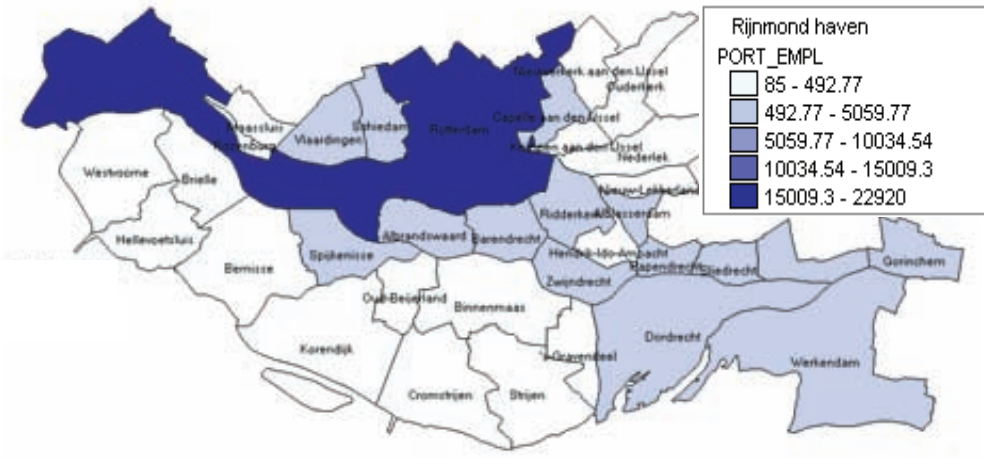
Municipality	Port firms	Port employment	% port firms	% port employment	Cluster score
Albrandswaard	168	2248	12.4	30.9	275
Rozenburg	25	413	5.2	18.7	144
Rotterdam	1711	22920	4.0	7.9	99
Zwijndrecht	312	1663	11.5	10.0	97
Werkendam	223	868	10.6	10.8	97
Hardinxveld-Giessendam	71	810	5.7	9.9	89
Ridderkerk	201	1513	6.5	8.0	78
Strijen	30	217	4.6	9.6	74
Spijkenisse	100	1503	3.4	7.4	74
Ouderkerk	59	219	10.7	9.3	72
Alblasserdam	67	554	5.5	7.7	69
Nieuw-Lekkerland	32	134	8.0	9.1	67
Papendrecht	90	856	5.3	7.0	66
Nederlek	57	272	6.2	7.5	62
Hendrik-Ido-Ambacht	103	488	6.5	6.8	60
Barendrecht	153	1221	4.5	6.1	60
's-Gravendeel	49	210	8.0	7.6	60
Sliedrecht	65	651	4.2	5.8	54
Krimpen aan den IJssel	139	478	8.1	6.0	54
Binnenmaas	53	314	4.0	6.0	52
Schiedam	127	1965	2.7	4.6	49
Gorinchem	69	992	2.7	4.9	48
Vlaardingen	78	903	2.1	4.6	46
Dordrecht	308	1885	4.1	3.8	41
Brielle	38	203	3.3	4.6	38
Bernisse	31	149	3.9	4.7	38
Cromstrijen	43	197	4.2	4.5	38

Hellevoetsluis	78	334	3.8	4.1	37
Korendijk	21	85	3.0	4.4	33
Maassluis	42	223	2.7	3.7	32
Westvoorne	36	116	3.4	3.1	26
Nieuwerkerk a.d. IJssel	53	150	3.6	2.2	19
Capelle aan den IJssel	150	929	3.4	1.6	18
Oud-Beijerland	30	122	1.8	1.1	10
Total / Average	**4812**	**45805**	**5.28**	**7.18**	**64**

Source: calculations based on: Bureau van Dijk, Reach database, 2009

Figure 5-1 gives a visualization of port (related) employment in the Rijnmond area. By far the most employees work in the port areas that are part of the municipality of Rotterdam; the second place in number of port related employment is Albrandswaard with only 1/10th of the number of people employed in Rotterdam.

Figure 5-1: Port related employment per municipality



Source: Authors calculations based on database of companies in the Netherlands by BvDijk(2009)

Figure 5-2 shows the number of port related firms per municipality, which shows a bit more even spread than the number of employees, indicating that Rotterdam locates the relatively large port firms.

Figure 5-2: Port related firms per municipality

Source: Authors calculations based on database of companies in the Netherlands by BvDijk(2009)

Figure 5-3 shows that the specialization in port employment, expressed as the percentage of total employment, differs from 1% to 30%. Besides the areas that are part of the deep sea port, the municipalities east of Rotterdam show a relative high concentration of port related employment. These are municipalities that are located along the rivers running between hinterland and seaport.

Figure 5-3: Rijnmond region specialization in port employment (% of total employment)

Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

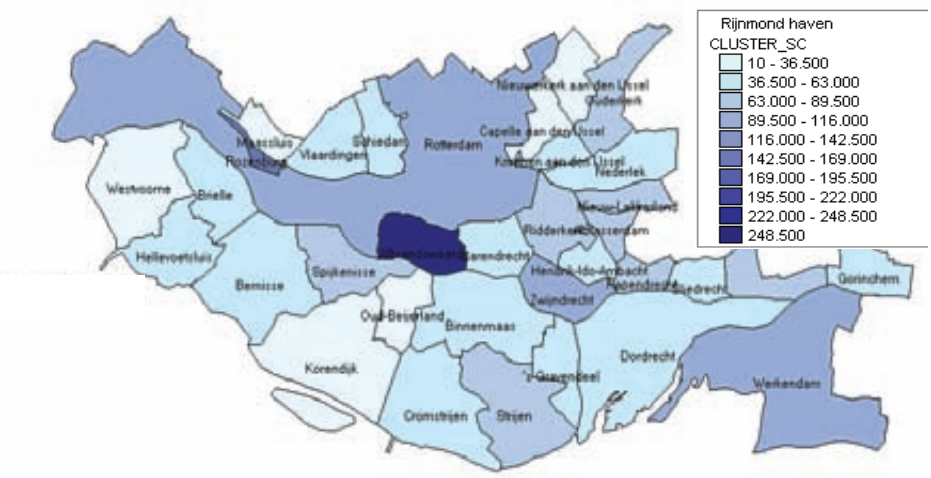
Figure 5-4 shows what part of the total number of firms in each municipality is port related. The communities with many small firms, often specialized in inland shipping and transport planning like Zwijndrecht and Werkendam are the most specialised.

Figure 5-4: Rijnmond region specialization in port firms (% of total firms)

Source: Authors calculations based on database of companies in the Netherlands by BvDijk(2009)

Figure 5-5 shows the combination of absolute number and specialization for each municipality, giving an indication of both the relevance this municipality has for the port cluster and the importance of port activities for the economy of the municipality.

Figure 5-5: Municipalities cluster score (% port employment* LN of port employment)



Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

Port specialization postal code area

Because the municipalities are not of the same size, comparing them on port specialization does show how important the port is for the municipality, but does not give a complete picture of the clusters structure.

On the level of 3 digit postal codes the concentration of port activities is more precise and shows where the most port oriented locations are. The figures show that the port area of Rotterdam is, off course, very specialized. The centre of Rotterdam on the other hand shows a relatively low number of port firms and employment. The most port firms locate in the Waal-Eemhaven area in Rotterdam, where many stevedores locate Note that chemical industries are left out of the definition of the port cluster.

Figure 5-6: Number of port firms per pc3 code

Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

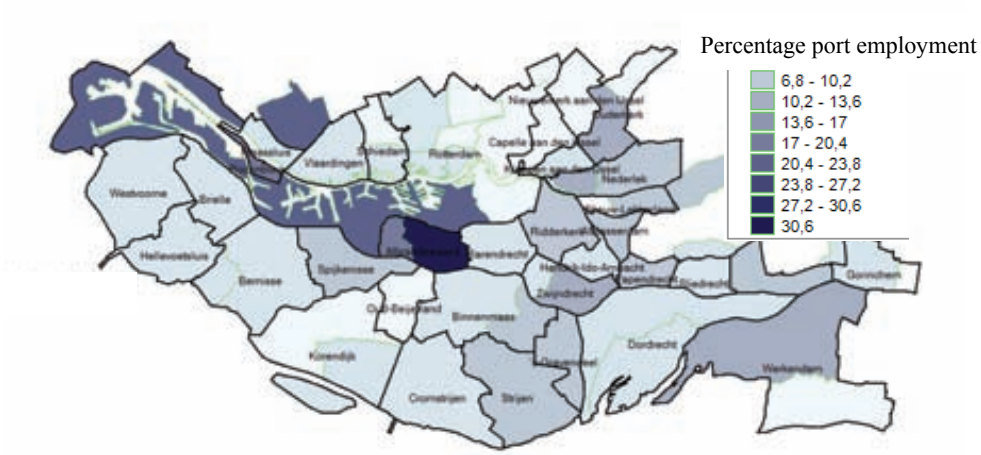
Measured in port related employment, the port areas in Rotterdam clearly are the centre of the cluster.

Figure 5-7: Port employment per pc3 code

Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

In terms port employment the port areas of Rotterdam and the town Rhoon in Albrandswaard, where many ship agents and transport companies locate, are the most specialized areas in the cluster.

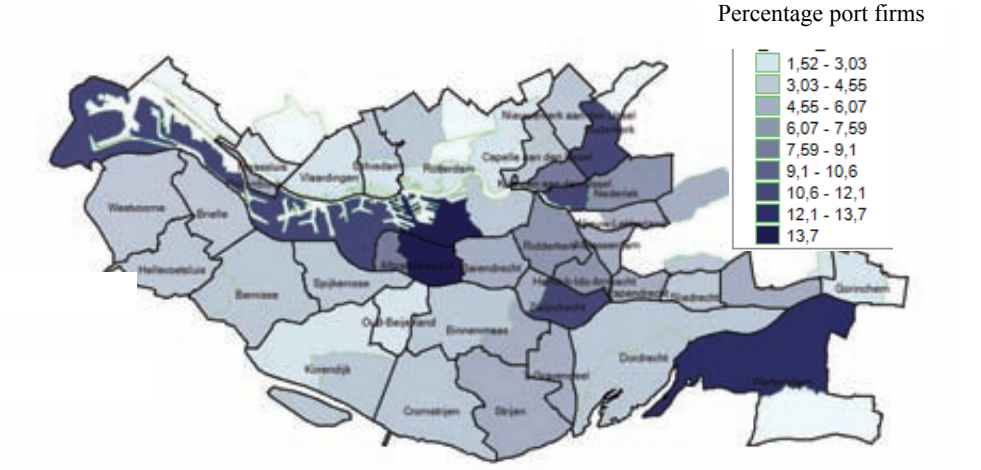
Figure 5-8: Specialization in port employment per pc3 code



Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

The specialization rate measured in port firms shows that the areas that contain the smaller firms in the Waal-Eemhaven and places east from the port are the most specialized.

Figure 5-9: Specialization in port firms per pc3code



Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

The cluster score, the measure defined to show the cluster relatedness, applied to the 3 digit postal code areas gives the most precise outline of the cluster structure. It shows that next to the port areas the locations along the main rivers are typical port cluster locations. The urbanized areas of Rotterdam, Capelle and Dordrecht show little cluster relatedness, offices that are located in these areas are seldom port related.

Figure 5-10: Cluster relatedness of pc3code areas (% port employment x LN port employment)

Source: Authors calculations based on database of companies in the Netherlands by BvDijk (2009)

5.4 Owners of port assets

In the discussion about *leader firms* an important question is 'who is in control?'. Besides other qualities one aspect of leader firms, having economic power, is a basic precondition. The port of Rotterdam consists of many firms, between 3000 and 5000 depending on the definition of the port cluster. In this paragraph we describe what the most influential companies in the port of Rotterdam are, based on the controlled assets.

The leader firms in the port of Rotterdam are important players that have an influence on the development and competitiveness of the port cluster. At the same time, many business units in the port of Rotterdam are part of an international group of companies. The behavior of the companies in Rotterdam is thus influenced by international development and decisions made by international companies. A leader firm in the port today might change its behavior tomorrow because an investment or disinvestment decision was made

by a parent company. To have a view on possible development of the leader firms in Rotterdam we have to know who is making the decisions, and thus 'who owns the port?'

The ownership of the companies in the port is analyzed by looking at the shareholders of the companies. These shareholders can be natural persons, investment companies and banks, and producing companies. Based on these shareholders we can characterize the firms and might gain understanding about the behavior of the leader firms.

Being in control, we interpret as having a majority share in a company. While this does not always mean that you have absolute control over the way a company does business, it does show the possibility to influence the management and gives the possibility to steer the strategy of the firm, especially concerning investments.

The following companies can be distinguished:

- Fully owned by private persons, often director-shareholders
- Owned by investment companies / banks
- Owned by a national mother company
- Owned by a foreign mother company
- Listed at the stock exchange, fragmented shareholders
- Listed at the stock exchange, dominant shareholder

We expect the shareholder structure to have an impact on the behavior of the firm. Largely because the shareholder structure determines the level of independency of the executive management in making decisions about investments and strategy.

From a database of companies in the port, we selected all companies with more than 5 employees, registered with the chamber of Commerce (compulsory for doing business in the Netherlands). The companies selected are active in transport, stevedoring, or logistics according to their registered BIK codes of industry[19]. This results in a list of 874 companies. Total assets of these companies add up to €23.153.757.000. These companies have 724 external shareholders (not being the management or owner-director).

To judge the influence of the shareholders we multiply the share they have in the company by the total assets in that company. International activities are completely filtered; the reported assets include some overseas activities of companies, but only for those

[19] Note that this study does not include manufacturing often found in ports, such as chemical industry and steel production.

companies that have Rotterdam as their worldwide headquarters. Table 5-5 shows the direct shareholders in the port. These companies might have shareholders of their own with a controlling share. These ultimate shareholders are presented in a later table.

Table 5-5: Largest shareholders in the port of Rotterdam

Shareholder	Country	Controlled assets (X € 1000)
Municipality Rotterdam	NL	2,430,182
A.P. Möller - Maersk A/S	DK	1,736,371
Hal Holding N.V.	NL	815,265
Hutchison Whampoa Limited	HK	779,590
Apl Logistics Ltd	SG	182,894
Aviva Plc	GB	132,717
Odfjell Terminals Asa	NO	130,579
Schenker (Bax) Europe Holding Gmbh	DE	119,472
Nichirei Logistics Group Inc	JP	97,109
Kuehne Und Nagel International Ag	CH	94,242
Stena Line Holding B.V.	NL	89,634
Nile Dutch Holding B.V.	NL	79,438
Damen Holding	NL	79,288
Hoyer Nederland B.V.	NL	77,636
Jp Morgan Chase & Co.	US	58,630
Smit Internationale N.V.	NL	56,770
T.W.E. Beheer B.V.	NL	55,086
Broekman Beheer B.V.	NL	52,152
Atorka Group	IS	48,963
Berg Shipping B.V.	NL	48,902
Thyssenkrupp Ag	DE	48,461
Ing Groep N.V.	NL	48,113
Koninklijke Vopak N.V.	NL	38,773
Peninsular And Oriental Steam Nav. Company	GB	37,303
Bank Of America Corporation	US	37,189

Arklow Shipping Limited	IE	35,793
Lbc	FR	32,324
Schenk-Papendrecht Beheer B.V.	NL	32,265
Cma Cgm Holding B.V.	NL	26,854
Kotug International B.V.	NL	26,524
Neele Groep B.V.	NL	24,141
NYK Holding	JP	23,481
Sealiner Holding Bv	NL	23,402
H.E.S. Beheer N.V.	NL	23,146
Geodis Wilson Holding Ab	SE	22,174
Visbeen Holding B.V.	NL	22,005
Saybolt Holding B.V.	NL	21,631
Rensen Beheer B.V.	NL	21,484
Den Hartogh Holding B.V.	NL	20,033
Van Uden Group B.V.	NL	19,361
Ers Holding B.V.	NL	19,126
Sca Transforest Ab	SE	19,059
Van Der Vlist Transportgroep B.V.	NL	18,923
Agro Delta Groep Van Vennootschappen	NL	18,845
Ebrex Holding B.V.	NL	17,012
Henry Bath & Son Limited	GB	16,888
Samskip Hf	IS	16,557
Touax Sa	FR	16,281

Source: calculations based on Reach database, Bureau van Dijk (2008)

With some distance to the number two, the largest asset owner in the port of Rotterdam is the municipality, as the largest shareholder in the port authority. Other large shareholders in the port are the A.P. Möller group and Hutchison Whampoa. These companies are owners of the largest container terminals in the port. HAL holdings is the largest investment company with a stake in the port, they are a majority shareholder in Royal Vopak. Other large investments in port companies are made by Aviva and JP Morgan Chase. They invest in Smit International and Royal Vopak, both listed at the Amsterdam

stock exchange. In the rest of the list primarily logistic companies are present that have subsidiaries in the port of Rotterdam who own warehouses or a fleet of trucks.

Ultimate shareholders

Most large companies are owned by a series of shareholders, who in their turn might be owned by shareholders with a controlling investment. By following the path of all controlling shares of 25% or more the ultimate shareholders of the companies in the port are be found. The following table show shows the most important ultimate shareholders of the companies in the port of Rotterdam, and in how many companies they have a share.

Table 5-6: Ultimate shareholders in the port of Rotterdam

Ultimate Shareholder	Sum of controlled balance (X € 1000)	Number of organizations
Municipality Rotterdam	2,439,028	2
A.P. Möller - Mearsk	1,736,371	8
Unknown	1,379,666	343
Hutchison Whampoa Limited	795,500	2
Kuehne Holding Ag	188,484	4
Government Of Singapore	182,894	1
Bundesministerium Der Finanzen	149,140	5
Odfjell Asa	132,904	3
Smit Internationale N.V.	113,540	5
Nichirei Logistics Group Inc	97,109	1
Thyssenkrupp Ag	96,922	2
Cornelder Holding	89,947	9
Brännö Brygga Advokat Ab	89,634	1
Nile Dutch Holding B.V.	79,438	1
Damen Shipyards Group N.V.	79,288	5
Hoyer Nederland B.V.	77,636	1
Koninklijke Vopak N.V.	77,546	4
Dp World	74,606	2
Shiela Mary Tyrrell	70,821	2

Ólafur Ólafsson	67,030	4
Broekman Beheer B.V.	58,232	9
Vepex Holding Bv	57,880	3
Interbulk Group Plc	49,708	2
Betz, Willi	48,454	2
Challenger Financial Services Group Limited	32,324	1
Grand Total	**12,368,811**	**974**

For a large part, the ultimate shareholders are the same as the direct shareholders, for example Hutchison and City of Rotterdam. Further, the table shows some well known names in international transport. Like Kuehne, Odfjell and Smit. Interesting parties in the list of ultimate shareholders are the governments of Singapore, who has a controlling interest in APL, and the German government that has a controlling interest in five companies.

The influence of these companies might differ from direct managerial control, as is the case with A.P. Moller/ Maersk, to indirect influence by investment policies. The latter group of shareholders might influence what is happening in the port of Rotterdam by investing or disinvesting in port(related) companies, in this way increasing or decreasing the capital that is available for the port industry.

The ultimate shareholders are clearly a set of international companies. A further analysis of these companies leads to information about the home countries of the foreign investors in the port of Rotterdam. Table 5-7 shows the origin of the ultimate shareholders in the port of Rotterdam.

Table 5-7: Origin of ultimate shareholders in the port of Rotterdam

Country	Number of stakes	Assets controlled
Netherlands	485	4,152,997
Denmark	11	1,744,736
China	3	1,590,301
Germany	19	331,880
Switzerland	7	194,401
Singapore	5	187,145

Japan	9	167,004
Norway	4	136,095
Sweden	4	131,525
United Kingdom	13	99,591
United Arab Emirates	2	74,606
Iceland	5	72,014
Ireland	2	70,821
France	4	45,175
Belgium	18	37,983
Australia	1	32,324
Lebanon	2	27,436
Netherlands Antilles	4	16,864
Italy	4	14,140
South Africa	2	11,477
Finland	2	10,316
Israel	1	9,849
Virgin Islands, British	2	9,821
Kuwait	1	6,305
Cayman Islands	1	5,550
Liechtenstein	2	5,306
Malaysia	1	3,242
Korea, Republic of	1	1,437
United States	1	1,067
Luxembourg	4	24
Bermuda	1	0
Unknown or family owned		1,379,755
Grand Total	974	12,368,811

Still, by far the most assets are controlled by companies of Dutch origin. However a substantial part of the Rotterdam port is under direct or indirect control of firms or governments from other countries, primarily other European countries and the large Asian economies. There is a notable absence of American shareholders in the port.

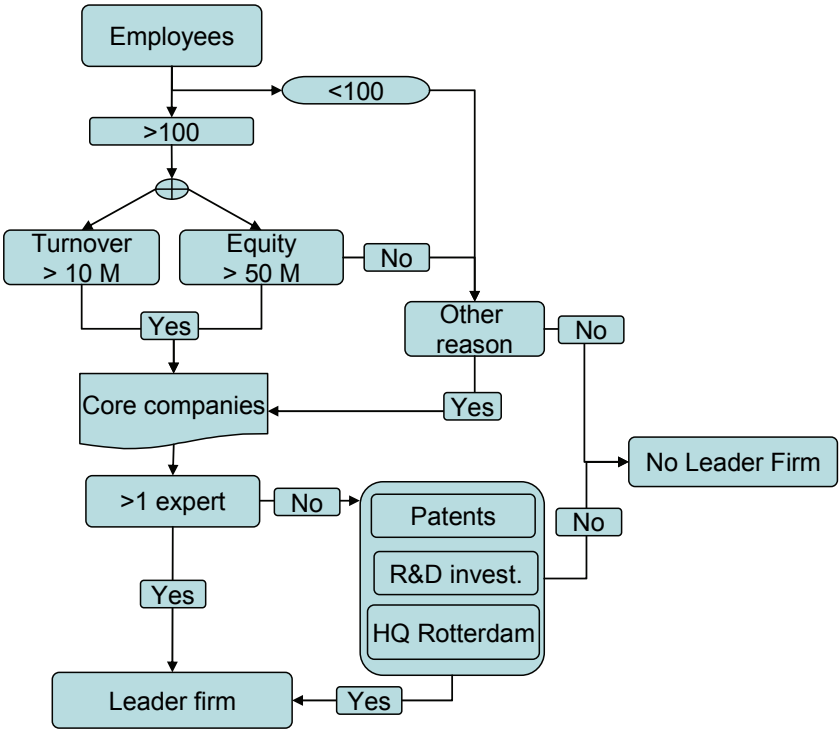
The list of shareholders and controlling firms is merely a list of Core Companies, firms that have a central position in or for the port. It does not show whether these core companies are also Leader Firms. For a judgment about leader firm behavior, more information about the characteristics of the companies is needed.

5.5 Selecting leader firms

In this paragraph the core companies in the port of Rotterdam are selected of which one could expect that they show leader firm behavior. This expectation is based on the theoretical characteristics of leader firms that were identified in chapter 4.1.

The activities that take place in the port of Rotterdam vary from stevedoring to manufacturing. In this study we include those activities that are water and transport related. In previous research (Nijdam & De Langen, 2006) it was found that the companies in non-maritime manufacturing, such as chemical production and oil refinery, are poorly connected with the other port related companies when it comes to innovation and sharing knowledge. Since the main characteristic of leader firms is the creation of external effects, and in relations with suppliers the external effect is often knowledge spillover, we expect the leading chemical companies not to have a leader firm impact on the port and maritime business. The selection of leader firms follows the steps in Figure 5-11.

Figure 5-11: Selection process of core companies and leader firms



Applying this selection to the 4812 organizations[20] that are registered with the chamber of commerce as located in the Rijnmond area and involved in port related activities leads to the results in Table 5-8.

[20] This also includes local subsidiaries and separate locations of the same company. The number of organisations is therefore overstating the actual number of companies.

Table 5-8: Number of firms that meet the core company criteria

Criteria	# Companies
>100 employees	103
>10M turnover	130
>50M equity	73
>10M turnover OR >50M equity	152
>10M turnover * > 50 M equity * >100 employees	38
>10Mturnover * >100 employees OR >50M equity * >100 Employees	73

The number of 'core companies' in the Port of Rotterdam is 73. These are companies that have more than 100 employees and have a total equity of more than 50 million euro or a net turnover of more than 10 million euro. There are only 38 companies that meet the three criteria simultaneously.

To finalize the leader firm selection, experts[21] were interviewed about what they think are the companies that act as leader firms in the port. By these experts 27 companies were identified as leader firms in the port of Rotterdam. A company is included in the list when two or more experts considered the company a leader firm. The table below shows the 27 companies that are potentially leader firms in the Port of Rotterdam. The shaded lines in the table represent the companies that participated in the research. Companies marked with * are included partly in the research, because they did not cooperate in full case studies but did provide enough information to be included (partly) in further analysis.

[21] Experts include four directors of cluster organisations, 2 ceo's of large port firms, 2 managers of the Port Authority, 1 specialised port consultant

Table 5-9: Identified leader firms in the port of Rotterdam

Name of company		Name of company
APM Terminals Rotterdam BV		Interforest
Argos Groep B.V.		Jo Tankers BV
Bakker Sliedrecht Electro Industrie B.V.		Keppel Verolme
Boskalis*		Koninklijke Vopak N.V.
Broekman Group		Kühne & Nagel N.V.
EECV		Mammoet Nederland B.V.
Europe Container terminals*		Maersk lines
Europees Massagoed Overslagbedrijf (EMO) B.V.		Odfjell Terminals (Rotterdam) B.V.
Gevelco		Samskip
Havenbedrijf Rotterdam		Schenker International B.V.
Hoyer Nederland B.V.		Seabrex Rotterdam B.V.
Huisman Itrec		Smit Internationale N.V.
IHC Merwede		Van Oord*
Imtech*		

5.6 Characteristics of the leader firms

The table below shows the characteristics of the analyzed leader firms. These fifteen firms vary in size and business model. The smallest leader firm has 250 employees, the largest employs 2200 people in the Rijnmond area. The local connections of the firms also differ; one company buys 95% of all its input in the Rijnmond region while other companies only scarcely buy in this region. On average leader firms buy 45% of their input from local suppliers. The clients of the leader firms are generally of a more international nature, on average only 17% of the turnover is production for clients located in Rijnmond[22].

[22] Note that service delivered in Rijnmond to an international company (e.g. a shipping line) is considered export in economic statistics.

The number of suppliers that is located in Rijnmond and is important for the production process of the leader firm ranges from nil to eight. The percentage of the input that these important, local suppliers provide is average 31% but ranges from zero to 80%. Average owners' equity of the leader firms is almost 68 million euro. The minimum owners' equity is 82 thousand euro, for a company that is financially fully under control of the shareholders. The turnover of the companies ranges from 70 million to 700 million euro's. The profit resulting from this turnover is on average 9%.

	Number of cases				
2006	**Valid**	**Missing**	**Mean**	**Min**	**Max**
Employees	15	0	799	250	2200
Export_percentage	12	3	58	10	100
Purchasing_quote	12	3	0,53	0,2	0,96
% Supplies_from_region	15	0	45	2	95
Number_suppliers_rijnmond	15	0	3	0	8
%_input_from _prime_suppliers_rijnmond	14	1	31	0	80
Number_prime_suppliers_dependent	15	0	0,3	0	2
%_turnover_Rijnmond	15	0	17	0	65
Owners_equity (X1000 €)	13	2	67.664	82	288.638
Total_equity (X1000 €)	13	2	241.931	25.670	795.500
Net_turnover	14	1	291.461	70.301	704.896
Profitmargin	15	0	9	-0,17	19,05

Part III: Supplier relations and innovation; theory and cases in Rotterdam

6 Buyers, suppliers and innovation

In the previous chapters the different leader firm effects are described. These effects are often related to innovation and involve a buyer supplier relationship. Especially the relation between a leader firm and a supplier in product development shows leader firm effects. This chapter discusses theory and examples of buyer-supplier relations and innovation. In chapter 7 and 8 the relation is explored further by in depth research on the relations between leader firms and their suppliers in the Rotterdam port complex.

6.1 Relations with suppliers

When deciding how to deal with supplies companies have several options. First of all the buyer should decide whether or not he needs a supplier at all. Maybe it is possible or even better, to produce the product or service in-house.

Aspects of purchasing management

Within a company, the managing of the purchasing process has an influence on different aspects of the company. First, purchasing must make sure that the supplies are acquired for the lowest price. In doing so it contributes to the profit margin of the company.

Second, the purchasing should structure the dependencies of a company. In a situation where there is a common product that is only needed occasionally, buying is the best option. Things change however when the product becomes more specific for a company or the frequency of the demand rises. In these cases, making the product yourself might be a better option. Making instead of buying avoids transaction costs and prevents being over-dependent on one supplier that might abuse this dependency (Williamson, 1975). Within the purchasing function, having an overview of the dependencies and managing this is an important task.

Third, purchasing management involves selecting suppliers not only on their capability to deliver products or services, but might also include managing the supplier base with product- or market development in mind. So, the purchasing function in a company also has a long term responsibility.

Transaction costs economics

Buying from suppliers means that there is a transaction between two companies. Each transaction brings costs with it, for example when searching for the right supplier and

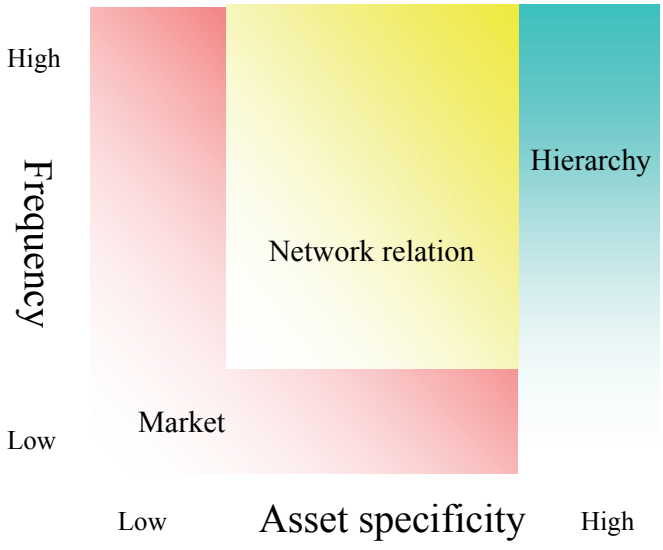
negotiating contracts. Wiliamson (1975) started from this notion in developing the transaction costs economics to explain behavior in interfirm relationships.

The higher the transaction costs, the more likely it is that a firm will 'make' instead of 'buy'. These transaction costs are dependent on the characteristics of the transaction; mainly on the frequency of the transaction and the specificity of the assets that are involved.

The frequency of the transaction determines the total costs because transactions that take place often can be incorporated in one agreement. The costs per transaction stay low because there is no need to find a supplier for every transaction and no costs are made for negotiations.

High asset specificity means that there are no alternative uses for the assets that are involved in the transaction. As a result the buyer and seller are strongly connected. The investments are made specifically for a (series of) transactions between two parties. When the relation is terminated the investments are immediately depreciated. For a supplier who makes such investments, this can lead to high dependence and the possibility of opportunistic behavior of the buyer (Nooteboom, 1990). The buyer can threat the supplier to end the relationship, and thereby making the investment worthless. Figure 6-1 shows how frequency and specificity lead to network relationships.

Figure 6-1: Factors determining market networks and hierarchies



In the case of low frequency and low specificity it is likely that all transactions are market transactions. There are no specific investments necessary, the product is widely available. A low frequency means that there is no need to establish a relationship.

With medium asset specificity, forming of network relations is more likely because there is a need for some control over the assets. If at the same time the frequency grows, the forming of network relations is likely from a cost perspective.

In the case of high asset specificity, the risks associated with the transaction can reach unacceptable levels for both the supplier and the buyer. In this case it is likely that a company will choose to make the product or service in-house, and place the activity in the company hierarchy.

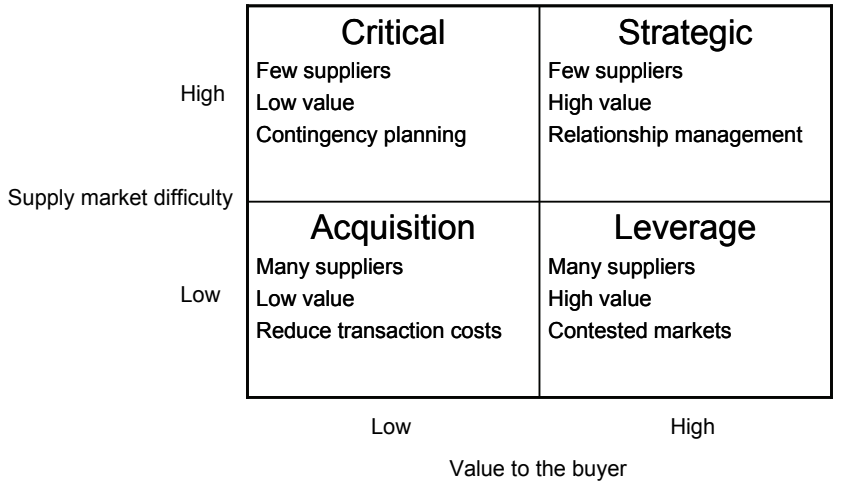
Power and leverage in buyer supplier relations

Specific interest is paid by Williamson (1985) to the power balance in the buyer supplier relationship. Whenever there is a network relation or a collaborative setup of the buyer-supplier relationship there is a chance of abuse of this relationship. Collaboration can confront buyers with the problem of a supplier that is behaving opportunistic, while the buyer is suffering from bounded rationality. This may lead to a shift in the power balance. From a relation that is first buyer controlled towards a relationship where the supplier creates unforeseen switching costs that limit the options for the buyer. Opportunistic behavior is then likely to occur, because the buyer becomes depended on one supplier. From the work of Williamson it follows that long term collaborative relationships between buyer and supplier are not always the ideal situation.

Portfolio approach

The dependency on the supplier is an important issue for the next decision, 'how should the buyer supplier relation be formed?' Many have tried to categorize the types of relationships with a portfolio approach, building on the initial portfolio selection method of Markowitz (1952). The Purchasing Portfolio Management approach was first developed by Kraljic (1983). This approach builds strategies for buying firms in their dealing with suppliers. Given a certain type of market and the value the product or service has to the buyer, there is an optimal strategy for the buying firm. The four basic strategies are given in the figure below.

Figure 6-2: Purchasing portfolio management strategies



Source: Cox et al (2004), based on Kraljic (1983)

The *critical* strategy should be applied in cases with products that have a low value for the buyer but are relatively difficult to obtain on the market. This means, primarily risk management is needed to avoid discontinuity in future supply. In the *strategic* box a company should focus on building relationships with the suppliers and possibly collaborate with them. On easy markets where a company buys supplies of low value, the *acquisition* quadrant, the focus should be on costs and operational improvement. In the *leverage* quadrant a company will regularly test suppliers and monitor the market closely.

Assuming that there are only four strategies towards suppliers does not do just to the complex matter, neither is it very probable that market complexity and value to the buyer are the only variables involved in deciding what strategy to follow. Moreover, judging what is 'high' and what is 'low' is not an objective procedure. Using the portfolio approach might lead to different outcomes, depending on which manager is making the judgment.

Another shortcoming of the portfolio approach for analyzing buyer supplier relationships is the focus on the buyer; the supplier side is mostly disregarded (Kamann, 2000). Also the portfolio approach is a static model; it assumes that suppliers have a certain position and that the buyer has a choice how to deal with the power and uncertainty related to that position. The portfolio approach does not take into account the possibility to use market

power to develop suppliers or to put effort in creating a more balanced power distribution in supply chains.

Nevertheless it can be a good starting point for an analysis of supplier strategy. Gelderman and Van Weele (2005, 2003) recently added to the discussion by analyzing the way practitioners use portfolio models. It appears that companies that use these models also poses what they call 'purchasing professionalism' and have the purchasing function positioned in a central position within the company, directly reporting to top management. The professionalism of the function has the strongest correlation with the use of portfolio models. In other words, when a company takes purchasing serious, it is often using portfolio models to base decisions on.

6.2 Suppliers and development

The development of suppliers and cooperation between buyers and suppliers in de developing new products, improving processes and developing markets is widely researched. This paragraph discusses the different research approaches and findings, resulting in an overview of the most interesting topics to research in the port of Rotterdam.

Claims that are made about the benefits of involving suppliers in production or new product design are amongst others: access complementary skills, economics of scale in joint research, access to new technologies and access to new markets.

Particularly the role suppliers can have in product development by early involvement of suppliers in the development process is researched. Many find a positive relation between early development and the speed or quality of the developing process.

Clark (1989) found benefits from the suppliers' know-how and a reduced development time. Ragatz et al. (1997) identified benefits regarding costs, quality and a reduced development time. The results of their study show that shared education and training, formal trust development processes, formal risk and reward sharing agreements, agreements on performance measurement and the commitment of top management from both organizations are essential factors in succeeding. These factors depend strongly on the sharing of assets and information.

Also in the design of new products the involvement of suppliers can be beneficial. The manufacturability of the product proves to be higher when suppliers are involved in an early stage (Wasti and Liker, 1997). By involving the supplier in the design of a new product, there is more knowledge about compatibility incorporated in the development

team and possible production conflicts can be recognized and resolved already in the design process.

The statements made above are intuitively appealing, in general it shows that more hands make light work and combining knowledge leads to better products and faster development. In most cases this proves to be true; however there are cases where joint development is not the best strategy. Involving suppliers in development does ask for effort of the buying company to embed the suppliers' knowledge and know-how in the process. It is imaginable that the costs of managing the process with suppliers outweighs the benefits the suppliers can bring in the development. In markets with rapid and uncertain technological development, this seems to be the case (Eizenhardt and Tabrizi, 1995). Furthermore, Hartley et al. (1997) conclude that adopting the techniques suggested in the literature will not necessarily reduce development time and lead to technical success in the project. Most development outcomes are very context dependent and are influenced by management and employees.

The apparent conclusion from the existing body of literature is that most authors assume and find a positive relation between collaboration and performance in product development, but there are also studies that show negative effects of collaboration. Apparently there are other factors that influence the success rate of joint product development. These factors might be found in the setup of the cooperation, the type of product that is developed, market conditions and the quality of the people involved.

Stimulating

The common denominator in most research is that one company stimulates another company to deliver better products or services. Stimulation can be as easy as expressing the expectations a buyer has. Leenders and Blankhorn (1988) found that suppliers are often as good as they need to be, but not better and a buyer gets what he asks for, but not more. This observation gives reason to suspect that in most buyer-supplier relationships there is room for improvement and that this improvement can be realized by just stating the possibilities from the supplier side or by expressing higher expectations from the buyer side.

Proximity

Theoretical developments in economic geography, regional economics, organizational studies and business economics over the past decades have emphasized that proximity is an

important factor in firm performance. The proximity of customers and suppliers are claimed to provide for several agglomeration or cluster effects. Empirical test show that in several cases these claims hold. Oerlemans and Meeus (2005) provide evidence on the importance of proximity for innovation. Both spatial and organizational proximity prove to be positively related to innovation outcomes and firm performance.

Knowledge spillovers

Innovation is claimed to be the prime effect of clustering (Porter 1989, Krugman 1995). Innovation that is linked with the geographical closeness of companies is often associated with knowledge spillovers, also called Marshallian externalities. These externalities do not always appear to be pure unintended sharing of knowledge. Oerlemans and Meeus (2005) state that often there are economic transactions involved, many spillovers are organized knowledge flows between knowledge institutes and firms or between firms and most knowledge flows do not enhance innovation but increase the competences of a company which might, but will not always lead to innovation. They therefore distinguish between sectoral and regional spillovers on the one hand and intentional knowledge flows on the other hand, that are organized or accompanied with an economic transaction.

Competition and cooperation

Deephouse (1999) shows that a firm has to be different and similar to its competitors at the same time. To gain a competitive advantage a company has to differentiate from its competitors, resulting in less competition because clients will perceive the product or service as unique. However, by being too different a company faces problems with acceptance in the market, the legitimacy of the company is questioned by consumers, suppliers and competitors. Empirical results show that balancing between differentiation and legitimacy improves firm performance.

Especially in a cluster context, the legitimacy argument is of relevance. Being part of a cluster can have benefits through agglomeration effects like knowledge spillovers. These spillovers, especially those associated with buyer supplier relations might be maximized when legitimacy of a firm is high. By being similar in innovation strategy to competitors and suppliers in the cluster makes it easier to exchange knowledge and to use knowledge from others.

Strategies

Companies can develop specific strategies to deal with their suppliers and possibly improve performance of these suppliers and the own operations. A concept that has developed over the last decade is that of 'supplier development' (SD). Watts and Hahn (1993) state that supplier development is a long term, cooperative effort with the aim to improve the capacity of suppliers in the field of technology, quality, delivery and cost management.

To realize improvement, particularly when aimed at multiple issues at the same time calls for a deliberate strategy towards suppliers. Krause et al. (2000) distinguish four supplier development strategies:

1. Competitive pressure: The buying party uses market power to reward the best suppliers. The best suppliers receive the most business.
2. Evaluation and certification systems: By evaluating suppliers on a regular base and give them feedback on the results the suppliers keep a closer watch on their own performance and quality.
3. Incentives: by providing financial incentives suppliers can be stimulated to show certain behavior or to invest in development. Incentives can include bonuses and shares in costs reducing improvements.
4. Direct involvement: Companies can invest directly in their supplier's organization, through assets or shares. Also, making people or organizational capacity available for suppliers can be way to help suppliers develop.

The four strategies aim at the same goal, receiving better products and services from suppliers. There is a huge difference between the strategies, mainly concerning the type of relation that is needed between a company and its suppliers. Using competitive pressure and incentives means that suppliers can be held at arm's length, while direct involvement asks for a much closer relationship and the presence of trust.

It should be noted that these strategies are not mutually exclusive. A company that uses monitoring and feedback might use this information to put competitive pressure on its suppliers by comparing the performance between suppliers. Also, an incentive structure can provide competitive pressure when more than one supplier can benefit from the incentives they might compete for it by trying to meet the demands of the buying company.

In a study of 500 production and service firms in the USA, Krause and Scannell (2002) found that continues market testing, the basic form of competitive pressure, is not often combined with other, more involved, forms of supplier development efforts.

The type of relationship determines partly how much time and effort a company should invest in the supplier strategy. An incentive structure can be put in place in a standardized way, but could also be custom build for every supplier or for every project. The same is true for monitoring, while direct involvement always asks for a reasonable investment of time and effort by the buying firm.

Research by Modi and Mabert (2007) shows the importance of communication in supplier development. In every strategy the form and frequency of communication is a determining factor for the success of the strategy. Furthermore they pose that evaluation and accreditation is a necessary condition for successful knowledge transfer between buyer and supplier. The selection of suppliers before involving them in development programs is an important step and evaluation should be part of any strategy for supplier development.

Product vs. service based firms

Differentiating between firms that produce services and those that build products is relevant in evaluating the strategy towards suppliers. Service providing firms use their supplies in their own production process, while product base firms integrate al large part of their supplies into their own product. Intuitively one would expect product base firm to be more closely involved with their key suppliers since these provide part of their end product. However, some service firms might be very dependent on supplier of specialized equipment.

Krause and Scannell (2002) researched the difference in supplier development strategy between product and service based firms. They find mostly the differences one might expect. Service firms are less dependent on their suppliers and rate the level of importance of strategic goals for supplier development lower than product firms. Service firms use more competitive pressure and less monitoring, incentives and direct involvement strategies. Both types of companies seem satisfied with the result of their efforts to improve supplier short-run performance. The long-run capabilities of the supplier are of lesser interest to both service and product base companies.

For the port of Rotterdam these differences are of importance since both product base leader firms, such as shipbuilding, and service companies, such as stevedoring, are present

in the port. The findings of Krause and Scannell might hold for the majority of firms, one could expect that the outcomes differ in specialized service industries in seaports.

Investments

The direct involvement strategy distinguishes three ways to be involved in the suppliers' organization.

1. Invest in the supplier with capital or by providing equipment
2. Take a share in the company
3. Provide people or organizational capacity for the supplier

Wagner en Hoegl (2005) identified that involvement of suppliers in the development of new product scan have both positive and negative outcomes. They distinguish factors on organizational level; how good is the supplier? And on project level; how well is the cooperation managed?

The research discussed in this chapter measure the performance of the supplier by informing at the buyers' side about the perceived improvement in performance. There is no study that shows objective data about suppliers performance increase after investments of the buying firm.

Krausse (1997) sees one other big advantage of supplier development. Together with developing individual suppliers, the whole 'supplier base' for a certain industry evolves as a result. A buying firm that is active in supplier development will attract better suppliers around it and have a positive influence in the economic region. This argument is in line with the thought that part of a cluster's success is the presence of specialized suppliers (Porter, 1990).

Notable in the literature is that almost all studies take the buying side as the starting point for analysis. All described initiatives are geared towards developing the supplier and only scarcely take the efficiency gain for the buying party into account. Research in the Dutch maritime industry (De Langen and Nijdam, 2003, 2006) shows that this is an important effect. Cooperative development between leader firms and buyers or suppliers showed many examples of learning effects on the buying side.

6.3 Examples of advanced supplier management

In this paragraph several examples of companies that are successful in cooperation with their suppliers are discussed. These companies invest in their suppliers to get better products, or they have a sophisticated strategy towards supplier management. Most research on this subject is done in the automotive industry (Von Corswant en Tunälv, 2002, Dyer 2000). Besides, there are case studies from several other industries, like foods (Van der Valk en Wynstra, 2005), production of electricity (McGovern en Hicks, 2006) and the electronics industry (Wynstra en Ten Pierick, 2002).

Philips

In the Netherlands, Philips is one of the companies known to put effort in supplier management and supplier development. On supplier development a notable study is done by Wynstra and Ten Pierick (2000) at the Medical Systems division. At this division, involvement of suppliers in product development became important after a decision to outsource activities that were not core competencies of Philips Medical Systems. Like in many cases, the main issue case was when to involve which supplier. For Philips the answer lay in two dimensions. One, the degree of responsibility for product development that is contracted out to the supplier and two, the risk of the development. The risk in the development depends on the complexity of the component and the importance of the component for the final product. Suppliers with a large responsibility for development, working on a high risk component are to be involved in an early (conceptual) stage of development. Suppliers with lower responsibility but working on high risk developments should be next. Followed by high responsibility suppliers working on low risk components and finally low risk component suppliers with low responsibility.

Next to planning the stages when suppliers are involved, every supplier is ‘assigned’ a communication and management profile. There is more regular face-to-face contact with suppliers that deliver high risk components, while other suppliers are only contacted by fax or mail.

The key to this portfolio approach is the structured manner in which all suppliers and components are assessed simultaneously. Working in this structural way the component development and supplier involvement are aligned in an optimal order and thus minimizing the risk of mismatches between components and avoiding bottlenecks in serial

development of components. At the same time the supplier management efforts are done efficient so that the transaction costs of outsourcing development are minimized.

Automotive

The automotive industry is a sector where supplier development and supplier involvement are used to a high degree. Several researchers pointed out that since the 1980's the relations between car manufacturers and suppliers have often evolved into partnerships aimed at joint development. (Clark and Fujimoto, 1991; Smith and Reinertsen, 1995; Von Corswand and Tunalv, 2002)

Von Corswant and Tunälv (2002) researched the supplier relations of a Swedish car manufacturer in a project where a new car platform was developed. Five separate suppliers where involved in the new design of the engine, interior, exterior, the electrical system and the chassis. Von Corswand and Tunälv focused on the critical factors when involving suppliers in product development. They identified nine critical factors based on interviews with management and engineers of the car manufacturer and suppliers and did in depth research on four suppliers that are typically important for the automobile industry.

- Technological competence.
- Suppliers' co-operation with other auto manufacturers and own suppliers.
- Openness and matching of expectations.
- Timing of involvement of suppliers.
- Long-term strategy for involvement.
- Coupling between production and product development.
- Project management.
- Pro-active supplier.
- Co-coordinating auto manufacturer

A *suppliers' co-operation with other auto manufacturers and own suppliers* is of importance to keep the supplier up to date, to learn new technologies and to assess the quality of its own development efforts. The risk of knowledge spillover to other parties seemed to be far outweighed by the potential benefits of a more capable supplier. In the case of the Swedish car manufacturer, sometimes the potential benefit was not realized. A hierarchical organization of the supplier, limiting the possibilities for communication or a

too autonomous position of the suppliers' development team seemed to reduce the knowledge transfer between supplier and manufacturer.

On the supplier side it is important to have a *coupling between production and product development.* The supplier development team should be involved in the normal production process to secure the practical applicability of the new developed system or component. In the study it showed that collaboration with developers from the suppliers did not automatically gave access to the suppliers' production capabilities and resources. Having a representative from the suppliers' production facility in the development team is an important factor for successful cooperation in development.

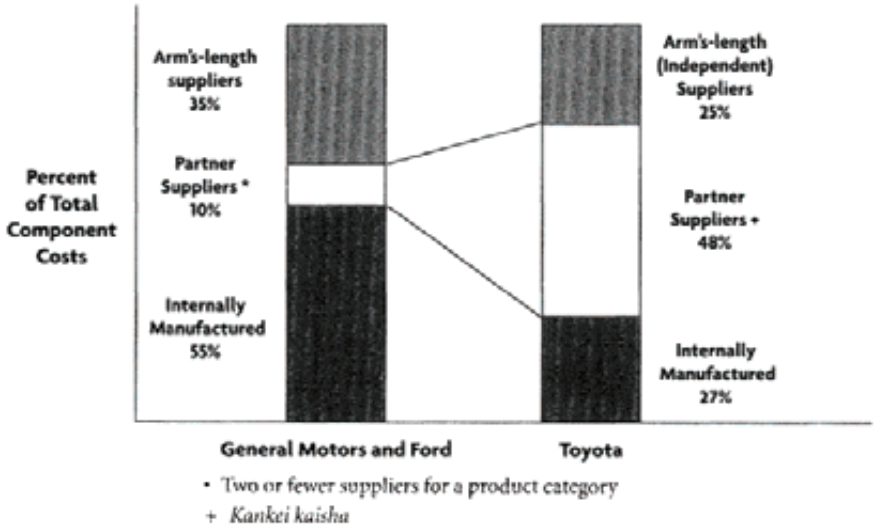
Suppliers and the car manufacturer agreed that a *pro-active supplier* is a necessity. Specifically a supplier should take responsibility for benchmarking with competitors, come up with own design solutions even if this is not explicitly demanded, scrutinize their own solutions by checking compatibility with other components and should foresee the needed resources from the beginning of the development.

Furthermore, a *Co-coordinating manufacturer* is of importance, which means that the manufacturer leaves the responsibility for the development to the suppliers and takes a co-coordinating role to align the efforts of the different suppliers.

Toyota

Toyota is an often researched example of a company that builds competitive advantage through cooperation with its suppliers. In comparison with other car manufacturers, Toyota puts more effort in building and maintaining their supplier base. As a result the supplier base of Toyota looks rather different from that of two other large manufacturers, Ford and GM.

Figure 6-3: Comparison of GM, Ford and Toyota supplier base



Source: Dyer, 2000, collaborative advantage

In far more instances than Ford or General motors Toyota has only one or two suppliers for a certain product. In most cases these suppliers can be considered partners. Womack et al. (1990) already found that the 'lean production' system of Toyota was giving them a competitive edge.

Dyer (2000) claims that not only the lean production, but especially the partnering is the main reason why Toyota outperformed its competitors consistently between 1982 and 1998. In the production network the suppliers play a vital part and the creation of trust, shared knowledge and dedicated investments in assets made the production network into an *extended enterprise*: where Toyota is the central company and the suppliers production process is tightly integrated with that of Toyota, but also with the processes at other suppliers.

Involvement with and understanding of the suppliers are the two key elements of Toyota's success. This involvement reduces the time that is needed for negotiations and problem solving. Only 20% of the time spend on face-to-face contact with the suppliers is spend on contract matters, as opposed to 50% at GM. The latter also has almost 10 times more people working in procurement (Dyer, 2000). Besides relations between Toyota and its

suppliers, also the relations among suppliers are facilitated by Toyota to improve knowledge sharing and building of trust between suppliers. Furthermore, Toyota provides frequent performance feedback on several areas aimed at stimulating its suppliers.

Based on the Toyota case Dyer (2000) formulates the following three lessons for other firms. First, a company should carefully select the members of the extended enterprise, beginning with a strategically segmentation of suppliers and manage them according to the strategic impact. Second, by creating an identity for the extended enterprise. Suppliers should feel they are part of a successful close network. Third, be patient; a lot of time is needed to build the network and to let it evolve into an extended enterprise that creates competitive advantage.

The suppliers view

Some studies specifically included the supplier view on buyer supplier relations. Dyer (2000) identified that suppliers react to the strategy that a buyer is using towards its suppliers. Suppliers where more willing to work for Toyota than for GM or Ford because the latter two focused only on costs and not on development. This also resulted in the delivery of better products to Toyota, because this manufacturer put more emphasis on quality and assisted the suppliers in achieving higher standards. In more cases where there is a clear difference in the buyer's strategy towards suppliers, the supplying companies have adopted different strategies for each supplier.

In the yacht building industry Struijk & Hamerslag is the leading interior builder. In their workshop they have a dedicated room for their client Feadship. S&H reports that this buyer has far higher standards than the other yacht builders, and is the only one that puts precision and quality above costs and developing time (author interview, 2005).

6.4 Conclusions

Both the theoretical discussion and the cases that are researched in the current literature on buyer-supplier relationships are primarily focused on the buyers, studies with a supplier side view are much less common. From a buyer's perspective the most comprehensive and most use frameworks for research are the portfolio based models. These models propose a different strategy towards suppliers depending on factors such as the type of product the specificity of the product and the market circumstances for the supply.

The theoretical insights seem to be more positive about buyer-supplier relations that are build on trust and aim for co-operation in some way. Networking and collaboration is more often presented as a solution for a problem than as one of the options a buyer has to configure its relations with suppliers.

Cases that are research are mainly about production of complex consumer products, especially the automotive industry. Without exception these cases are about companies that have a strategy to involve suppliers in their production process and keeping suppliers innovative by collaboration. Cases about companies that are successful because they use competitive pressure to push suppliers to perform better are practically none existent. This is no proving that these kinds of companies don't exist, but at least they are not so successful that they attract the interest of researchers.

6.5 Innovation

The case studies in chapter 4 show a strong position of leader firms in the field of innovation. Most leader firm effects are related to making suppliers and buyers more innovative. The role of leader firms in innovation is therefore an interesting subject to deepen. First the subject innovation is discussed. Second, a model is developed for selecting leader firms specifically on innovation indicators. Using this model the innovative leader firms in the Rotterdam Port complex are selected. Further some cases are discussed to give insight in the effects these leader firms have on other companies.

Innovation is a widely discussed subject by economist and business researchers alike. This broad discussion leads to numerous definitions of innovation, differing from 'something new' to complex descriptions of technological advancements. Katobe and Swan (1995) argue that the definition and proper measurement of innovation is one of the main obstacles in understanding innovation.

This paragraph describes what is considered an innovation and explores the different types of innovation that are found in the literature. The notion of innovation as something new is widespread; it typically shows the difference between innovation and change. Change is something different, but not necessarily new while innovation is always something new (Slappendel, 1996). The question then remains "what is new, and to whom is it new?" Is 'new' only applicable to physical things or is there also something like 'new behavior' that can be called innovation? And is a development that is new in a certain industry, but common knowledge in another sector also an innovation?

Sorts of innovations

One of the first innovation scholars, Schumpeter (1943) distinguished between five sorts of innovation: new products, new methods of production, new sources of supply, exploitation of new markets and new ways of organizing business. In many cases innovations are characterized by the following dimensions:

- Technological and non-technological development
- Product and process innovations
- Radical and incremental innovations

Technology

Technology is a central issue in innovations. Technological innovations can include the development of products, working methods and machines. Non-technological innovations include new services and new organizational set-ups.

In the service sector most innovations are of a non-technological nature. For example, new ways of financing introduced by banks. This can lead to a better use of capital and subsequently lead to higher productivity, without any technological development.

Product and process innovations

The dimension product en process innovations refers to the result of the innovation process. In general an innovation can lead to a new product or to a new way of producing a product.

Product innovations are physically new or improved products, making a new or improved product involves an innovation process that often starts with some form of R&D, leading to a new idea, then a testing phase or prototype and finally a new product.

Process innovations typically have a less linear development trajectory. First, because process innovations often stem from a demand pull because of existing failures in the production process or because of a higher demand for efficiency. Second, a new process often means that work has to be rearranged; the implementation of a process innovation is therefore more gradually than of a product innovation.

In terms of result the difference between a product and a process innovation is that product innovations lead to new and better products, while process innovations lead to cheaper or better products, but not to new products.

Incremental and radical innovation

The distinction between incremental and radical innovations is made by many scholars. Christensen (1997) describes the dilemma an existing, large firm has with radical innovations. In many cases completely new techniques are in the developing phase no better than the existing techniques, leading to hesitation with the owners of proven techniques to change. Further, incumbent firms have more to lose than newcomers and the higher risks associated with radical innovations increase the chances of loosing considerably.

Table 6-1: Radical and incremental innovations

	Radical innovation	**Incremental innovation**
Description	Fundamental renewal	Improvement in current products and processes
Knowledge	Divers, new combinations of knowledge	Specific, improvement of existing knowledge
Organization typical for this type of innovation	Outsiders en new firms	Incumbent firms

Differentiating in three characteristics of innovations results in eight categories of innovation presented in the table below, with examples of typical innovations for the categories.

Table 6-2: Categories of innovations and examples

	Incremental		**Radical**	
	Technical	**Non-technical**	**Technical**	**Non-technical**
Product	Faster microchip	Easyjet budget airline	Combustion engine	Container transport
Process	Autocad-software in design	Self steering teams	Internet protocol	Ford's assembly line

The innovation process

Innovation in common understanding is referring primarily to an outcome; there is something new or something different, of better quality etc. In studies on innovation there

is a tendency to look at innovation as a process (Jacobs en Waalkens, 2001). Both literature and practice in innovation have seen a development from an rather linear, technology drive process towards an more interaction based process of innovation, where both market and technology forces can be the driver for innovation, and during the innovation process many actors provide feedback to improve the innovation process and outcome (Nelson & Winter 1982). The starting point does not have to be fundamental science, the impulses and ideas can also come from the market or production systems.

The input for innovations is in any case knowledge, without knowledge no new development is possible; Evolution in business is not a natural force, like it is in nature. Levin (1988) made a study of the possible sources of knowledge for innovation:

- Independent R&D; a company is developing new knowledge by itself
- Licenses; a company buys the knowledge from another company and has the right to use this knowledge for a certain amount of time.
- Information from patents; patented inventions are publicly available, next to protecting the inventor from copycats it also reveals knowledge to others, who can use the knowledge to make further developments.
- Publications and conferences; in scientific journals and at conferences research results and new insights are presented. In business publications new market ideas and organizational knowledge is presented. Both can be a knowledge input for the innovation of companies.
- Informal knowledge exchange; in business networks often knowledge exchange takes place during cooperative projects or during informal business meetings.
- Hiring employees with tacit knowledge; by hiring personnel a company automatically acquires the knowledge this person holds.
- Reverse engineering; by taking a product apart or analyzing a service in detail a company might acquire knowledge about the products of competitors.

This list includes most knowledge-sources that would fit into a linear innovation process. What is missing is the market information

The innovation process is not the same for every organization. The process and the results can differ based on the type of firm (e.g. product or service firm) or the type of industry. Potters et al. (2008) found that the effect of R&D on productivity increases with the level

of technology in a certain industry. In low-tech industries the productivity effects are lower than in high tech industries.

However in any firm or industry the innovation process includes learning. Knowledge is the main resource and learning is the main process for innovations (Lundvall, 1992), so innovation can be seen as the application of knowledge.

Knowledge in its turn is the set of technical, organizational and process know-how and the combination of perception, understanding and judgment of all relevant parties and developments. In this definition explicitly the judgment and understanding of the relevant environment is included. This is in line with the ideas of bounded rationality and cognitive differences between organizations. Understanding these differences better is valuable knowledge to any business organization.

Open and closed innovation

A rather recent discussion is that about open innovation (Gassmann, 2006). The linear form of innovation, within a company is termed closed innovation. There is limited input from other parties and the innovation process takes place with little interaction. The more open type of innovation is found in situations where cooperation with customers, suppliers or even competitors is sought to improve the innovation process and outcomes. The leading principal behind open innovation is that knowledge might not be created in the same place where the innovation takes place (Chesborough et al, 2006). Furthermore, the locus of both the innovation and the exploitation does not necessarily have to lie within the boundaries of the firm.

Motives for innovation

Investments in innovation are generally made improve the production process or make better products. On average investments in innovations are wise from a business perspective. It is found that R&D and innovation have a positive effect on business performance, leading to higher outputs (Jaffe, 1988; Klette and Kortum 2004). This is an average, there still is a chance that innovation costs money but does not generate higher returns. In other words, uncertainty and risks are always associated with innovations.

Porter (1990) distinguishes four main reasons for innovation: Competition, Clients request, Cost savings and Legal reasons. Although presented as different categories, one can argue that that most innovations tend to have a combination of reasons as a starting point. For

example, reacting to a clients request also as an element of competition in it, as do cost savings arguments. Legal reasons for innovations often consist of safety and environmental legislation, which in many cases could also be seen as a client request.

Push and pull factors

Innovations come about as a result of both market pull and technology push processes. Although the extreme ends of the spectrum (only pull or only push) are not situations found in practice (Dosi, 1982) the nature of the two driving factors is different. In situations that have more market pull characteristics, the innovations tend to be incremental and have a less technical nature. More radical innovations and especially those that have a sizeable technological component are more often the result of technology push factors (Dosi, 1982).

Definition of innovation

Taking into account the previous discussion on the nature and process of innovations, in this research innovation is defined as follows:

Innovation is all new technical and organizational development within a company, or group of companies that leads to a rise in productivity.

In this definition a development that is new for the sector at hand but not necessarily for all sectors is seen as innovation. For example the first application of existing knowledge from another sector.

Measuring innovations

The output of the innovation process is a new technique, organization, marketing concept etc. The concrete results of these innovations are very divers and therefore not easily measured. An ongoing discussion in innovation literature is how to measure innovations and the innovativeness of firms (Johannessen et. al, 2001).

In many studies for pragmatic reasons (data availability) the output measure ‘number patents’ is used. This measures the number of registered and protected new products. This automatically excludes many other innovations from the count. Process innovations cannot be patented when there is not a new physical product involved.

Other measures used are R&D variables, such as R&D- expenditure, intensity or capital. R&D is a somewhat broader concept of investing in innovations, it also covers non

technical and market innovations to some extent. R&D expenditures also give a better view on a companies' efforts in the field of innovation. However, also R&D as a measure has drawbacks. First, R&D is only one part of the innovation process and the total innovation process should be considered ideally. Second, investments in R&D do not guarantee an innovative outcome. Although many scholars find a relation between R&D expenditures and new products (Erken, 2008), R&D alone is not a sufficient condition for innovations.

One field of study that focuses specifically on the regional context of innovation is the 'regional and national systems of innovations'. In the systems of innovation literature the regional or national setting is taken as an explicit starting point for analysis and an explaining variable for the innovative results of firms located in the region. Lundvall (1992)

7 Leader firms, suppliers and innovation in the port of Rotterdam

In this chapter the network the leader firms in Rotterdam is described. Specific attention is paid to the supplier network and the effects the leader firms have on their suppliers.

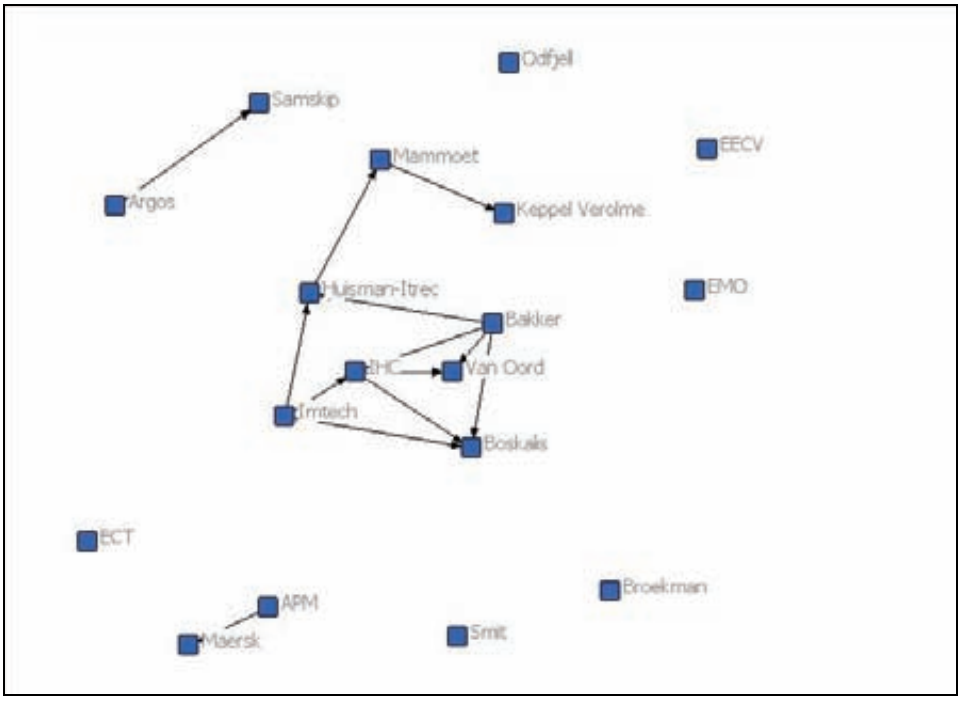
7.1 Core network

Research in the port of Rotterdam showed that innovation and knowledge spillovers mainly take place within the direct network of a firm, especially in buyer-supplier relationships (Nijdam and De Langen, 2006). The most interesting relations are those between companies and the suppliers that directly contribute to the competitiveness of the leader firm, the 'core suppliers'. The 2nd tier suppliers deliver their products and services to the core suppliers and might be of importance for the final product of the leader firm but are often not a part of the leader firm's strategic network. The commodity suppliers are suppliers that deliver goods or services that are widely available and not vital to the production process or product of the leader firm. The commodity suppliers are therefore not included in this research.

The combination of leader firms and their most important suppliers form the core network in the port of Rotterdam. The most important suppliers are identified by interviewing the leader firms, and asking the director or purchasing manager "who are your most important suppliers?" The judgment of what is important is left primarily to the interviewee, after explaining that it should be suppliers adding to the core activity of the firm. All firms identified those suppliers that provide services or products that are essential for their own product or process.

With an organizational network analysis the network is analyzed on centrality of companies and the clustering of companies. The first network to show is the set of relations between the leader firms themselves. This network shows that leader firms in the dredging and off-shore industry form a close, economically dependent, group of companies. The large stevedores, the terminals, in the port of Rotterdam do not have economic relations with each other.

Figure 7-1: Buyer-supplier networks between leader firms



Since Rotterdam is the largest port in Europe and is an important link in many transport chains one might expect that there is a set of leader firms in these sectors that are closely connected and work together often. In the study of 15 leader firms and their most important suppliers this pictures does not seem reality. The following reasons are an explanation:

First, the number of Rotterdam based leader firms in transport is relatively small. There are three transport companies that are considered leader firms: Maersk, Samskip and Broekman.

Maersk is the world's largest shipping line and uses APM terminals for stevedoring, which is a company owned by the same holding as Maersk lines. Samskip uses primarily RST as a stevedoring company; RST is not considered a leader firm. Furthermore the other transport service providers that Samskip uses are not considered leader firms. The same is true for Broekman that uses the services of several transport companies, but neither of them can be considered a leader firm in Rotterdam.

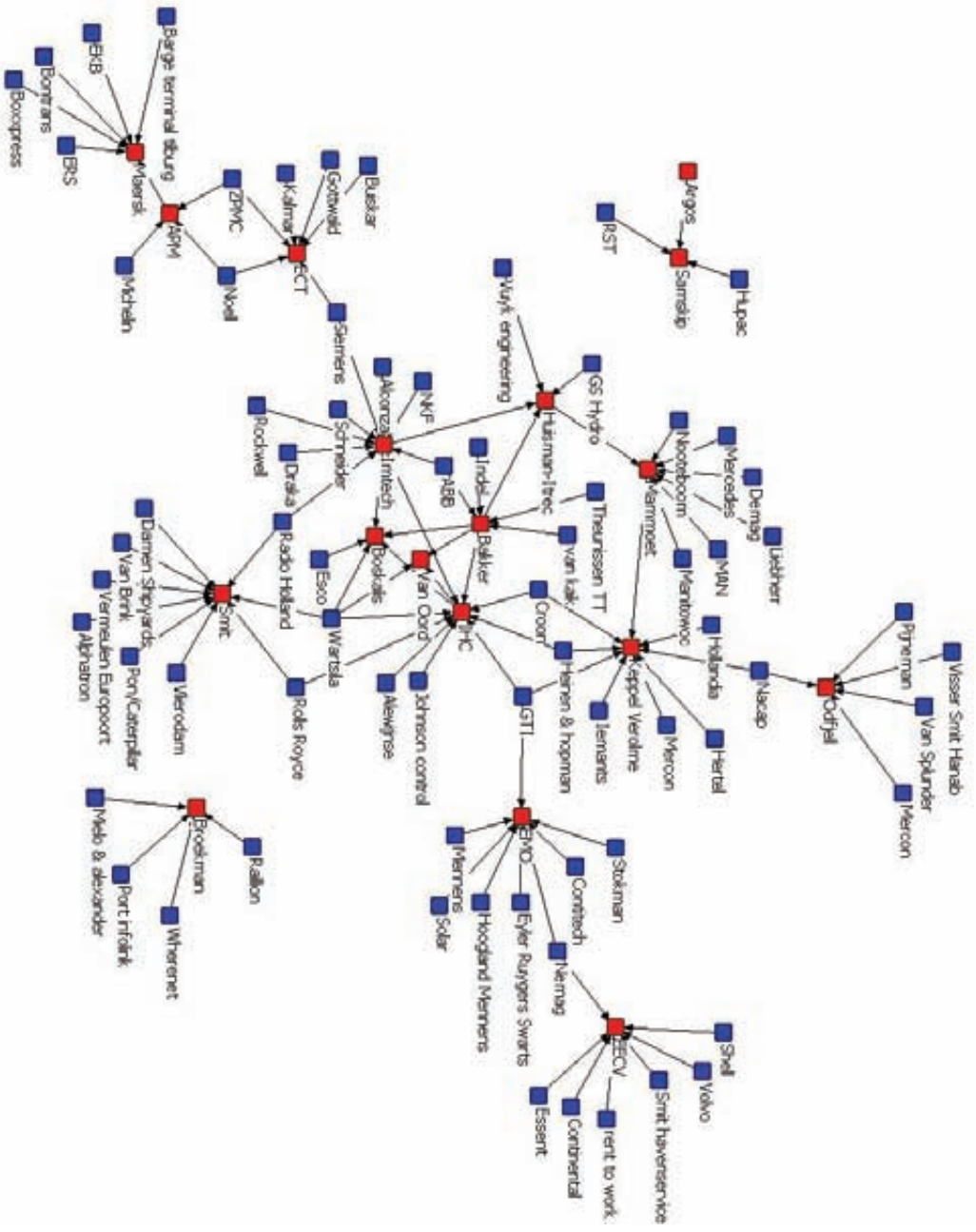
Second reason for the limited network in transport and stevedoring is the international character of the stevedoring business. Although stevedoring is a localized activity and Rotterdam is a prime stevedoring location, most clients are international companies that only visit Rotterdam with their ships and have no influence on the Rotterdam business community.

Third, stevedoring is a service. This implies that there are no other companies that contribute directly to the production process. The hardware that is needed on a terminal is provided by companies that are not necessarily located in the vicinity of the terminal. There is no need for closeness because of the low frequency of transactions.

Suppliers in the network

When the view is expanded to the combination of the leader firms and their core suppliers the network gives insight in the centrality of the suppliers and indirect connections between leader firms. These indirect connections can be important for knowledge spillovers. Companies that are core suppliers to multiple leader firms might form a bridge between different knowledge fields. The complete network is given in the figure below. The core suppliers were identified by asking the management of the leader firms who the most important suppliers are. The importance of the suppliers was mostly based on the volume of the input, the contribution to innovation or an essential product that a supplier provides.

Figure 7-2: Network of leader firms and their suppliers



Comparing the complete network with the leader firm network some central suppliers are indentified that form a link between two or more leader firms.

Table 7-1: Suppliers that form a link between leader firms

Supplier	Product
Nacap	Piping
GTI	Electro technical systems
Heinen & hopman	Climate control systems
Croon	Electro technical systems
Nemag	Grabbers
Wärtsilä	Engines
Rolls Royce	Engines
Radio Holland	Navigation and communication equipment
Siemens	Electric machines and systems
ZPMC	Cranes
Noell	Cranes
ABB	Mechanical and electrical components

To further explore the centrality of the suppliers a short network analysis is deployed. Table 7-2 shows the centrality of the different companies in the network measured in degrees (number of connections) and the Eigenvector (connections to central players). All firms with a centrality degree of more than one are included. The network is based on the suppliers that are important to the leader firm, consequently the leader firms are automatically ranked high on centrality. The interesting information from this table therefore is the centrality of the suppliers. It shows particularly which suppliers are the most central players in the port. Wärtsilä, ABB and GTI are the most central suppliers, followed by the nine other 'bridging' suppliers. The centrality of the leader firms in this table shows how many suppliers each leader firm calls important for its operations and production. The leader firms that are most central are thus those that are most dependent on their network for their competitive position and have more incentives to show leader firm behavior.

Table 7-2: Centrality of firms in the core network

Company name	Degree	Eigenvector		Company name	Degree	Eigenvector
IHC	12	68		Mammoet	9	14
Imtech	12	52		Siemens	2	12
Bakker	9	48		EMO	9	6
Boskalis	6	46		Nacap	2	4
Wärtsilä	4	36		ECT	7	3
Van Oord	3	32		Nemag	2	1
Huisman-Itrec	6	27		Odfjell	6	1
ABB	2	21		Noell	2	1
Smit	10	21		ZPMC	2	1
GTI	3	20		EECV	8	0
Keppel Verolme	10	20		APM	4	0
Rolls Royce	2	19		Maersk	7	0
Croon	2	19		Broekman	4	0
Heinen & hopman	2	19		Samskip	3	0
Radio Holland	2	16				

7.2 Strategies towards suppliers

The leader firms were asked whether they deploy strategies towards their suppliers to enhance the performance of these suppliers. Four types of strategies, as discussed in chapter 6, are distinguished. Competitive pressure, when market signals are used; evaluation and certification, when advice is given; incentives, when suppliers are financially rewarded for improvements; direct involvement, when the buyer actively participates in the organization of the supplier. Table 7-3 shows to what degree leader firms use the four strategies.

Table 7-3: Use of supplier strategies

		Count
Competitive pressure	Always	7
	Sometimes	5
	Never	0
	in a specific case	0
Evaluation	Always	4
	Sometimes	7
	Never	1
	in a specific case	0
Incentives	Always	0
	Sometimes	4
	Never	5
	in a specific case	3
Involvement	Always	0
	Sometimes	5
	Never	7
	in a specific case	0

More than half of the leader firms use competitive pressure as a way to improve the performance of their suppliers. For the leader firms it means that they explicitly communicate to their suppliers that a certain performance will lead to more business. Since the leader firms often have some market power because of their size, the stimulus from making effects of different performance levels explicit is reported to have a positive effect on performance levels.

Evaluation procedures are used sometimes by most leader firms. According to the leader firms, evaluation is only a viable strategy towards suppliers with who there is a structural, long term relation. The firms that reported always to use evaluation have implemented a routine for the evaluation. These routines can vary from giving structured feedback on performance to regular evaluation sessions with all suppliers involved in a certain production process. One firm never uses evaluation procedures with the aim to improve supplier performance.

A strategy to give financial incentives to suppliers is not a standard procedure with any of the leader firms. Most firms never use this strategy. Other firms use it sometimes or only in a specific case, for example when a supplier and a leader firm work on a joint investment in new techniques.

Direct involvement in the operations of suppliers is a strategy most leader firms never use. These leader firms have the opinion that suppliers should use their own resources to develop better services or products. The leader firms that do get directly involved in the organization of their suppliers do this to make sure that necessary knowledge of products and processes is present within the organization of the supplier. In most cases this was essential for the efficiency and quality of the leader firm's own production process.

Stimulating innovations

Next to general strategies to improve supplier performance, leader firms can also stimulate suppliers specifically to invest more in innovations. They can do this by expressing high demands to the supplier; by making functional specification, meaning that they specify what a product must do and not what it should look like; by involving the supplier in a innovation project and by making knowledge and techniques available for the suppliers so they can innovate easier.

High demands is the least popular way to stimulate innovations. Most leader firms think that expressing high demands alone is not enough to make a supplier more innovative. The most often used way is to make knowledge and techniques available to the supplier. The leader firms report that this is the most efficient way to stimulate suppliers, because it directly improves the capabilities of the suppliers. Making functional specifications for a product or service is done more often than not. Some leader firms trust that their suppliers will understand very well what the needs of the leader firm are and often use functional specifications to stimulate suppliers to come with unexpected innovative ideas. These are the leader firms that also report strong relationships with their supplier, that are long lasting and characterized by frequent face-to-face contact.

Involvement of suppliers in innovation projects is done by most leader firms, but not very often. Leader firms pick projects and suppliers carefully before starting a joint project, but every leader firm acknowledges that involving suppliers in innovation is very important for getting new insights and ideas.

Table 7-4: Reported use of ways of stimulating innovations (1=never, 5=very often)

	Mean
Stimulate with high demands	2,42
Stimulate by functional specification	3,17
Stimulate by direct Involvement	3,33
Stimulate by knowledge sharing	3,42

Stimulating innovations can be done in several ways, but in all cases stimulating is primarily a one-sided action of the leader firm. The most important precondition is that there are suppliers present that have the potential to be innovative and can improve in their innovativeness by stimulation from a leader firm.

Internationalization

One of the nine forms of leader firm behavior is functioning as a stepping stone in the internationalization process of suppliers. The leader firms in the port of Rotterdam only have a limited role in the internationalization of other companies. The stevedoring companies only have operations in Rotterdam or are part of an international firm and have no internationalization agenda of their own. The transport and service companies have international operations and sometimes use suppliers from Rijnmond for their operations abroad. Most leader firms have their main production locations in the Rijnmond area and their activities abroad are not of the nature or size that suppliers benefit from internationalization opportunities. This relatively local focus of the leader firms is represented by the results about internationalization with suppliers. Only 8 out of 15 leader firms have a role in the internationalization of their suppliers. These 8 firms help their suppliers only occasionally in their internationalization. Four ways of helping suppliers abroad were surveyed: offering long term contracts to suppliers, so risks for them are decreased; Co-invest in a project of a supplier; offer a location on-site abroad; and operate as a matchmaker between the supplier and international clients. The results show that long term contracts are the most used method to help suppliers, but only in some cases.

Table 7-5: Helping suppliers with internationalization (1= never, 5= very often)

	Mean
Long-term contracts	2.88
Invest	2.13
Matchmaker	1.88
Location on-site	1.38

Two companies reported to use long term contracts very often and two often, for the purpose of stability in international operations. Three companies said to invest often abroad in cooperation with suppliers. Two companies often function as a matchmaker and only one company facilitates a supplier on an international location.

8 Case studies of the leader firms

In chapter five potential leader firms were selected, meaning that these firms are expected to show leader firm behavior that brings positive effects for others in the cluster. There is a variety among the leader firms in the way they realize these effects. The difference in leader firm behavior does not mean that there is a distinction between good and bad companies. There can be numerous external factors that influence the possibilities for a firm to behave like a leader firm. This chapter presents cases of the individual leader firms and finalizes with the leader firm scoreboard; an overview of the amount of leader firm behavior per company. The scoreboard is based on activities in the following fields[23].

1. Coordination of production networks

   A first form of leader firm behavior is the coordination of production networks. Leader firms invest in the coordination of this network. As a consequence the whole network becomes more competitive. In most industries examples of network coordination can be found where a leader firm puts together a group of partners in response to specific opportunities.

2. Role as lead user

   By expressing a 'critical demand', a more sophisticated demand than that of other firms in the market, leader firms improve the innovativeness of their suppliers.

3. Creating standards

   Leader firms set new standards, for instance of safety and pollution prevention. Other firms, especially suppliers that are confronted with such standards in an early stage, benefit.

4. Creating 'new combinations'

   Leader firms have a central role in creating new combinations of previously unrelated technologies. The combination of such technologies leads to new products. Other firms in the production network benefit from this product development.

[23] The 9 forms of leader firm behavior were identified in the Dutch maritime Cluster as discussed in chapter 4.

5. Improving the transfer of knowledge

   A fast diffusion and transfer of knowledge adds to the competitiveness of a cluster. Because of the knowledge they possess and their central role in knowledge networks, leader firms improve the transfer of knowledge in the cluster.

6. Encourage and enable internationalization

   Leader firms compete on international markets. They can start production in other countries and urge or encourage firms in the cluster to internationalize in order to supply them in these countries. Leader firms can lower the barriers to internationalize by letting suppliers use their international network or by guarantying a long-term contract for production facilities abroad.

7. Creating reputation

   Leader firms often create reputation for a whole cluster. When they engage in projects at the frontier of what is possible, these projects get widely known in the industry and contribute to the reputation of the cluster as a whole. Also maintaining high quality or efficiency standards can add to the reputation of others, especially when leader firms advertise their 'local roots'.

8. Improving the labor market

   The quality of the labor market is important for the competitiveness of the cluster. Leader firms invest to improve the quality of the labor market. Leader firms are often found among the larger firms in a cluster. These firms benefit the most from a well-trained professional labor force. This gives them the incentive to invest in education projects.

9. Organizational infrastructure

   Leader firms play a role in creating and maintaining the organizational infrastructure in the cluster. Such infrastructure is an important condition for effective cluster governance (De Langen, 2002).

The leader firms are analyzed based on company publications, publications in professional media, interviews with industry experts and with management. Based on this input the leader firms are rankled and receive a score between 1 and 10. 1 meaning there is no leader firm behavior, 10 meaning leader firm behavior in (almost) all fields and with great impact on other companies and the port-cluster.

The method of case studies is chosen for two reasons. First the set of research subjects is limited; there are only 27 firms that potentially have leader firm effects. Second the number of variables researched per case is greater than the number of cases. The ratio between cases and variables make this study particularly suitable for a case study-approach (Yin 1998).

SMIT INTERNATIONALE

Smit Internationale is a Rotterdam based global operating company in harbor towage, salvage, heavy lift and terminal operations. The company works at more than 30 locations worldwide and operates a fleet of 400 vessels. In total 2650 people work for Smit, in Rotterdam, they employ 500 people. With revenues of € 470 million, the profit was €77 million in 2006. The main activity performed in the port of Rotterdam is harbor towage, but most activities in salvage and heavy lift are also coordinated from Rotterdam. The main locations for fleet management are Rotterdam, Singapore and Cape Town (South Africa).

Clients

Every division of Smit has its own client base. For the harbor towage division the clients are the shipping lines, with whom often contracts are made for a longer period of time. The heavy lift and particularly the salvage operations are project based and less predictable markets.

Competitiveness

The competitiveness of Smit lies primarily in the combination of specialized knowledge and a worldwide network-organization. Smit is the company with the largest track record worldwide in salvage projects[24] and has an extensive fleet of specialized ships that can be used on every continent. The combination leads to short response times and often innovative solutions. In Harbor towage Smit is also one of the main players in the market, with very strong positions in European, Asian and South American ports.

Innovation

Smit's innovations are primarily rooted in the salvage division. This division is often confronted with salvage projects that call for a new type of solution for lifting or

[24] According to Smit's management

dismantling a ship. An examples of this types of innovation is the development of an underwater saw to cut up the submarine Kursk before lifting it. The saw was a new development in cooperation with Huisman-Itrec, a Rotterdam based company specialized in off-shore constructions.

Another innovation project was started in 2008 together with Damen shipyards to develop the 3E Tug, an environmentally friendly tugboat that will have minimal pollution through the application of new energy technologies and propulsion systems.

The knowledge for innovation projects is both developed 'in house' and in cooperation with innovation partners. The partners are located in or at a short distance from Rotterdam. In general, technical innovations are not the first concern of Smit; in most cases technology is bought off the shelf. The application of new techniques in the towage and salvage operations however does need another innovative step. This is often done by Smit in cooperation with suppliers.

Suppliers

Smit has a purchase/turnover ratio of 0.59 (277/470). Meaning that almost 60% of their turnover is bought in, 40% of the turnover is produced by Smit. The purchasing function within the organization is gaining importance the past two years. Every division now has its own purchasing unit, with the purchasing unit of Vessel Management being the largest. A shift is being made to more centralized purchasing. Purchasing of large equipment and ships is done by the board of directors, in consultation with the engineering department. The influence of 'strategic buying' is growing, putting more emphasis on the total costs of ownership when buying investment goods.

The suppliers of Smit are almost always located in the Rijnmond area. Everything Smit needs, can be provided by companies located no further than 40 KM away. For the operations in Rotterdam 99% of all purchased goods and services come from the Rijnmond area. Most ships, for use worldwide, are purchased from a yard in Gorinchem. For the Singapore operations, the ships are ordered locally. Next to ships, the most essential products and services for Smit are: Navigation equipment, engines, winches, ropes and safety equipment.

Suppliers in Rijnmond

The following suppliers are considered very important by Smit:

Supplier	Product
Rolls Royce	Thrusters
Pon/Caterpillar	Engines
Wärtsila	Engines
Vlierodam	Ropes
Vermeulen Europoort	Ropes
Radio Holland	Navigation equipment
Alphatron	Navigation equipment
Van Brink	Ship repair
Damen Shipyards	Vessels

All these companies are located in the greater Rijnmond area, or have a sales and service office there. For example the engine suppliers have their production abroad, but maintenance and technical know-how is present in the local subsidiaries, as is the case with Rolls Royce, Caterpillar and Wärtsila.

Face-to-face contact with the suppliers takes place often, facilitated by the short distances between the companies. In these meetings primarily the quality and the price of the services delivered is discussed. Secondary are topics about the future of Smit and the role of the suppliers in the future. The suppliers are not dependent on Smit; for some, Smit is a large account but it is not expected that suppliers will go bankrupt when Smit stops doing business with them.

Strategy towards suppliers

Supplier development strategies are only recently an issue on Smits agenda. Currently the competitive pressure strategy is used to improve the suppliers' performance. Evaluation and certification is applied in some situations now, but will be part of standard procedures in the near future. Direct involvement with suppliers hasn't been a strategy at Smit until now. Neither is providing incentives, but this might be used in the future.

Smit is currently changing its strategy towards suppliers, they are moving from "buying to purchasing management". One recent case is the tendering of the maintenance on navigation and communication equipment on the tugs. Smit was looking for a supplier that would accept a partnership approach. Instead of Smit scheduling maintenance and the supplier sending a bill for the hours worked, Smit wanted a contract where the supplier

does curative and preventive maintenance for a fixed price. The supplier has a responsibility to keep the fleet operational.

Smits purchasing management found that making a contract with a supplier is one thing, but that having the personnel of the companies act according to it is something else. In selecting Radio Holland as a preferred supplier for the coming years and awarding them the contract for maintenance of the navigation equipment on the Smit vessels, the attitude of Radio Holland's management towards cooperative relations with their customers was an important factor. In the execution of the contract, the employees of both companies have to have the same attitude but worn in habits sometimes proof to be an obstacle.

Suppliers and competitiveness

The clients of Smit are the large shipping lines and individual ship-owners. Smit is independent of its clients in deciding what suppliers to use. The clients want a service and they trust Smit will use the best equipment available. What Smit offers its clients is an international network, flexibility and expertise. The ship-owners know that they can have the same level of service in every location where Smit operates. Some suppliers are important for Smit to maintain this international standard. Shell, Radio Holland, Damen shipyards, Wartsila and Caterpillar al have an international network that can provide service and products on Smits' international service locations. The foreign locations of Smit use local service but components are supplied for 70% by suppliers from Rijnmond. To stimulate suppliers to maintain an international network that is complementary to that of Smit, long term contracts are made. According to Smit the network of Radio Holland is expanding faster because Smit is a large client providing international business.

In general the suppliers in Rijnmond are important for the competitiveness of Smit. Primarily because of the quality of service and products they provide at a good price. Reliability and innovativeness of the suppliers is also important but less than quality and price.

Leader firm Behavior

Coordination of production networks	For special projects Smit aligns suppliers to develop new instruments and methods
Role as lead user	Lead user for many suppliers
Creating standards	Setting standards in salvage and special transport
Creating 'new combinations'	Occasionally during special projects
Improving the transfer of knowledge	Has a central role in knowledge circulation in

	Rotterdam for the off-shore sector
Encourage and enable internationalization	Supplier of communication equipment services Smit worldwide
Creating reputation	Smit is an international example of Rotterdam-Dutch innovativeness in off-shore and salvage.
Improving the labor market	Cooperation with technical education facilities
Organizational infrastructure	Very active in the local business community

EUROPEES MASSAGOED OVERSLAGBEDRIJF (EMO)

The Europese Massagoed Overslagbedrijf (EMO) is the largest dry bulk terminal in Europe, located at the Maasvlakte, the most western part of the Rotterdam port, where they employ 400 people at their facility. EMO has one facility and no international subsidiaries. It has a turnover of 110 million euro (2006).

The company shares are owned by HES Beheer, Manufrance and (indirectly) E-on and Thyssenkrupp. In the daily operations and decisions EMO is independent of its shareholders.

Clients

The clients of EMO are for the most part located in the German Ruhr area, where large steel and energy producers are located. The most important clients are:

Eon, RWE, Rogesa, Arcelor, Ruhrkole AG, Elektrobel, Essent, EMBW and Billiton. 7% of total turnover is related to Eon, the only client in the Rijnmond area, located next to the EMO terminal at the Maasvlakte.

Competitiveness

The market proposition of EMO is that they are fast and reliable. In the business of bulk stevedoring the most valued characteristics are efficiency in loading and unloading and the availability of the system. The one supplier that adds to this feature of EMO is Stokman. Their personnel are flexible and available for solving problems in the installations. Especially the repairing and installing conveyor belts at the terminal is a job that only they can do fast enough with high quality.

Innovation

The innovations on the EMO terminal are aimed at improving efficiency and reducing pollution. The efficiency gains are mainly reached by automation of the terminal. The last decade EMO invested in the automation of the stacker-reclaimers, machines that are used to stack coal and iron ore on the terminal. The traditional machines are now equipped with a 3d scanner GPS positioning and an automatic steering module that makes it possible that the stacker-reclaimer operates fully automatically with an accuracy of 10cm. The basic techniques for this were not newly developed, but it's the first application of the technology on such a large scale. EMO cooperated with a German engineering bureau (ISAM) to further develop the technology and make it suitable for the application in the large scale bulk handling. The result is a higher utilization rate of both the machines and the terminal which drew the attention of many other companies active in large scale handling of bulk materials of which Corus Steel in IJmuiden was the first to adopt the same technique.

Suppliers

The ratio buying/selling is 25/110 for EMO, resulting in 23% of the turnover being bought in. This is an average, in years with a large expansion or investment projects the figure is substantially higher.

EMO has a separate department for purchasing which is relatively autonomous in selecting suppliers. In consultation with operations and maintenance departments the best suppliers are selected. In the management team there is one person responsible for purchasing, but not as a single responsibility. The suppliers of EMO are located throughout Europe. The most important suppliers are:

Name	**Product**
Stokman	Tech. Personnel, pulleys and rollers
Contitech	Conveyor belts
Mennens	Steel cables
GTI	Electronic personnel
Solar	Electro trading company
Hoogland Mennens	Tools
Eyler Ruygers Swarts	Bearing techniques
Nemag	Grabbers

The products that are crucial for EMO operations are the conveyor belts, the steel cables and the terminal management system. These are rather specific for EMO and cannot easily be replaced.

Suppliers in Rijnmond

Approximately 10% of the materials and 20% of the services is purchased in Rijnmond. Of all contracted people 70% is coming from companies in Rotterdam. 20% of the suppliers that are of great importance to EMO are located in the Rijnmond area. These suppliers are not dependent on EMO, there is no supplier for which EMO is the vital customer.

Strategy towards suppliers

The strategy EMO uses towards its suppliers is based on the relative importance of the supplier for the daily operations and the uniqueness of the product. In all cases durability of the delivered product and the price are the most important features of the supplied product that are evaluated.

EMO uses its uniqueness occasionally in negotiations with suppliers. For suppliers of wear prone materials the terminal is an interesting test case. The wear and tear on this facility is greater than on any other industrial site, because of the huge volumes and the salt water environment. If a material can last on the EMO terminal, than all industrial sites in the rest of the world are potentially interested. Because of this material suppliers are very keen to supply to EMO.

Cooperation with suppliers takes place in special projects, where EMO-specific development takes place. This is the case with the development of automated stacker/reclaimers, guidance of electric cables in cranes, and constructing conveyor belts. One example of joint development is the cooperation with Promati in improving their belt-scrapers. In general EMO is aiming at standardization of all processes, and this is not easily combined with an experimental approach to suppliers.

Evaluation of suppliers takes place regularly; regular suppliers are sometimes audited externally on quality and safety. Financial incentives for suppliers to improve their production are never given. Direct involvement in the suppliers' organization also never takes place. What does happen is coordination of suppliers and sub-suppliers in complex projects. There is no supplier located in the Rijnmond area that is vital for the competitive advantage of EMO.

Leader firm

EMO is the largest facility for dry bulk stevedoring in Europe. This position makes it a perfect spot for developing and testing new materials and techniques. EMO is willing to cooperate with others to help the development further. Furthermore, EMO is an example for other dry bulk operators; with their automated machines on the terminal they show the state of the art in terminal layout and automation.

The leader firm role for the port cluster is primarily based on this last characteristic of EMO. The technical development mostly takes place in cooperation with foreign, mainly German, companies. EMO is typically functioning as a knowledge bridge between the port cluster and innovative foreign companies.

Coordination of production networks	Very limited, service is delivered on the spot by own organization
Role as lead user	Has a role for some local companies, but mostly for foreign companies
Creating standards	Sets the standard in Rotterdam and Europe for handling dry bulk
Creating 'new combinations'	No special projects
Improving the transfer of knowledge	Is open to share the knowledge they develop in cooperation with suppliers
Encourage and enable internationalization	No international market positions
Creating reputation	Adds to the reputation of Rotterdam with a highly efficient terminal
Improving the labor market	Has limited opportunities for this due to the port labor market structure.
Organizational infrastructure	Plays an active role in (in)formal networks

IHC-MERWEDE

The IHC Merwede group employs 2200 people in the locations Sliedrecht, Kinderdijk, Nieuwerkerk aan den IJssel and Hardinxveld Giessendam. The IHC-Merwede group of companies builds ships for different markets. The most important are the off-shore and dredging markets. In the off-shore market most clients are international companies. In the dredging market the clients are primarily the Dutch and Belgium dredging companies. The company had a net turnover of 775 million euro in 2007 and a profit margin of 10%. IHC has 10 locations abroad, these are primarily service stations; there is no production and

only limited sales activities. The specialist nature of the ships build by IHC Merwede brings along an extensive sales process with visits to the yards in the Netherlands.

Clients

The clients of IHC-Merwede differ per sub-market. The clients per market are:

Dredging: Van Oord, Boskalis, Jan de Nul and DEME

Off-shore: Subsea 7, Seaway heavy lifting, Superior Offshore International, Toisa, Hornbeck Offshore Service

Ferries: Stena, SNCM, Bronholm

Naval: Royal Dutch Navy

Currently the primary focus of the IHC-Merwede shipyards is on the off-shore and dredging markets. These markets have shown strong growth in the past years and provide enough work for the full capacity of the yards. 40% of the production is for clients in the Rijnmond area.

Competitiveness

IHC-Merwede is the largest producer of dredging vessels in the world and delivers their ships to all the major dredging companies. The ships are sought after because they are efficient, innovative and durable. The ships and installations are build in close cooperation with the suppliers of electro-technical and hydraulic systems making it possible to have a short lead time for the production of innovative ships.

Innovation

The innovations from IHC cover all aspects of the ships. Most innovations take place in the dredging and off-shore ship building. Notable innovations in recent years are new hull designs with lower water resistance and better maneuverability, Dynamic positioning systems, and visualization systems for work underwater. The innovations of IHC led to 16 European patents in the last 8 years, making it the most innovative maritime company in the Netherlands.

Over the years IHC developed the integration of so many sophisticated systems into their ships that it was possible to develop a large size hopper-dredger that can be operated by one man from the bridge. The 2007-build dredger Brabo for the Belgium DEME-group successfully proved the operational benefits of such as system. The sailing and dredging systems have been integrated, making it possible for one man to fully operate the ship even in difficult circumstances.

Recent process innovations at the IHC-Merwede yards are primarily aimed at improving the production process. The most notable innovation is the use of design software, were all engineers of IHC-Merwede and the suppliers work in simultaneously. This means that everyone working at a specific ship can see all technical information of other components. Furthermore the engineers can add extra logistical information to the system. This minimizes waiting time for other suppliers. At the same time it shows the different suppliers where the bottle necks in the production process are, so they can adjust their own planning to that and prevent the creation of another bottleneck.

Early involvement of suppliers in the development of ships and making knowledge and techniques available for suppliers is the two most used ways to enhance innovativeness at the suppliers.

Suppliers

IHC-Merwede yards buy in approximately 70% of their turnover. For the dredging vessels a lot of components are bought from other IHC companies. The suppliers of IHC-Merwede can be divided in two categories. The suppliers of the components, such as thrusters, engines and winches are found internationally, but 90% is European. The suppliers that contribute to the engineering and the design of the ships are more often local companies and almost always Dutch.

Important suppliers for IHC-Merwede are:

Company	**Product**
GTI	Electro technical systems
Croon	Electro technical systems
Bakker Sliedrecht	Electro technical systems
Imtech	Electro technical systems
Alewijnse	Electro technical systems
Johnson controls	Climate systems
Heinen&Hopman	Climate systems
Wartsila	Engines
MAN	Engines
Rolls Royce	Engines

Some suppliers of IHC-Merwede have become dominant on the world market. Mainly the suppliers of electronic systems, such as Bakker Sliedrecht and Imtech. Others already were worldwide component suppliers, such as Wärtsila and Rolls Royce for engines.

Suppliers in Rijnmond

A substantial part of the suppliers is located in Rijnmond; between 20 and 30% of total inputs comes from these local suppliers. The supplier most depended on IHC's production is Bakker-Sliedrecht. They are technologically very involved and a large part of their business and assets is geared towards the production of IHC ships. For every project (ship) the set of suppliers can differ, but the list of suppliers that is used by the IHC-Merwede yard did not change over the past years. For most components, two or three suppliers are available.

The supplier base that is present in the Rijnmond area and centered on the shipbuilding industry is also of importance for the ship maintenance services. It makes it possible to present a full service packet to the customers of the port.

Strategy towards suppliers

In general terms the technical director of IHC-Merwede describes the strategy as follows: "it's the collective of firms that counts, we cannot do it on our own." There is a strong focus on cooperation with suppliers, but still the use of competitive pressure is present, at the start of every project the best supplier for every component is selected in a competitive procedure. IHC-Merwede refrains from organizing financial incentives such as cost and profit sharing, because they find that this increases opportunistic behavior. The basic assumption of IHC-Merwede in dealing with its suppliers is: "the suppliers know better than we what they can deliver for what price, so we will not get involved in their cost structure". What does happen is that both IHC-Merwede and its suppliers keep a low profit margin to be able to deliver a competitive end product. There is a deep understanding with all parties that opportunistic behavior of any firm will lead to loss of business for everyone.

Two practices at IHC-Merwede illustrate the cooperative strategy that this leader firm has towards suppliers, the evaluation process after a project and the education of their employees and suppliers' employees in a course tailored for IHC-Merwede and its suppliers.

Evaluation

IHC-Merwede made it into a standard practice to evaluate a project with the suppliers. After a project is finished a consultant (Lloyd's) is hired to do a study about the opinion of

all companies involved. These findings are later discussed in a session with all suppliers and IHC Merwede present. In these sessions all issues are discussed, both the issues between suppliers and IHC-Merwede and issues between suppliers. Open feedback is given and plans are made to improve future projects.

Education

On initiative of IHC-Merwede a course was developed with the technical University delft and branch organization VNSI. This course is aimed at improving the coordination and cooperation skills of the people at IHC and the employees of the suppliers that are involved in the complex shipbuilding projects of IHC-Merwede. Now 17 suppliers are involved in this course..

Competitiveness

The IHC-Merwede group of companies is geared towards building one-off projects. Their leading position in the market for off-shore and dredging vessels is build on the capacity to produce tailor made ships, equipped with specific machinery and tools to perform specialist tasks. Their competitive advantage lies in delivering highly specialized vessels relatively quickly at a competitive price. According to IHC-Merwede, the suppliers that add to these competences are the electro-system contractors and knowledge providers Marin and TNO. In the Rijnmond region the electro-system contractors are the most important parties for the competitiveness of IHC-Merwede. They add substantially to the final product in terms of innovation, speed of production and quality.

Leader firm

IHC-Merwede is a leader firm in almost all aspects; in innovation, local knowledge transfers, cluster organization, labor market and reputation effects IHC is regarded by most experts and industry executives as highly important for the cluster. Only internationalization effects are limited.

Coordination of production networks	IHC has a very strong role in the coordination of a large variety of suppliers and co-producers
Role as lead user	IHC is the main lead user for many suppliers in the maritime industry
Creating standards	IHC is the standard setting company in the dredging industry
Creating ‘new combinations’	New combinations are sometimes explored, but the focus is on developing the existent technologies further

Improving the transfer of knowledge	Knowledge transfers between IHC and suppliers and amongst suppliers is explicit policy
Encourage and enable internationalization	Internationalization effects of IHC are limited. Only indirectly they enable suppliers to internationalize
Creating reputation	IHC is world leader in dredge ship building and adds strongly to the Dutch reputation.
Improving the labor market	IHC participates is several educations and initiator of initiatives to attract people to the shipbuilding industry
Organizational infrastructure	IHC is very active in initiating and participating in cluster initiatives.

KEPPEL VEROLME

Keppel Verolme is a constructor of large structures for the off-shore industry and a specialist in ship conversion. They have the largest construction-pit in Europe, and are the preferred supplier for the largest new building and conversion projects of international oil and gas and off shore companies.

Verolme has a long history in the port of Rotterdam. They started in 1957 in Rotterdam-Botlek as a shipyard that specialized in building large tankers. After fierce competition from Asian shipyards in the 1980's, Verolme chose to specialize in off-shore constructions. In 2002 Keppel from Singapore took over the Verolme yard in Rotterdam, making it part of a worldwide network of facilities for off-shore construction and ship conversion and repair.

Keppel Verolme has about 350 employees, but during projects some 400 to 600 extra employees are hired on a temporary base. Furthermore, often more than 1000 subcontractors are working at the yard of Verolme.

The sales of Keppel Verolme are primarily export. Most clients are internationally operating off-shore or shipping companies. Only 5% of the turnover comes from clients in the Rijnmond area.

Competitiveness

What makes Keppel-Verolme unique is the size of the facility and the capability to plan and coordinate the construction of complex, large scale off-shore installations. The large dry-dock of 400 by 90 meters and surrounding facilities are unmatched in Northern-Europe and only one of the few places in the world where these large installations can be built and repaired.

Suppliers

The purchasing quote of Keppel Verolme is 70%, which is fairly high for a producing company. This indicates that they subcontract a large part of the production process. The coordination of these sub-contractors is one of the core capabilities of Keppel Verolme.

The structures that are built at the Keppel Verolme yard are mostly designed by the client, including the specifications of the components to be used. This gives Keppel Verolme little freedom in selecting suppliers for these components. The suppliers that are selected by Keppel Verolme are mostly contractors that do part of the construction work. 80% of Verolmes suppliers are located in the Rijnmond area and they provide 50% of the total input, measured in euros. These are primarily service providers. Suppliers of components like engines and pumps are often located elsewhere. Important suppliers of Keppel Verolme are:

Company	**Product**
GTI	Electro-technical systems
Croon	Electro-technical systems
Hertel	Accommodation builders
Nacap	Mechanical installations
Mercon	Steel constructions
Hollandia	Steel constructions
Iemants	Steel constructions
Heinen&Hopman	Climate installations
Mammoet	Heavy lift assistance

These suppliers are almost all met face-to-face on a monthly basis, when progress, commercial issues and capacity are discussed. Although the quality of the suppliers is deemed very important by Keppel Verolme, evaluation of the performance of the suppliers is not yet standard procedure.

Supplier development is at an early stage at Keppel Verolme. Ideas are evolving about helping suppliers to maintain high service levels and to develop methods to manage the relations with the core suppliers in a more structural way. One recent development was the inclusion of Nacap in the set of suppliers. After their good performance in the construction of the Hummingbird, a large floating oil production and storage unit, they were also asked for other projects. Previously Nacap was not involved in the construction of off-shore

structures and installations. In the future Nacaps knowledge about pipe-systems could be available for the whole off-shore sector in Rotterdam as a result of the first order that Verolme placed with Nacap.

Most suppliers that work on the installations for Keppel Verolme are deemed very important for the competitive position of the company. The high quality of the systems installed by these suppliers is a competitive advantage on the international market.

Leader firm

The leader firm role of Keppel Verolme is found primarily in the coordination of the production network. The brand Keppel Verolme is the flag that brings in complex and innovative projects. The suppliers of Keppel Verolme in the Rijnmond area lift on this business and are challenged by the sophistication and size of the works done at the yard.

Coordination of production networks	With many suppliers, coordination is a core capability of Verolme. However, due to the one-off character of projects structural coordination of a production network is difficult.
Role as lead user	The complex structures manufactured at Verolme imply a lead user function.
Creating standards	Verolme sets standards of quality to some extent. Due to the small in-house design and development organization this role is somewhat limited
Creating 'new combinations'	Verolme creates combinations between techniques and suppliers during complex projects, which brings new insights for all parties involved
Improving the transfer of knowledge	Knowledge transfers take place between suppliers. Verolme has no structural policy for that but facilitates it by bringing the suppliers together
Encourage and enable internationalization	There is no internationalization
Creating reputation	Verolme adds to the reputation of Rotterdam as a centre for the off-shore industry
Improving the labor market	Verolme has its own educational and training facilities where current and future employees are trained. Verolme adds to the quality of the cluster labor pool in this way
Organizational infrastructure	Keppel Verolme is active in cluster networks, but has an limited role in cluster organization

HUISMAN-ITREC

Huisman-Itrec is a company specialized in the design and construction of complex steel structures, cranes and installations for the off-shore industry and oil and gas companies such as drilling equipment and deepwater pipelay systems. The company has a turnover over 230 million euro and made a profit of 34 million euro (2007). The company has seen a fast growth in turnover from 50 million in 1998.

The headquarters is in Schiedam -within the Rotterdam port area- where they also operate a construction facility. Other construction facilities are located in Czech Republic and China. Of the total 1500 employees, 700 work in the port of Rotterdam.

Clients and market

Important clients of Huisman are off-shore and heavy lift companies such as: Jumbo, Bleuwater, Mammoet, Big Lift, All seas en Smit. Important suppliers are electro and hydro-technical companies like Bakker-Sliedrecht, GS-Hydro(US) en Vuyk engineering. Competitors are National Oilwell (US) and IHC-Gusto in the field of offshore equipment, WMF and Liebherr (DE) in the market for cranes.

Competitiveness

The competitiveness of Huisman-Itrec is primarily based on their innovative designs in one-off projects. Huisman is one of the few companies in the world that is capable of complete design and building of large scale new equipment for use in very demanding circumstances such as on open sea. The organization has an 'innovation as routine' type of working style which makes them often the first choice for off-shore companies that are trying to build something new.

Innovations

The innovations of Huisman are technical product innovations. Almost every large project that is conducted by Huisman calls for the 'invention' of new solutions. The clients of Huisman have a critical demand for innovative and efficient products. An illustrative innovation is the 'reeled pipelay system'. This system makes it possible to lay pipes on the ocean bed with an unprecedented speed of 2 kilometers per hour. A conventional pipelay system would need 4 hours for this task. The innovation in the system is that pipe-laying becomes a continuous process. Instead of inserting the pipes one-by-one the reel provides an ongoing flow of pipes. Huisman-itrec has 16 patents ranging from cranes to pipelay-systems and special purpose ships.

Leader firm

Huisman is considered a leader firm in the Rotterdam port cluster by most experts and by the management of other leader firms. The primary argument for that is the high rate of innovations that Huisman produces.

Coordination of production networks	Coordination task is limited, most products are designed and produced 'in house'
Role as lead user	For electro and hydro technique Huisman is a lead user
Creating standards	Huisman sets the standard in pipelay and off-shore drilling equipment
Creating 'new combinations'	In cooperation with off-shore and heavy lift companies new combinations are created
Improving the transfer of knowledge	Most knowledge is in house, transfers take place in the close network
Encourage and enable internationalization	Huisman has international locations, but these have little effects on the Rotterdam cluster
Creating reputation	Huisman is one of the flagships of the Rotterdam off-shore sector
Improving the labor market	Engineers of Huisman are well trained and sought after by other companies
Organizational infrastructure	Active in cluster initiatives, but no frontrunner in creating infrastructure

MAMMOET

In 2001, Van Seumeren took over the company Mammoet. The combined firms continued under the brand name Mammoet. Both companies were specialized in heavy lifting, Van Seumeren on land and Mammoet also at sea. The new Mammoet formed a world class player in the heavy lifting and project cargo transport. The headquarters is located in Schiedam on the banks of the river Maas.

The largest business of Mammoet is heavy lifting and special transport on land, but the maritime and port related business is growing and in this field Mammoet gets the most attention in the media. In recent years they took up the challenging salvage job of the nuclear submarine Kursk. 75% of production and service is for clients abroad. Mammoet has a turnover of 573 million euro and a profit margin of 21% (2007).

Clients

The main clients of Mammoet are the large petrochemical companies that use cranes and heavy lifting for the building and maintenance of their installations and transport of factory components. Other clients are more incidental users of special heavy lifting equipment and governments for salvage jobs.

Competitiveness

Mammoet stands out in the world of heavy lifting because they have a large fleet of cranes and machines that can be utilized almost everywhere in the world and is amongst the most innovative. The last decade Mammoet also proved to be a competitive salvage company by providing innovative solutions for complex tasks. The most notable salvage job undertaken by Mammoet is the lifting of the nuclear submarine Kursk. They won this job because Mammoet offered a new way of lifting that would shorten the operation dramatically and made lifting safer than with a conventional method.

Innovations

The innovations of Mammoet are both technical and process innovations. The heavy lifting division is responsible for many technical innovations in crane design. The salvage and off-shore division are working on innovative procedures when they have a complex salvage task at their hands. Mammoet holds 9 patents[25] in the field of crane design and salvage methods.

An illustrative example of Mammoets innovations in the last decade is the Platform Twin-ring Containerizable crane (PTC). This giant size crane can fully be unrigged into parts with the size of a maritime container. This innovation creates the possibility to quickly ship the crane to every place in the world a road truck can reach, making it the most useable crane in the world. The PTC cranes are build by Huisman-Itrec, a neighbor of Mammoet in Schiedam.

Suppliers

Mammoet has a purchasing quote of 40%, which is average for a service oriented firm. In monetary terms Mammoet uses very limited inputs from local suppliers; only 2% of total purchase comes from suppliers in the Rotterdam region.

[25] Espacenet, European patent register 5-2-2009

The suppliers that have the most direct influence on the quality of Mammoet's services are the producers of cranes. This is also reflected in the list of most important suppliers according to Mammoet's management.

Company	Product
Liebherr	Cranes
Demag	Cranes
Manitowoc	Cranes
Mercedes	Trucks
MAN	Trucks
Nooteboom	Trailers

Noteworthy is that most of the important suppliers are German companies and only one, Nooteboom, is Dutch but not from Rotterdam. The suppliers that are located in Rotterdam are less vital to the firm. The contribution local suppliers make to the competitiveness of Mammoet is their reliability and the quality of their products and services. The contribution to innovation from local suppliers is limited.

The most important suppliers are met on a monthly basis to discuss ongoing projects and future developments. Competitive pressure and evaluation is sometimes used to stimulate suppliers to increase performance. Incentive systems and direct involvement is never used.

Leader firm

Mammoet is considered a leader firm by most experts and port executives. The main reasons for this are the unique projects they undertake and the complex equipment they use and sometimes develop. They are an important player in the off-shore industry when it comes to knowledge development. The characteristics of Mammoet's projects also make it a company that is 'in the picture' and brings positive association with the general public.

Coordination of production networks	Mammoet coordinates suppliers in special projects
Role as lead user	Mammoet has very sophisticated demands in order to make
Creating standards	Standards for quality, speed and possibilities in heavy lifting are continuously set by Mammoet
Creating 'new combinations'	In cooperation with other companies Mammoet occasionally creates new combinations
Improving the transfer of knowledge	Knowledge transfers are improved by combining suppliers and partners in difficult projects
Encourage and enable internationalization	Mammoet operates worldwide, but has limited effects on the internationalization of others
Creating reputation	Mammoet is one of the flagships of the Rotterdam off-shore sector
Improving the labor market	Some investments in training and education
Organizational infrastructure	Active in cluster initiatives, but no frontrunner in creating infrastructure

SAMSKIP

Samskip is a trans-European multimodal transport company that provides short sea and land transport. The company originally is from Iceland, but expanded fast the past five years, for a large part through takeovers. One of their major acquisitions was the Rotterdam based Geest North sea lines in 2005. Samskip now is the largest short-sea-shipping company of Europe, with an annual turnover of € 460 million. The EBIT is about 3% of the turnover and the purchasing ratio is 0.87. Meaning that 87% of the turnover is delivered by suppliers. The shares are still in hands of the Icelandic family that started Samskip. The operational headquarters is now based in Rotterdam.

Clients

The clients of Samskip are the users of intra-Europe transport, mainly the European producers of consumer goods and foods. For these clients Samskip offers a pan-European multimodal network. The backbone of the network is the short sea network offering scheduled sailings to and from most European ports.

Competitiveness

Samskip has grown fast in the last decade. From a relatively small ship-operator into the largest short sea operator in Europe. They expanded the network by acquisitions and

endogenous growth. With the strategic takeover of Geest lines they acquired the largest part of the network and the transport system with the 45 feet container. This 45 feet container fits the continental transport flows better than a traditional container (20 or 40 feet) because it fits exactly 13 pallets of goods.

Innovations

Samskip is in a business where costs are the main selling point, and the organization owns little assets. This combined makes Samskip an unlikely candidate for large scale technological innovations. The innovations of Samskip are in the design and organization of the transport network and in the design of the containers that are owned. What makes the transport network unique is the complete integration of multimodal transportation.

The innovations in the container design are rooted in the Geest-lines organization that is now part of Samskip; they introduced the 45 foot container that can be transport on every modality. In recent years Samskip expanded on this concept by designing new types of containers. Such as the coolboxx reefer container and by designing lighter containers.

Suppliers

Samskip owns relatively little assets, the equipment owned consists mainly of containers, primarily 45 feet containers that are specifically designed for intra European transport of palletized cargo. The transport services are hired and ships are chartered, and not owned. On both these markets, there is a great number of suppliers that can deliver comparable services. Individual suppliers that are of importance to Samskip are Argos oil for the bunkers (ship fuel), because they are a large supplier moneywise, Rotterdam Shortsea Terminal, because they are the prime supplier of terminal services and essential in the transport network of Samskip and Hupac, because they provide an important train link from Rotterdam into Europe.

Strategically very important is the RST terminal in Rotterdam, with this supplier there is face to face contact at least on a monthly basis to discuss the going business and the planning for future activities. Currently there is a capacity problem at the RST terminal and a little room for expansion in the port of Rotterdam, which leads to operational problems for both RST and Samskip. Samskip is actively trying to help RST in dealing with these capacity problems.

The largest group of supplier in terms of money, is the transport services.

Strategy towards suppliers

The primary strategy of Samskip towards its suppliers is the competitive pressure, the best performing supplier receives the most business. In all cases some form of competitive pressure is used.

New in the strategy of Samskip is the introduction of an unambiguous tendering procedure for road transport. Until recently Samskip used approximately 80 transporting companies, all operating under a different contract. To streamline this Samskip started a tender procedure. The transport companies received an overview of the forecasted 2008 transport flows and the invitation to tender for a part of this transport. The road transporters provided information about their company, which Samskip used to make a short list of potential suppliers. After that some companies that made the short-list based on their qualities but not on price, were asked to give a new price that was more in line with the other offers that Samskip received. The final selection was made on price and references of the transport companies. All trucking companies got a contract with similar terms and conditions. This step in professionalizing the purchasing practice is the upbeat for more monitoring and evaluation of the suppliers and the introduction of incentives for transport suppliers. Starting this year there will be two supplier meetings per year to discuss the performance of the transport services and what Samskip and the suppliers can do to improve this.

Suppliers in Rijnmond

Samskip has its operational headquarters in Rotterdam and the port of Rotterdam is an important link in their transportation network. This makes it likely that they use a fair amount of local suppliers. The Rijnmond based suppliers are typically the RST terminal and road haulage suppliers, for which half of the € 170 M worth yearly business is spend in Rijnmond. For this reason Samskip sees the suppliers in Rotterdam as important for their competitive power. These suppliers add to the competitiveness of Samskip primarily through their reliability, quality and cost level. Innovation is far less important.

Suppliers and competitiveness

The competitiveness of Samskip is based on the speed, quality and reliability of their services. They are able to deliver the quality level because they operate a large multimodal European network. At the same time most services are bought in by Samskip, making Samskip dependent on the supplier for delivering the quality the clients expect.

Because of these dependencies one could expect that Samskip has many strategic partnerships to maintain control over all operations. However, the transport market proves to be so competitive that there is no need to do this, switching costs are very low and the service levels of many transport companies are of comparable quality. Also for the containers Samskip uses a market approach towards the suppliers, the containers are designed in-house and then ordered at the company that can deliver for the lowest price. The only supplier that can be considered close to Samskip is RST, the reason for this closeness can be found in the lock-in situation that Samskip is in. For the European network the port of Rotterdam is of utmost importance, and RST is the only large scale terminal that can handle short sea containers. The cooperation between the two companies is not based on joint ambitions but emerged primarily because the market circumstances forced them.

Leader Firm

Coordination of production networks	Samskip coordinates transport networks that link multimodal transports to Rotterdam, physical production network are not coordinated
Role as lead user	Samskip is a lead user for the transport companies in intermodal transport and for terminals specialized in short sea shipping
Creating standards	Samskip literally created a standard for short sea shipping with the new 45 ft container and expands this concept.
Creating 'new combinations'	Samskip makes new combinations (firms and techniques) in developing new types of containers
Improving the transfer of knowledge	Much development is done in house. Knowledge transfers take place to some extent with the producers of containers.
Encourage and enable internationalization	Samskip has little influence on the internationalization of others
Creating reputation	Samskip adds to the reputation of Rotterdam as a central spot for intra European cargo flows
Improving the labor market	Samskip has little influence on the local labor market
Organizational infrastructure	Samskip is involved in cluster wide initiatives.

BROEKMAN

The Broekman group, with headquarters in the Rotterdam port area, is a group of companies specialized in cargo handling and transport. Particularly in the handling of cars, Broekman is a prominent company in the Port of Rotterdam. The only large scale facility for this, the Rotterdam Car Terminal, is owned by the Broekman group and forms the 'core' of the company. Further the company invested in transport and break-bulk cargo handling primarily through takeovers of ship agents and the Gevelco terminal, which handles paper and steel and is the only all-weather terminal in Rotterdam. Broekman also recently expanded its activities into air-transport. For the study at hand the focus will be on port related services, with special attention on the car terminal.

Innovations

Broekman is one of the fastest growing transport and stevedoring companies in the port of Rotterdam. It generates business in the port that was previously not found in Rotterdam. The position of Rotterdam in the supply chains of cars has grown from almost non-existent in 2000 to one of the three leading European ports in 2008. One element in the fast growth is the innovative way of doing business. Two innovations are important for Broekman; the construction of multi-deck car storage and the introduction of a RFID (Radio Frequency IDentification) real-time locating system to track 40,000 vehicles at their car terminal, making inventory management more efficient.

Broekman brought new knowledge to the port by investing in RFID technologies in the car terminal. At the time of implementing the RCT was the largest test facility of RFID technology in the world and the first in the world. The size of the terminal provided the supplier of the technology with valuable experience. For other companies in the port and logistic business the RFID project of Broekman proves to be an inspiration to also invest in advanced technology for better warehouse management.

Suppliers

Broekman has a purchasing quote of 55%, which is for a large part due to the transport and forwarding business. For the terminal operations the purchasing quote is considerably lower. As Broekman is a group of companies, there are multiple suppliers that are important for the company. Every business unit has its own specialized suppliers, like the trucking companies for the transport business and contractors for the car terminal.

Synergy in the supplier base of the different business units is based on economics of scale; synergy in knowledge development is in most cases not apparent. The important suppliers to the individual business-units have limited influence on the performance of other business units.

Suppliers in Rijnmond

The following suppliers are considered important:

Company	Product
Railion	Rail transport
Wherenet	RFID
Portinfolink	Information services
Mielo & Alexander	IT & consultancy

Suppliers and competitiveness

The handling of cars in the port of Rotterdam is done for several large car producers and importers. These clients seek for an efficient terminal in Western Europe to handle their transport flows. Efficiency in the case of a car terminal means fast transfer of cars between ship and terminal, efficient storage of cars and a well functioning system for reclaiming cars from storage. The constructor of the car decks and the supplier of the IT system are therefore the suppliers that are most important for the car terminal to maintain competitive.

The business units transport and logistics use suppliers that have a lesser impact on the competitiveness of Broekman. They do have to deliver a timely and reliable transport service, but this is more widely available in the market and hence not a distinctive quality supplied to Broekman.

Leader firm

Locally, the effects of Broekman are primarily found in sharing knowledge in the informal network. In the port of Rotterdam the management of Broekman is among the most active in organizing and participating in knowledge sharing and networking activities. The main effect is that they bring entrepreneurial spirit in the port. The often-presented case of the implementation of the RFID system shows other companies in the port how to organize innovation together with suppliers in a transport company. Up till now it has not led to the implementation of the same system at other port facilities in Rotterdam.

Coordination of production networks	Coordination of transport networks especially in car distribution leads to the position of Rotterdam
Role as lead user	The car terminal has one of the largest RFID systems in the world, for the suppliers of these systems Broekman is a lead user
Creating standards	Broekman sets the standard in handling cars, especially in applying warehouse management systems in this business
Creating 'new combinations'	Broekman is not involved in 'new combinations'
Improving the transfer of knowledge	Broekman actively vents out the knowledge they developed in RFID systems
Encourage and enable internationalization	Broekman has little effect on the internationalization of others
Creating reputation	The reputation of Rotterdam as a centre for car handling is solely created by Broekman
Improving the labor market	Broekman does its share in education projects, but has limited cluster wide influence in this field
Organizational infrastructure	The Broekman management is one of the most active in cluster organizations

APM TERMINALS

APM terminals is a worldwide operating company exploiting container terminals, mainly for Maersk lines. The company is owned by the AP Möller group in Copenhagen and managed by the APM Terminals headquarters in Den Haag. The Terminal in the port of Rotterdam handles 2 million containers per year and has a current capacity of 2.7 million TEU.

Innovations

In March 2008 the Port of Rotterdam Authority signed an agreement with the APM headquarters in The Hague stating that the two organizations will cooperate in developing new ideas and projects to improve container terminal operations. These ideas can involve efficiency gains, marketing and planning but also initiatives to improve environmental performance. The agreement involves all 50 terminals that APM has worldwide. However, the cooperation with the port of Rotterdam and the construction of a new terminal at the Maasvlakte II make it likely that Rotterdam will be an important 'test centre' for new terminal concepts in the future.

Suppliers

The suppliers of equipment, such as cranes and straddle carriers for APM terminals are for a large part international companies. Decisions about the purchasing of large equipment are made at the AP Möller head office in Copenhagen. Important suppliers for the APM terminal in Rotterdam are:

Company	Product
Noell	Straddle carriers
Michelin	Tires
ZPMC	Cranes

APM has a purchasing quote of about 30%. A large part of the purchasing is local supply of maintenance and parts. The local purchasing management is responsible for this 'daily' purchases. About 20% of total supplies is strategic, and this is mainly bought abroad and the purchasing management for strategic supplies is mainly done at the headquarters in Copenhagen and The Hague.

Supplier evaluation does not take place structurally at the local level. Concerning strategies towards suppliers and supplier development, APM terminal in Rotterdam uses primarily competitive pressure to stimulate suppliers to improve performance. Incentives and direct involvement in the suppliers' organization is not used by APM.

What is important for APM is that local suppliers are reliable and efficient, so that they contribute to a continuously smooth operation of the terminal. Innovation is not an issue in the relation between APM and their local suppliers.

Leader firm

APM terminals opened their location in Rotterdam in 2000 and is a rather young company in the port. The APM terminal in Rotterdam functions as a dedicated terminal for Maersk lines, and most important investment decision are made by the headquarters in The Hague or Copenhagen and are aligned with the investments in other terminals all over the world. As a result, the terminal in Rotterdam has limited connections with other companies in the Rotterdam area.

The reason experts gave to call APM terminal a leader firm is the role it plays in keeping Maersk cargo flows connected to Rotterdam and the way it brought some competition in the container stevedoring market in Rotterdam, giving an efficiency impulse to the near-monopolist ECT.

Coordination of production networks	APM has little influence on production networks
Role as lead user	On corporate level APM is a lead user to some producers. The local terminal in Rotterdam does not have this function
Creating standards	APM uses the industry standard in machines and terminal layout, there is no APM influence on this standard yet
Creating 'new combinations'	There are no concepts/products developed by APM with 'new combinations' the company is geared towards operational excellence
Improving the transfer of knowledge	APM has moderate influence on knowledge transfers, there are some initiatives to cooperate with other firms in the port
Encourage and enable internationalization	APMT Rotterdam has no influence on the internationalization of other companies in Rotterdam
Creating reputation	Currently APMT does not create reputation for Rotterdam, this is likely to change when a new terminal is build on Maasvlakte II
Improving the labor market	APMT invests in training and education of employees that later are likely to work for other port-companies
Organizational infrastructure	APMT has little involvement in the organization infrastructure of the cluster

ODFJELL

Odfjell is a Norwegian company specialized in transport and storage of chemicals. The headquarters of the terminal division is located in Rotterdam, as well as a large storage and distribution facility. The Rotterdam facility has a turnover of 70 million euro (2006). With a profit margin of 19% they were one of the most profitable port-companies in 2006.

Competitiveness

Odfjell is a market leader in chemical parcel tanker shipping. The specialization on chemicals in combination with the worldwide transport network and terminal locations is the unique selling point of Odfjell. "The strategy of Odfjell Terminals is to grow along Odfjell's major shipping lanes and at important petrochemical logistics junctions around the world."[26]

[26] Odfjell website: www.odfjell.com

Innovations

At the Odfjell terminal all innovation efforts are aimed towards process improvements. Developments aim at efficiency gains in design and maintenance of the terminals. Maintenance and construction are largely subcontracted; innovations are therefore often a combination of knowledge of Odfjell and suppliers that use new techniques at the Odfjell terminal.

Suppliers

Purchasing of Odfjell amounts to approximately 30 million Euros a year, resulting in a purchasing quote of 42%. Suppliers that are important are mainly for building and maintenance of the terminal, approximately 95% of the purchasing. A total of 60 firms supply almost 90% of the purchased goods and service. Maintenance of a chemicals terminal is specialized work. The pipelines, loading and off-loading jetties and the tanks all need maintenance personnel specially trained for this kind of equipment.

In many cases contracts are tendered to a selected group of suppliers, since the reliability of the suppliers is of utmost importance to Odfjell, they pre-select trusted suppliers to bid on a tender. Next to reliability the costs and quality are very important. Innovativeness and speed of production are less important characteristics of a supplier. The suppliers of Odfjell are mostly located in the Rijnmond area, about 80% of the purchased goods and services comes from the area.

The following suppliers are considered important:

Company	**Product**
Van Splunder	Port facility Construction
Mercon	Steel tanks
Pijneman	Cranes
Nacap	Electrical and instrumentation
Visser Smit Hanab	Quay wall construction

Suppliers and competitiveness

Some suppliers add to the competitiveness of Odfjell. The competitive position of Odfjell is mainly determined by the reliability and costs of the terminal. The costs of the terminal are for a large part dependent on the efficiency of suppliers. An example of a supplier that provides cost reducing services is Jetset. Jetset developed a machine, called Ragworm that can cut worn steel plates from a tank for replacement with the use of waterjets. Cutting

with this machine is 20 times faster than conventional methods, is safer and gives lower risks of damage to the rest of the tank. Ragworm was developed by JetSet Hydro Technics at the request of Odfjell.

Leader firm

The leader firm function of Odfjell is primarily based on its size, network position and interaction with suppliers.

Coordination of production networks	Odfjell incidentally coordinates production of supplier combinations
Role as lead user	Odfjell has high demands for terminal design and efficiency and was a lead user for the company 'Jetset'
Creating standards	Odfjell is one of the frontrunners in tank terminal design and operation
Creating 'new combinations'	There are no new combinations initiated by Odfjell
Improving the transfer of knowledge	Knowledge transfer between suppliers is stimulated and facilitated by Odfjell
Encourage and enable internationalization	Suppliers of Odfjell do not profit from internationalization
Creating reputation	Odfjell adds to the reputation of Rotterdam as the leading port for tank storage in Europe
Improving the labor market	Odfjell invests in training of their employees, but not in cluster wide education
Organizational infrastructure	Odfjell's management is very active in cluster networks and initiatives

ARGOS OIL

Argos oil is an oil trading company that started in 1984 with small scale distribution of fuels. In the past 25 years the company expanded, primarily in the Port of Rotterdam. The company now includes divisions that are active in international oil trading, bunkers for ships and owns several gas stations. The financial results of the company, for 2006, are presented in the table below. The results show a typical trading organization, high turnover, limited value added and a high value of the purchased goods. In 2007 Argos reached a turnover of more than 750 million euro's and 300 employees. Currently Argos is developing further into the energy production market. The turnover of amounts to little over 1 billion euro and an operational result of 10 million.

Competitiveness

Argos has primarily developed its market in the fields where the large oil companies are withdrawing. The large oil producing companies tend to concentrate on exploration and production and disinvest in the trading business and delivery to consumers. Argos stepped into the gap between large producers and customers. It started in the distribution of oil and oil products, expanded towards bunkers and storage, later added a trading organization and is now making the step to become an energy producer. In the port of Rotterdam they own a 500.000 M3 facility for oil storage and are developing production facilities for bio-diesels.

Suppliers

Argos has a purchasing quote of 96%, which is the highest in the sample of leader firms. The importance of purchasing for Argos is reflected in the presence of a separate group within the company that is dedicated to purchasing under direct supervision of one of the directors. The most important purchased goods and services are:

Oil(products), transport services, surveying, building and engineering, banking and insurance, IT and legal services.

As Argos is a trading organization, the suppliers of Argos can be divided into those that provide the traded goods and those that provide goods and services that enable Argos to do the trading. The trading goods are fully supplied by the oil producing companies that are present in the Antwerp-Rotterdam-Amsterdam range. Other goods and services include the development of storage and production facilities in the port of Rotterdam, the transport of oil and oil products and financial services to facilitate the trade.

Most of the suppliers (+- 80%) has presence in the Rijnmond area and commercial contacts are held with these local companies or subsidiaries.

Most suppliers are met face-to-face 2 to 4 times per year to discuss going concerns and the exchange of market knowledge. For Argos it is also important to develop a trust relationship with many of its suppliers. Especially for the trading partners a sense of trust is important; the very volatile oil prices make it of utmost importance that you can trust your trading partner will act the way that was agreed upon. The most important characteristics of the suppliers in Rijnmond are reliability and quality of their products and services. For innovation, the suppliers are less important.

Supplier Strategy

The strategy that Argos uses towards its suppliers is based on both market testing and building trust. For the trading organization trust is essential because it can only get the lowest price from parties that trust Argos as a trading partner.

For the purchasing of facilitating goods and services Argos uses several strategies to influence their suppliers. In all cases competitive pressure is used, sometimes evaluation and financial incentives. Direct involvement in the operations of the suppliers only takes place within the development of the bio-diesel production plant.

Leader firm

The leader firm role of Argos is primarily formed by its efforts in the cluster organizations and the developments in bio-fuels.

Coordination of production networks	Argos is primarily a trading company and does not coordinate large production networks
Role as lead user	Argos uses off-the shelf technology and thus no lead user role
Creating standards	Argos is creating standards in bio-fuel production in Rotterdam
Creating 'new combinations'	No 'new combinations' have been created
Improving the transfer of knowledge	Argos plays a role in the development of knowledge about bio-fuels in Rotterdam
Encourage and enable internationalization	Argos is a supplier to international companies and does not influence others in internationalization
Creating reputation	Argos adds to the reputation of Rotterdam as a hub for bunkers and as a centre for cleaner fuels
Improving the labor market	Effects on the labor market are limited
Organizational infrastructure	Argos is active in many cluster initiatives and organizations

EECV

EECV is a dry bulk stevedoring company handling iron ore and coal. Total throughput of the terminal amounts to 30 million tons of cargo every year. EECV is owned by two German steel producers, ThyssenKrupp Steel AG and Hüttenwerke Krupp Mannesmann GmbH. For these companies EECV unloads seagoing vessels, stores the cargo at its terminal and sends the coal and ore to the German Ruhr area by barge or train when the two clients need it.

Innovations

Innovations at EECV are focused at efficiency gain or environmental impact reduction, which are the most important issues for the terminal. As a cost centre for the large German steel-producers, the main objective of EECV is to be an efficient as possible link in the transport chain of iron ore and coal. The environmental impact is an important local issue, since the loading and unloading of dry bulks can lead to polluting spills and storage of coal can lead to hindrance and pollution for communities in the vicinity of the terminal. To prevent spreading of dust from the coal terminal, EECV was the first to construct fences designed to prevent coal-dust spreading through the air.

Suppliers

The supplies of EECV consist of machines, materials, maintenance and temporary personnel. The purchasing quote of EECV is average 45%. About half of the supplies comes from companies in the region. The regionally located suppliers are mainly the suppliers of personnel and maintenance service. For maintenance it's very important for EECV to have local partners, they have to be committed and flexible. For this reason EECV uses many relatively small suppliers for whom EECV is an important customer. Important suppliers of EECV are:

Company	**Product**
Nemag	Grabbers
Volvo	Shovels
Shell	Lubricants/ fuel
Rent-to-work	personnel
Continental	Conveyor belts
Smit	personnel
Essent	Electricity

Face to face contact with the suppliers is in most cases limited to two times per year. The strategy towards suppliers is primarily based on costs and competitive pressure.

Leader firm

EECV is expected to be a leader firm based on its size of operations. As one of the largest dry bulk facilities in Europe, one could expect some leader firm effects. On the other hand, because EECV is a dedicated terminal for its two shareholders the involvement with other companies is somewhat limited.

Coordination of production networks	The coordination role is limited to a task of the supply chain of the parent companies
Role as lead user	EECV is a lead user in the field of environmental protection techniques for bulk storage
Creating standards	EECV is standard setting in prevention of environmental damage in the dry bulk sector
Creating 'new combinations'	No new combinations are created
Improving the transfer of knowledge	Knowledge transfers to other parties are limited
Encourage and enable internationalization	No internationalization takes place
Creating reputation	EECV adds to the reputation of Rotterdam as an efficient and relatively clean port
Improving the labor market	EECV trains it s own personnel, but makes no special investments in the cluster
Organizational infrastructure	EECV has limited involvement in cluster initiatives

MAERSK LINE

Maersk is a worldwide operating shipping and logistics company, part of the Danish A.P. Møller group. The global headquarters of Maersk lines is located in Copenhagen. After the acquisition of P&O Nedlloyd in 2005, Maersk positioned the headquarters for Central Europe in the former Nedlloyd building in Rotterdam. The structure of the AP Møller group in the Rotterdam area is shown in the table below.

		Controlled assets (M€)
A.P. MÖLLER - MAERSK A/S	APM Terminals Rotterdam BV	111.853
	Damco International B.V.	34.532
	European Rail Shuttle BV	19126
	Maersk B.V.	1.399.447
	Maersk Benelux B.V.	14.347
	Maersk Ship Management B.V.	15.225
	Maersk Logistics Benelux B.V.	25.273
	Maersk Transport B.V.	9.823
	Safmarine Netherlands B.V.	2.793

Source: Author calculations based on Reach database by Bureau van Dijk

From the Rotterdam office the ships that are sailing to and from the ports in Belgium, Netherlands and Germany are serviced. The Central European office is also responsible for the hinterland transport to and from these ports and the operational sales and order process regarding deep sea transport. As a result it controls the Maersk cargo flows in the Netherlands, Belgium, Germany, and the larger part of Eastern Europe that is serviced through the North Sea ports. Most ships are managed from the central offices in Copenhagen. Maersk Ship Management in Rotterdam has 75 people, managing the manning of 48 Maersk line ships.

The operating results of Maersk Benelux are show in the table below. The figures show that Maersk in Rotterdam primarily has an intermediary function. The main costs are personnel, 991 people in 2006, and work that is contracted to third parties.

	2006 (X1000 EUR)
Turnover	176,153
Costs	175,605
Personnel	64,746
Depreciations	2,350
Contracted work	107,209
Mutations in assets	1,300
Results	548
Gross value added	68,944

Source: Chamber of commerce, Bureau van Dijk

Clients

The major clients of Maersk are the large producers and distributors of (mainly) consumer goods, like electronics and vehicles. The main characteristic of Maersk's clients is that they have a fragmented production process and consequently need frequent transport. Most clients are international companies and only very few are located in the Rijnmond area. Another substantial part of the client base are the distributors. Many of these clients have a warehouse and distribution activity in the Rijnmond area.

Competitiveness

Maersk line is the largest transporter of containerized cargo, making scale economies an important competitive advantage for Maersk. Because of its scale, Maersk can offer transport throughout the world, its extended network provides the customers with efficient transport to virtually all destinations in the world. Another specificity of Maersk is that it focuses on logistic solutions for the customers, as opposed to only maritime transport. The logistic focus makes that Maersk puts effort in supplying user specific transport.

Value for the local economy

The impact of Maersk on the local economy is substantial due to the size of operations in Rotterdam. The presence of a dedicated container terminal and logistic facilities make Rotterdam an important point in the Maersk network. As a result, Maersk leads a large part of the cargo flows through the port of Rotterdam. This has an impact on all port related services and employment as well as on the hinterland transport.

Especially the influence on the hinterland transport is of importance for the region. Being the largest container transporter in the port of Rotterdam, the containers handled by the APM terminal at the Maasvlakte account for 20 to 25% of total container volume in Rotterdam, the operations of Maersk have a large impact for the infrastructure in Rotterdam. Maersk is a promoter of hinterland transport by rail, offering their customers the possibility to have their container transported by ERS rail shuttle. From the APM terminal almost twice as much cargo is transported via rail than the average in the port of Rotterdam[27]. With the emphasis Maersk puts on rail transport it functions as an example for other transporters and Maersk provides the necessary mass to make rail shuttles profitable.

Suppliers

Purchasing and supplier management in the Maersk organization is divided amongst the different branches. The purchasing of large assets, such as ships and cranes, takes place at the headquarters in Copenhagen. The main purchasing responsibility for the regional offices is the hinterland transport, stevedoring and warehousing.

The total spend of the Maersk Rotterdam office is approximately 50% controlled by the office's own management, the other 50% is controlled by the Copenhagen office.

30 to 40 percent of total purchasing is done with companies in the Rijnmond area. At the same time, these companies only make up 5% of the supplier lists, showing that it's typically the larger suppliers that are located in Rotterdam. In total, some 971 suppliers in Europe deliver their services to Maersk

For the Rotterdam location of Maersk, a non-limited set of critical suppliers is presented in the table below.

ERS	Rail services (also an AP Møller company), because it is the largest transport provider for Rotterdam bound cargo
Boxxpress	Rail services, the largest supplier of rail transport for Maersk in Germany
Bontrans	Road transport and container depot in Rotterdam
EKB	Road haulage from the port of Rotterdam
Barge terminal Tilburg	The location of important clients close to this terminal makes it of particular importance in the Maersk Network.

[27] http://www.portofrotterdam.com/nl/nieuws/persberichten/2006/20060511_01.jsp

The relations that Maersk has with its clients in general are straightforward business relations. Based on importance and criticality, clients are managed on various levels, from a country level up to global level.

The strategy towards the suppliers is built on the motto "to maintain a good network everybody has to make some money". In practice this means that suppliers are first selected based on their operational performance, market testing is done regularly but long term development is taken into account before making decisions based on prices only. The interaction is limited to 1 or 2 meetings per year, when contracts and operational performance are discussed

The suppliers of Maersk do not deliver input that directly contributes to the competences of the organization, although they make the overall supply chain more valuable. The suppliers provide important links in the network, but core of the network and the vital linkages are under the management of the Maersk organization.

Leader firm

The Maersk organization has a considerable economic impact on the Rijnmond region, because of the large transport flows that are handled by them through the port of Rotterdam. The impact on the cluster is somewhat restricted due to the location of the headquarters in Copenhagen, where most 'high-impact' decisions are made, and because many suppliers are also part of the AP Møller group.

The leader firm effects on suppliers are for a large part to the benefit of ERS, also an AP Møller company. Effects on external suppliers are limited. Most suppliers provide a standard product, leading to little incentive for Maersk to invest in these suppliers.

Some specific examples of knowledge spillovers towards road transport organizations show that, although Maersk does not seem much embedded in the regional business community, there are some leader firm effects.

The main leader firms effect of Maersk can be found in the development of hinterland transport. As the main rail transporter and investor in inland terminals, Maersk functions as an example to shift cargo from road to other modalities and at the same time provides the critical mass for development of alternative hinterland infrastructure.

Coordination of production networks	Maersk in Rotterdam controls the transport networks in Western Europe
Role as lead user	Maersk is seldom a lead user for suppliers in the Rotterdam port cluster, most activities are performed in-house.

Creating standards	Maersk is creating a standard in global network development, which is an example for other logistic companies.
Creating 'new combinations'	There are no new combinations created by Maersk in Rotterdam.
Improving the transfer of knowledge	Knowledge transfers primarily take place within the AP Moller group. The presence of many APM companies in Rotterdam, makes this a centre for knowledge for both the company and the cluster in Rotterdam.
Encourage and enable internationalization	The suppliers are not supported by Maersk in internationalization.
Creating reputation	The largest logistics company in the world adds to the reputation of Rotterdam by maintaining a regional headquarters in the city and using Rotterdam as a main hub.
Improving the labor market	Maersk knowledge is transferred to other companies in the cluster through the labor market. Employees receive frequent training that is state-of-the art in transport business.
Organizational infrastructure	The role of Maersk in the organizational infrastructure of the Rotterdam cluster is limited.

8.1 Leader firm scoreboard

The following table shows the scores of the different companies on the elements of leader firm behavior. The score resembles the amount of leader firm effects originating from a company. A score of 10 means substantial effects in all fields of leader firm behavior. A score of 1 means some effects in one or two fields of leader firm behavior. The score does not imply sufficiency or insufficiency, a score of 1 already means the company is valuable for others in the cluster.

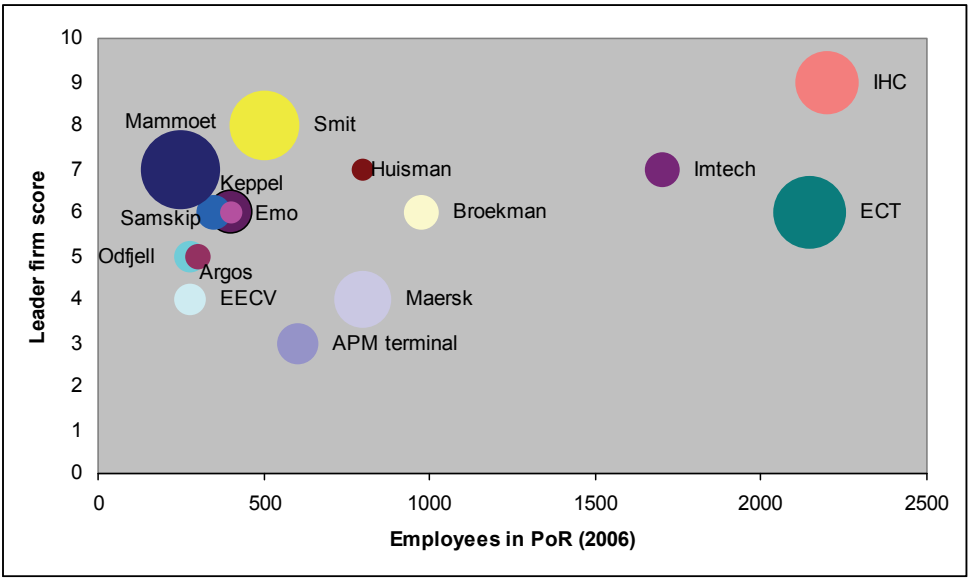
Firm	**Score**	**Note**
APM terminal	3.00	Focused on efficiency of own operation. Most development done in Denmark. Starting interaction with Port Authority and competitors with local benefits. Some participation in local networks
Argos	5.00	New, fast growing oil-trader, beginning with production of bio-fuels in Rotterdam. One of the first movers in the bio-fuel cluster in Rotterdam. Their knowledge network in Rotterdam is still in the developing phase.
Broekman	6.00	Group with many activities in Rotterdam. Very active in formal and informal networks. Leading company in the development of Rotterdam as car handler. Innovative development, but no large scale joint-initiatives with other port companies.

EECV	4.00	Cost centre for the German steel industry, less focused on the success of Rotterdam. Focused on efficiency, is an example for others in the field of social responsibility.
EMO	6.00	Largest automated dry bulk port facility in Europe. Systems are developed in close cooperation with suppliers. However, these suppliers are not located in Rijnmond. Showcase of technological development in stevedoring.
IHC	9.00	World market leader in design and building of dredge vessels. High quality standard, most innovations in the Dutch maritime industries. Numerous cooperative efforts with suppliers, buyers, educational facilities. Actively shares knowledge with other companies.
Keppel	6.00	Large facility for building and maintenance of off-shore equipment. Builds complex structures. Development in-house is limited and most production capacity is hired in. There is a strong role as a coordinator. Active in formal and informal networks in the port.
Maersk	4.00	Large container shipping line in the world, with regional headquarters in Rotterdam. Many decisions are taken at headquarters and many suppliers are Maersk group companies, local embeddedness is limited. Reputation and scale effects for Rotterdam are present because investments in the efficiency in hinterland transport.
Mammoet	7.00	Heavy lift shipping and off-shore activities. Strong reputation effects for Rotterdam. Active in the local cluster with co-development.
Samskip	6.00	Leading intra-European (maritime) transporter and developer of multimodal networks. Inventor of new transport concepts and equipment. Active in local networks.
Smit	8.00	Leading company in towage and special projects off-shore. Developer of innovative off shore equipment in cooperation with local firms. Large contribution to Rotterdam reputation. Lead user for many Rotterdam based companies.
Odfjell	5.00	Oil and chemical terminal in Botlek with expansion plans. Recently moved the HQ to Rotterdam. Active in local networks.
Imtech	7.00	Developer of state-of–the art ship equipment. Supplier to all major dredging and off-shore companies.
Huisman-Itrec	7.00	Huisman designs and constructs large and innovative structures for the off-shore industry. Innovation is a routine in this company and in this way brings knowledge in the cluster.

ECT[28]	6.00	The largest container terminal in Europe. Important player in attracting goods flows to Rotterdam. Has a history of innovative terminal concepts, but today focuses primarily on operational excellence. The take-over by a Chinese company limited the possibilities for the local management.

The figure below shows the score of the leader firms compared to their size measured in number of employees in the Rijnmond area. The size of the bubbles resembles the net value added of the companies. This results in an overview showing the importance of the firms for the regional economy. The leader firm score gives an indication of the companies' importance for other businesses in the cluster, the number of employees indicates the socio-economic significance of the firm, and the net value added is the resemblance of total economic activity in the Rijnmond area.

Figure 8-1: Relative importance of leader firms for the Rotterdam port economy



[28] Management did not cooperate with an interview on all issues; the score of this company is also based on external sources.

Part IV: Analysis of leader firm behavior

9 The causes of leader firm behavior

In this chapter the causes of leader firm behavior are analyzed. It is tested which characteristics of a company induce leader firm behavior. The tests are performed in two steps. First, a correlation analysis shows how individual characteristics of a firm correlate with leader firm behavior. In a next step combinations of characteristics are analyzed with a qualitative comparative analysis.

Cause and effect

In the case studies, effects of leader firms on the cluster in general and more specifically on their suppliers and innovation are described and analyzed. The effects are identified and shown to be present in the Dutch maritime cluster and the port of Rotterdam. The researched companies all show some type of leader firm behavior with positive effects for other companies. For the business community in the port of Rotterdam this is the most relevant information. It answers the question," does the port benefit from the leader firms that are located there?" A next question is whether these leader firms are more successful than other firms. If this is so, then consciously developing leader firm behavior could be a strategic goal for a firm. Seen from the perspective of the management of a leader firm: "what's in it for me, when we act as a leader firm?" The study provides some insights to answer this question. There are both quantitative and qualitative measures that tell something about the performance of the leader firms. In this chapter the following questions are addressed:

1. Do leader firms make more profit?
2. Are larger firms showing more leader firm behavior?
3. Is having a foreign parent likely to influence leader firm behavior?
4. Is there a relation between purchasing and leader firm behavior?
5. Is leader firm behavior related to local connections?

9.1 Firm characteristics and leader firm behavior

In the first step of the analysis, individual characteristics of the leader firms are related to their amount of leader firm behavior. The following table shows the correlation between leader firm behavior and the characteristics of the firms.

Table 9-1: Correlation between leader firm behavior and firm characteristics

Leader_firm	Correlation	Significance	Number of cases
Employees	.444 (*)	0.049	15
Foreign parent	-.660 (**)	0.004	15
Purchasing quote	0.397	0.072	15
Supplies from region	-0.263	0.172	15
# suppliers in rijnmond	0.255	0.179	15
%_turnover_Rijnmond	0.051	0.428	15
Suppliers_importance_innovation	0.280	0.189	12
Net_turnover	.499 (*)	0.029	15
Profitmargin	.473 (*)	0.038	15
Added_value	0.362	0.093	15
Tot_equity	0.437	0.068	13
Leader_firm	1		15

** Significant at the 0.01 level, ** significant at the 0.005 level*

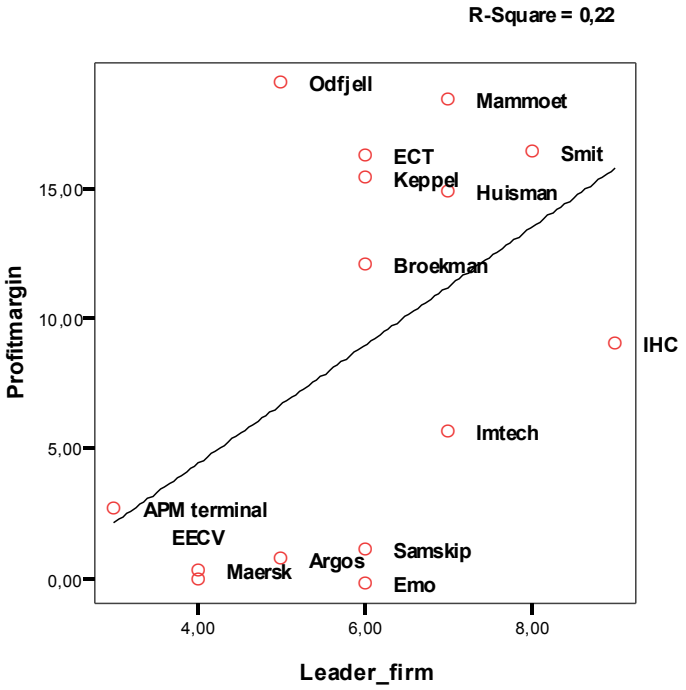
The table shows that there are four characteristics that are individually correlated with leader firm behavior. The size of the company measured in employees and net turnover is positively correlated to leader firm behavior. The profit margin of a company also has a significant positive relation with leader firm behavior. A negative relation exists between a foreign parent company and being a leader firm. The following paragraphs explore these relations in more detail.

Size and profitability

The quantitative measures for size and success are the turnover and the profit of the leader firms. We can perform a check to see if there is any correlation between the amount of leader firm behavior and the size and profitability of the companies. Figure 9-1 shows the scatter plot of profit margin and the score on the leader firm scoreboard. The profitability

of the leader firms ranges from 0% to 19%. The plot shows a slight upward trend indicating that leader firm behavior is associated with higher profits.

Figure 9-1: Relation between profit margin and leader firm role



A one-tailed bivariate correlation test leads to the conclusion that there is a positive significant relation between being a leader firm and having higher profits. This could mean that leader firm behavior raises profit margins. However, the relation might also be reverse; a company with relatively high profits might have more opportunities to make investments with leader firm effects. Being a leader firm often leads to higher profit margins, but having higher profits is not a guarantee for leader firm behavior.

We also see that the production oriented companies both receive higher score on leader firm behavior and have a higher profit margin. The profit margins of transport and trading companies are mostly lower, except for Odfjjel and ECT. IHC, the company that shows the most leader firm behavior has a median profit margin.

The leader firms in the sample have a turnover ranging from 70 to 700 million euro in 2006, this is turnover realized in Rotterdam. Figure 9-2 shows the scatter plot of net turnover and leader firm score. Here also there is an upward trend indicating a positive relation between size and leader firm behavior. Figure 9-3 shows the relation between added value produced by a company and leader firm behavior. Value added proves to be less related to leader firm behavior than turnover. Companies that produce a lot are not necessarily stronger leader firms. Reasons for this can be that these companies need fewer connections with suppliers and thus have fewer incentives for leader firm behavior.

Figure 9-2: Relation between turnover and leader firm role

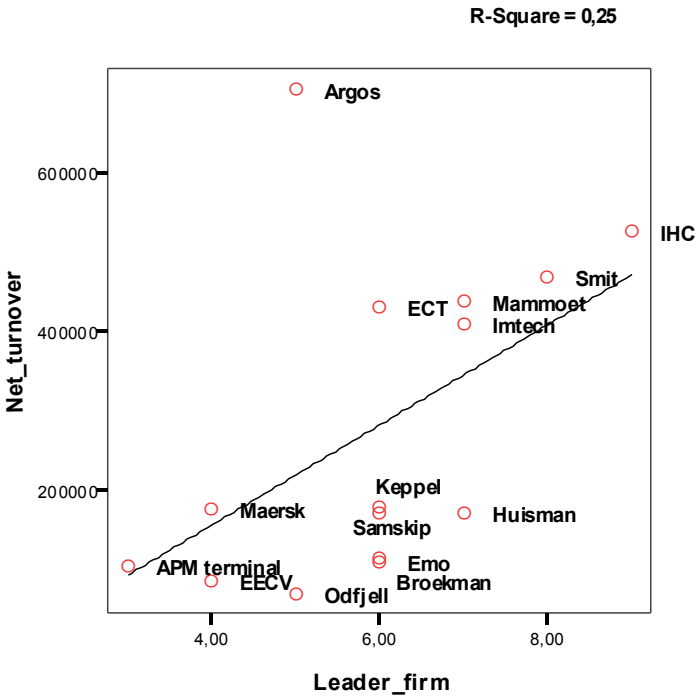
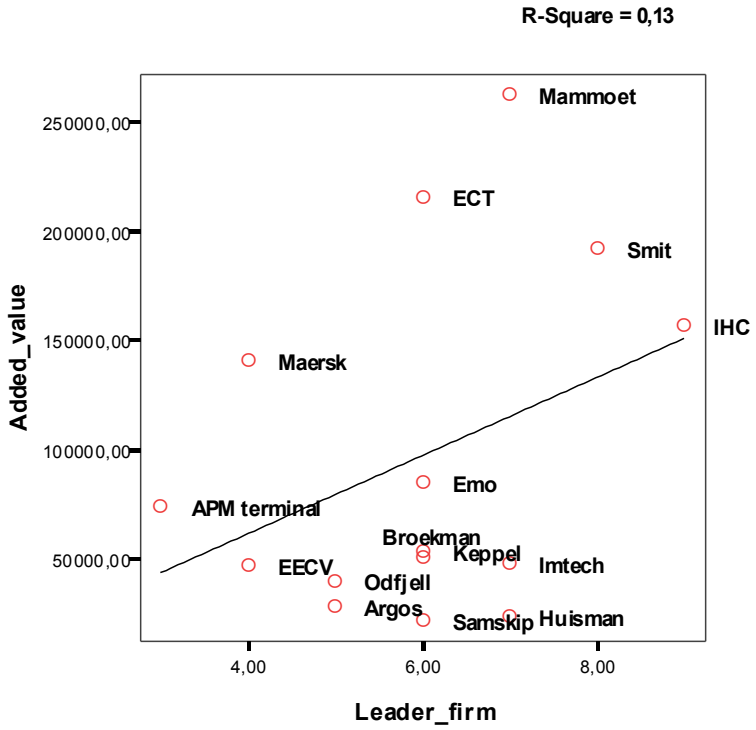


Figure 9-3: Relation between added value and leader firm



The conclusion from this is that companies do not have to be large to be a leader firm and leader firm behavior does not always make a company more successful, but both characteristics do have influence on the amount of leader firm behavior. Size in terms of added value has less influence than size in terms of turnover.

Parent company effects

In the literature and in the selection of leader firms, the location of the headquarters is a factor considered important for the local impact of a company. The assumption is that the location of a headquarter leads to more economic effects because there is more commitment of the management to the area where the headquarters is located and because interaction between companies is more frequent at the level of headquarters.

In the sample of companies, firms that have a foreign parent company and firms with headquarters in Rijnmond are present. For some companies this is unambiguous, firms like Smit Internationale and IHC were founded in Rotterdam and still maintain their headquarters there. For other companies the picture is less clear. For example container stevedore ECT was founded by Rotterdam port companies, grew with the help of government money and was taken over by a Hong Kong based holding in 2002. The ECT headquarters is still in Rotterdam but strategic investment decisions are nowadays made in Hong Kong, not in Rotterdam. The following table gives an overview of the headquarters locations of the leader firms.

Table 9-2: Headquarters location of leader firms

Company	Headquarters
APM terminal	The Hague / Copenhagen
Argos	Rotterdam
Broekman	Rotterdam
EECV	Duisburg / Rotterdam
EMO	Rotterdam
IHC	Rotterdam (Sliedrecht)
Keppel	Singapore
Maersk	Copenhagen
Mammoet	Rotterdam
Samskip	Rotterdam/Reykjavik
Smit	Rotterdam
Odfjell	Oslo
Imtech	Rotterdam/Gouda
Huisman	Rotterdam (Schiedam)
ECT	Hong Kong
Van Oord	Rotterdam
Boskalis	Rotterdam (Papendrecht)

During the research period (2003-2009) some takeovers of leader firms took place. Nedlloyd is now part of Maersk, Geest-lines was bought by Samskip and ECT was acquired by Hutchison Whampoa from Hong Kong.

Judging from the analyzed sample of 15 leader firms the headquarter location effect is present in most cases and proves to have a significant influence on leader firm behavior.

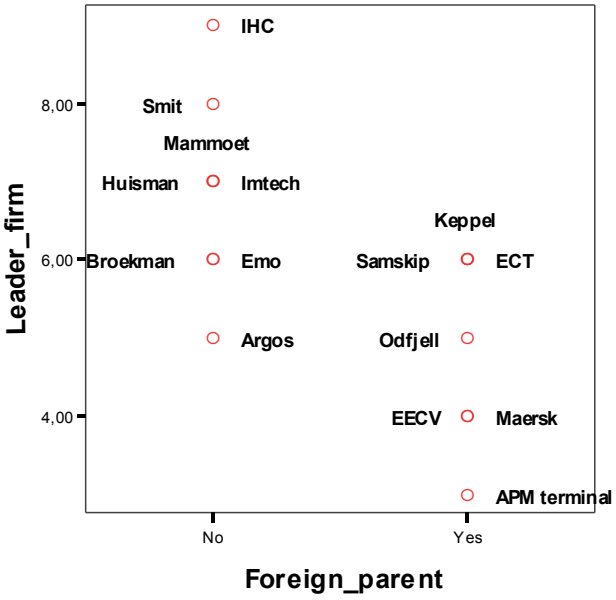
The table below shows the difference in leader firm behavior between companies with foreign parents and those with local headquarters.

Table 9-3: Leader firm score for local and foreign managed companies

Foreign parent?	N	Leader firm score Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
No	8	6,8750	1,24642	5,8330	7,9170	5,00	9,00
Yes	7	4,8571	1,21499	3,7335	5,9808	3,00	6,00
Total	15	5,9333	1,57963	5,0586	6,8081	3,00	9,00

A graphical representation of locally managed and foreign managed firms is given below.

Figure 9-4: Leader firm role of foreign and domestic managed firms



	Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Leader_firm	0,108	0,748	3,165	13	0,007	2,01786	0,63763

Companies with a foreign parent show significant less leader firm behavior than companies with their headquarters in Rotterdam. Still, also these companies act as leader firms in the Rotterdam area, but less so than companies with their headquarters located in Rotterdam.

Keppel Verolme is an example; this company has a parent company in Singapore. According to the management of Verolme the parent company is primarily interested in having production capacity available in Western Europe and further has little direct influence in for example the choice of suppliers. Maersk lines has its headquarter in Denmark and is known to have a rather centralized organization. This has its effects on the Rotterdam branch, but still Maersk is using Rotterdam suppliers for international maintenance.

The headquarter effect also seems to have a reverse effect, as is the case with Smit. Because Smit is located in Rotterdam and there is a strong cluster with specialized suppliers, the suppliers from Rotterdam are also producing for Smits subsidiaries abroad. From our sample of companies we can expect that the host location of the subsidiaries is an important factor in determining the effect of headquarter location. When the host location of a subsidiary is a strong cluster, the headquarter effect is limited. When the headquarter is located in a strong cluster, the effect on subsidiaries in other clusters is likely.

Table 9-4: Assessment of the headquarter effect in different situations

Subsidiary / HQ	Strong cluster	Weak cluster
Strong cluster	-	++
Weak cluster	--	+

Purchasing and leader firms

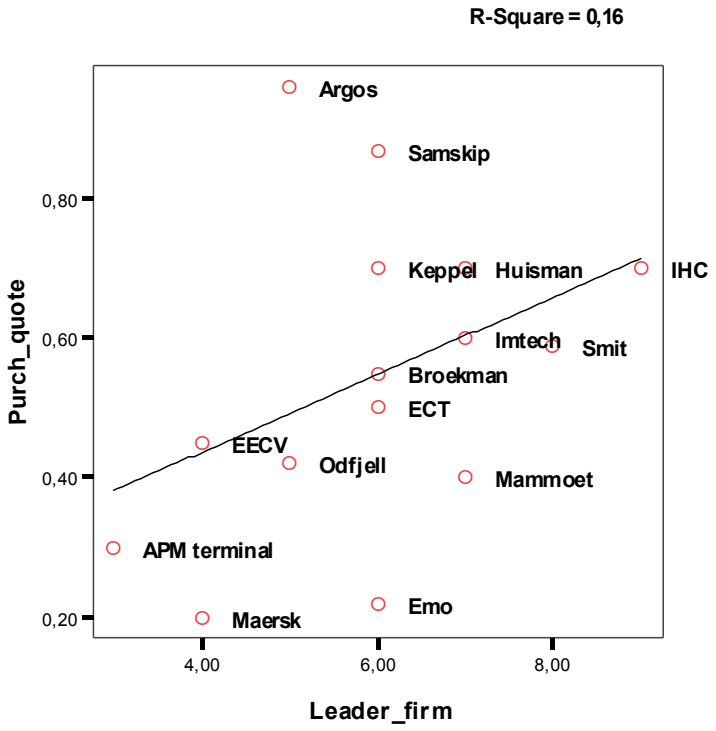
The fourth question asks whether there is a relation between purchasing and leader firm behavior in general. Purchasing is interpreted here as both the amount of goods purchased and the relation with the suppliers.

Regarding the amount of purchased goods, the purchasing quote is used as a measure. The purchasing quote represents the fraction of total production that is bought by a company. A relation between the purchasing quote and leader firm behavior could be expected because a high purchasing quote implies that a company (for a large part) is dependent on the

qualities of its suppliers to deliver its own products and services in time and of good quality. Giving the buying company the incentive to be involved in initiatives that improve the suppliers' performance, such as helping the suppliers develop new products, improve processes or train the employees of the supplier.

In our leader firm sample the purchasing quote ranges from 20% to 96%. In general, the producing companies have the lowest purchasing quote, because they have a high value added in their own production. A little higher quote can be found in the service companies, such as the stevedores, they buy equipment and maintenance primarily. The highest quote is found in the trading and intermediary companies. These firms buy in and sell goods or services without major changes, leading to purchasing quotes up to 95%.

Figure 9-5: Relation between purchasing quote and leader firm role



As can be seen in the figure, the purchasing quote has little direct relation with the degree of leader firm behavior. The leader firms that were assessed with a high score on leader

firm behavior do not have the highest purchasing quotes. Also, the firms with the highest purchasing quote do not show more leader firm behavior than the other firms.

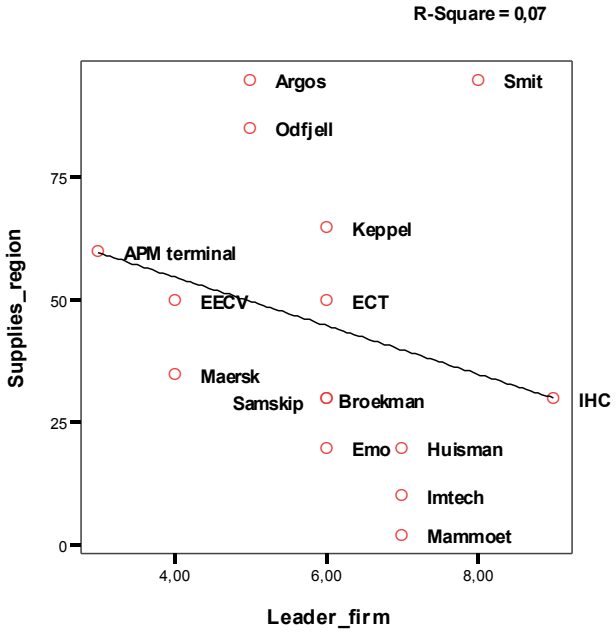
One reason for the companies with the highest quotes not to show the most leader firm behavior is that trading companies and intermediaries do not use the purchased goods and services for their own production but only for resale. They do not experience the qualities of the goods or services to the extent a producer or service company would.

Local suppliers

Another hypothesis related to suppliers is that companies with suppliers that are located in the vicinity of the company are more likely to behave as leader firms. We use two indicators for this, the percentage of the input that comes from local suppliers and the number of prime-suppliers that is located in the Rijnmond area. From theory we expect that companies with a high percentage of input from suppliers in the cluster also have a high incentive to invest in the quality of the cluster. When there is a high number of prime suppliers in the cluster, the same effect is expected.

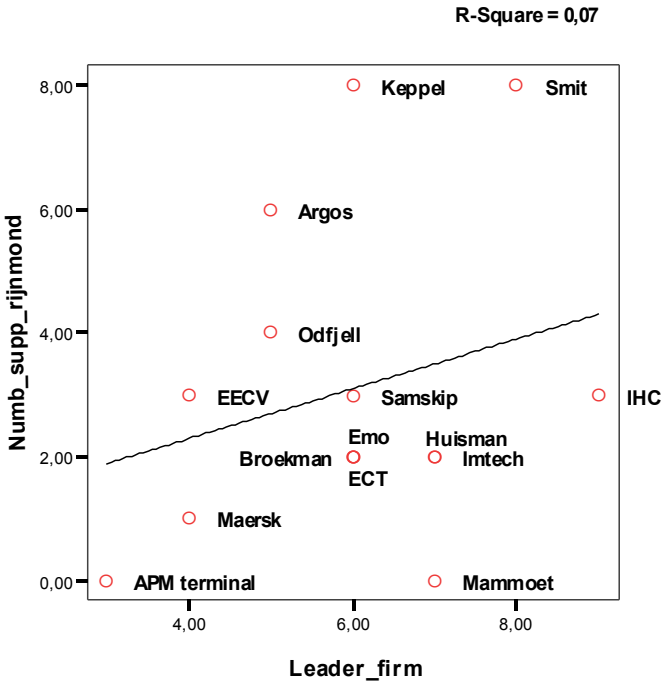
As becomes clear from the figure below there is no direct relation between the percentage of supplies from regional suppliers and the level of leader firm behavior. Some strong leader firms buy almost all their supplies in the region while others do not. In the interviews it was emphasized by most companies that local suppliers often are suppliers of services such as maintenance or construction work. The suppliers that deliver innovative products or machines that are important for the core business of the leader firms are in some cases located in other countries, in other cases the input delivered by the prime suppliers is only a small part of total supplies measured in Euros.

Figure 9-6: Relation between local supplies and leader firm behavior



When we look at the number of prime suppliers in the region we see a similar picture, with great variance in the number of prime suppliers for companies that have the same level of leader firm behavior. It seems that the composition of the supplier base is not an indicator for leader firm behavior.

Figure 9-7: Relation between number of prime suppliers locally and leader firm behavior



Service and production

In the sample of leader firms, both service and production firms are included. From theory one can expect that there is a difference in behavior towards suppliers. Production firms are more likely to have close relations with their suppliers for product development and thus are expected to have more spillover effects on their suppliers than service firms, who typically only periodically work together with their suppliers for the development of capital goods, like a crane for a stevedore.

The sample that is analyzed consists of fifteen companies of which eleven are service firms and four are production companies. The table below shows the difference in characteristics between both type of companies.

Table 9-5: Differences between service and production firms

	Company_type	
	Production	**Service**
	Mean	Mean
Employees	1263	630
Purchasing_quote	0.68	0.50
Supplies_from _region	31%	50%
%_turnover_Rijnmond	30%	13%
Net_turnover	€321,608K	€261,820K
Profitmargin	11.27%	7.91%
Leader_firm score	7.25	5.45

The production firms are considerably larger in terms of employees and net turnover. Another notable difference is that the production firms have a higher profit margin. In terms of local business there are some notable differences. First, the percentage of the turnover that comes from local clients is higher than for service firms. This is a result of the many international clients the stevedoring and transport companies serve. The supplies on the other hand are more local for the service companies than for the production companies. For production companies 1/3 of the supplies is local and for service companies half of total supplies.

Finally, the leader firm score for service and production companies also differs significantly. This is due to the nature of the production that takes place in the Rotterdam port. The production firms are mainly involved in off-shore and dredging equipment. These sectors are characterized by many innovative one-off projects, where there is more room for cooperation and co-development with suppliers, and thus for leader firm behavior. Many service companies are involved in the transport chain, where cost-advantages are the main issues. In a cost driven environment there appears to be less room for leader firm behavior.

9.2 Complex causes of leader firm behavior

In the previous section correlation between individual factors and leader firm behavior were explored. What that analysis does not show is a possible relation between a combination of factors and the amount of leader firm behavior. To analyze these combinations the Qualitative Comparative Analysis (QCA) method is used. In line with Fiss (2007) the leader firms in the Rotterdam port area is seen as an organizational setup that does not fit an statistical approach, but does generate substantial information to "combine verbal statements with logical relationships" (Fiss, 2007 p.1181).

A QCA approach uses Boolean algebra to identify the characteristics that lead to a certain outcome. Every research subject (firm) can posses or not-posses a certain characteristics.

Sets of firms can be constructed based on these characteristics. For example there is a set of firms that has international subsidiaries and there is a set of firms that has high marketing expenditure. Both sets might be sub-sets of the group of companies with superior sales performance. Other variables can be introduced concerning the environment, for example the presence of supporting industries. All these variables and characteristics are expressed in binary digits, 1 for yes and 0 for no, in a truth table that shows what combinations of characteristics lead to a certain outcome. Based on this table an analysis is made to distinguish necessary and sufficient conditions.

The first step in the analysis is the creation of the 'truth table', including the specification of the outcome (leader firm behavior) for each configuration of causal variables (independent variables). The second step is the selection of causal conditions and outcomes to minimize by determining which configurations should be included in the analysis[29]. The outcome of the analysis is an overview of the (combination of) causal conditions that lead to the outcome that is researched, in this case leader firm behavior. In the QCA the following characteristics of the firm are available for inclusion in the analysis:

- The size of the firm,
  - turnover
  - added value
  - employees
  - total equity

[29] Note that not all configurations have to be included because some configurations might be subsets of other configurations and other configurations have no explaining power (low consistency)

- Connectedness of the company,
  - percentage local buyers
  - percentage local supplies
  - number of core suppliers located in the region
  - location of the headquarters
- Importance of suppliers,
  - In the perspective of the leader firm
  - Purchasing quote
- The amount of leader firm behavior,
  - score on the leader firm scoreboard

Per theme an analysis is made to determine what factors influence leader firm behavior. The first model to test is one with variables from every theme that was identified as important from a theoretical point of view. This leads to testing the following model:

LEADER_FIRM = f (EMPLOYEES, FOREIGN_PARENT, SUPPLIES_RIJNMOND,
#_SUPPLIERS_RIJNMOND, %_TURNOVER_RIJNMOND,
IMPORTANCE_SUPP_INNOVATION, NET_TURNOVER)

This model predicts that the amount of leader firm behavior that a company shows is dependent on the number of employees, the presence or absence of a foreign parent, the volume of supplies that is locally bought, the number of suppliers in the region, the part of the turnover that is realized locally, the importance of suppliers for innovation and the net turnover.

Before calculating a solution some assumptions are made regarding the causal relations between the variables and leader firm behavior. In the table below, the expected relation of 5 variables is given. 'Present' in this table means that the only influence on leader firm behavior is expected to be positive. For two variables, percentage of turnover in Rijnmond and net turnover, there is no pre-defined relation. Theoretically these variables could have both a negative and a positive effect.

EMPLOYEES	Present
foreign_parent	Absent
SUPPLIES_RIJNMOND	Present
#_SUPPLIERS_RIJNMOND	Present
IMPORTANCE_SUPPLIERS_INNOVATION	Present

The number of employees and the importance of local suppliers are always expected to have a positive influence. A foreign parent is expected to have a limiting effect on leader

firm behavior. The net turnover is not defined as positive or negative on forehand, because the size of the sales is not direct related to the local environment.

For the model we calculate two solutions, one complex and one simple. The complex solution gives the variables that show the most consistency. This means that the given solution is the combination of variables that gives the best prediction of leader firm behavior. The simple, or parsimonious, solution shows the most essential variables that predict leader firm behavior. The complex solution is given in the following table. The three combinations of variables are sufficient conditions, meaning that having any of these combination of conditions is expected to lead to leader firm behavior. A variable that is present or high is shown in CAPS, a variable that is absent or low is shown in small letters.

Table 9-6: Conditions that lead to leader firm behavior

(CAPS=High score, small= low score)

	solution coverage: 0.707593 solution consistency: 0.777712	**raw coverage**	**unique coverage**	**consistency**
A	#_SUPPLIERS_RIJNMOND * %_turnover_rijnmond * net_turnover+	0.565217	0.304348	0.701052
B	foreign_parent * %_turnover_rijnmond * NET_TURNOVER+	0.294549	0.222086	0.802558
C	EMPLOYEES * foreign_parent * #_SUPPLIERS_RIJNMOND * IMPORTANCE_SUPPLIERS _INNOVATION * NET_TURNOVER	0.181159	0.108696	1.000000

Leader firm behavior is eventually a product of one of the following combination of conditions:

A) Many local prime suppliers, limited number of local customers and relatively low turnover

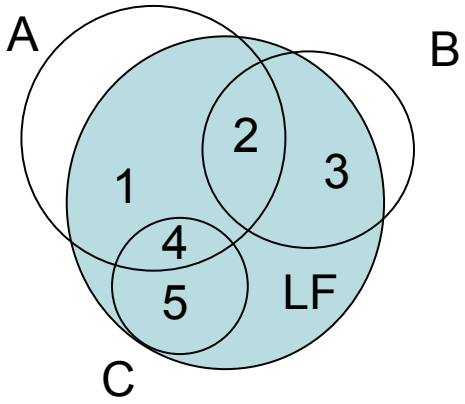
B) No foreign parent, limited number of local customers and high turnover.

C) Many employees, no foreign parent, many local prime suppliers, important suppliers for innovation and a high turnover.

The consistency of the solutions shows how many cases with the exact combination of conditions given in the solution show a positive result (relatively high leader firm behavior). Of all the cases that show the first combination of conditions (NUM_SUP_RIJN* perc_turnover_rijn* net_turnover) 70% also shows relatively high leader firm behavior.

The coverage tells how much of the outcome (leader firm behavior) is explained by the solutions. The 'solution coverage' represents the coverage of the three solutions together; the complete model explains 70% of the leader firm behavior. Per solution raw and unique coverage are given. Raw coverage tells how much of the leader firm behavior is explained by the specific solution, Unique coverage represents the amount of leader firm behavior that is explained uniquely by a specific solution. Schematically the outcomes are represented in Figure 9-8.

Figure 9-8: Schematic representation of consistency and coverage



Area's 1, 2 and 4 together represent the raw coverage of solution A and area 1 represents the unique coverage of solution A. 70% of the circle that represents solution A overlaps with leader firm behavior (LF), showing the consistency of solution A. Solution B is represented by circle B, which has more overlap with leader firm behavior (80%) showing higher consistency but covering a smaller part of all leader firm behavior, the coverage of 29% that is represented by area's 2 and 3. Solution C fully overlaps with leader firm behavior, meaning that companies with this profile always show relatively high leader firm behavior.

The area's that are not covered by solutions A, B or C show the cases where leader firm behavior is unexplained by the model. Other factors play a role in these cases, for example the attitude of management towards cooperation within the cluster.

The results of the model show that, given the assumptions, low membership in turnover realized in Rotterdam is a causal condition for leader firm behavior. This gives an indication that the firms that show the most leader firm behavior are mainly serving customers outside the cluster. An explanation for this is that the leader firms are often large companies for who the local market is too small. Furthermore, the majority of the leader firm effects involve suppliers and competitors more than the clients.

Further we can conclude that there is no single sufficient condition that will lead to leader firm behavior. We can notice that the number of prime suppliers is important in two solutions and that a high turnover is important in the other solution. This gives the idea that having one of the two is a necessary condition. The parsimonious solution of the model, representing the smallest possible solution to the model confirms this, as shown in the following table.

The parsimonious solution gives the minimal conditions that have to be in place to explain the outcome. The two most influential conditions for leader firm behavior are the total turnover and the number of important suppliers that are located in the Rotterdam area.

Table 9-7: Minimal conditions for leader firm behavior

solution coverage: 0.775772 solution consistency: 0.640840	raw coverage	unique coverage	consistency
NET_TURNOVER+	0.544540	0.152583	0.773538
#_SUPPLIERS_RIJNMOND	0.623188	0.231232	0.614286

Connectedness

A separate theme to analyze is the connectedness of the companies. The linkages with the local business community are a central theme in most theories that form the building blocks for the leader firm concept. In industrial districts the connections for production coordination are center stage, in cluster theory the spillovers that arise as a result of interaction are important and in network theory there is a distinction between strong and weak links, where the strong links are typically the modes for leader firm behavior. For connectedness the following model is tested:

LEADER_FIRM = f (FOREIGN_PARENT, %_SUPPlIES_RIJNMOND,
#_SUPPLIERS_RIJNMOND, %_TURNOVER_RIJNMOND)

In this model we exclude the size of the companies as a relevant factor to make a better judgment of the importance of the conditions that are associated with connectedness.

Three elements are included in this function. First the issue of control, is there full local control over the operations? This is represented by a yes/no variable for having a foreign parent company. A foreign parent might limit the local freedom to act as a leader firm.

Second, the connections with local suppliers, for this element two variables are used, the total percentage of supplies that comes from the Rotterdam region and the number of prime suppliers that are located in Rotterdam. A high percentage of total input might bring a firm to investment in the quality of the business environment, since many of its suppliers will benefit from this. A leader firm with many prime suppliers in Rotterdam might also invest in local knowledge development with these important suppliers, since these prime suppliers are essential for the production of the leader firm.

The final element is the percentage of the sales that is made to Rotterdam based companies, do the leader firms produce for local or for international customers? If they have primarily local customers, leader firms might be interested in helping these customers to expand their markets. When leader firms do not have local customers their investments could be more targeted at other, more distant markets instead of the local cluster. The summary of the most complex outcome of the model is given below[30].

Table 9-8: Local connectedness and leader firm behavior

(CAPS= high score, small=low score)

	Solution coverage: 0.651685, solution consistency: 0.778524	Raw Coverage	Unique Coverage	Consistency
A	foreign_parent* %supplies_rijnmond * %TURNOVER_RIJNMOND+	0.275281	0.269663	0.960784
B	%SUPPLIES_RIJNMOND* #SUPPLIERS_RIJNMOND* %turnover_rijnmond	0.348315	0.140449	0.911765

[30] The most complex outcomes means that no a priori assumptions are made about the direction of influence. In an intermediate solution, conditions that are expected to work one way are selected on forehand.

The overall model explains 65% of the difference in leader firm behavior with a consistency of 77%. Overall the results of the model suggest that there is not one type of connection to the local business community that explains leader firm behavior. Any type of connection can be an incentive to invest in the cluster. Finally, a foreign parent seems a limitation for leader firm behavior. The parsimonious solution in Table 9-9 gives more insight into the most important conditions.

Table 9-9: Minimal conditions for leader firm behavior related to connections

solution coverage: 0.764045 solution consistency: 0.660194	Raw covergae	Unique covergae	Consistency
# SUPPLIERS_RIJNMOND +	0.539326	0.308989	0.640000
%supplies_rijnmond *% TURNOVER_RIJNMOND +	0.370786	0.078652	0.942857
foreign_parent * % TURNOVER_RIJNMOND	0.359551	0.011236	0.800000

The number of prime suppliers in the region seems a sufficient causal condition for leader firm behavior. As long as there are important suppliers for a company located in the cluster, the company is likely to show relatively more leader firm behavior. Further, the absence of a foreign parent in combination with high turnover in Rijnmond or limited supplies from Rijnmond in combination with a high turnover in Rijnmond are causal conditions that lead to relatively high leader firm behavior.

Suppliers

When we test the relation with suppliers as a causal condition for leader firm behavior, three variables are used; the purchasing quote, reflecting how much a firm buys in relation to its turnover, and the importance of local suppliers to the leader firm in quality and in innovation projects. The last two variables reflect the perception of the leader firm's management. If we assume these three conditions are the only two that determine leader firm behavior, then we can construct the following model:

$$\text{LEADER\_FIRM} = f(\text{PURCHASING\_QUOTE}, \text{IMPORTANCE\_QUALITY\_SUPPLIERS}, \text{IMPORTANCE\_SUPPLIERS\_INNOVATION})$$

Table 9-10 shows the outcome of testing this model for the leader firms.

Table 9-10: Suppliers and leader firm behavior

(CAPS= high score, small=low score)

solution coverage: 0.918841 solution consistency: 0.826597	Raw coverage	Unique coverage	Consistency
purchasing_quote * IMPORTANCE_SUPPLIERS _INNOVATION +	0.634783	0.124638	0.840691
PURCH_QUOTE * IMPORTANCE_QUALITY_SUPPLIERS_RIJNMOND	0.794203	0.284058	0.908789

The solution shows that the purchasing quote is neither a necessary nor a sufficient condition for leader firm behavior; there are two paths towards leader firm behavior, one with a high purchasing quote and one with a low purchasing quote. The combination of a low purchasing quote and importance of suppliers for innovation is a combination of causal conditions that leads to high leader firm behavior and companies with a high purchasing quote and local suppliers that are important for the quality of the final product show leader firm behavior. The relatively high coverage and consistency of the second condition suggests that companies that are dependent on the quality that suppliers deliver tend to make more leader firm investments.

9.3 Conclusions

In this chapter the causes of leader firm behavior are further analyzed. From the cases it became apparent that the companies analyzed in this research all show some leader firm behavior. But some firms create more positive externalities than others. In the further analyzes of the characteristics of the firm and the relevant causal conditions the following conclusions can be drawn.

1. There is not one dominant factor that determines leader firm behavior
2. The size of the company measured in employees and net turnover is positively correlated to leader firm behavior.
3. Companies do not have to be large to be a leader firm and leader firm behavior does not always make a company more successful, but both characteristics do have influence on the amount of leader firm behavior. Size in terms of added value has no influence but size in terms of turnover seems to be an important condition for leader firm behavior. This shows that, for leader firm effects, external relations are more important than the in-house production capacity of the leader firm.

4. The profit margin of a company has a positive relation with leader firm behavior. Leader firm behavior is associated with higher profits. But having higher profits is not always a guarantee for leader firm behavior. It's a necessary but not a sufficient condition.
5. A negative relation exists between a foreign parent company and being a leader firm. The firms with foreign owners show less leader firm behavior because they do not manage their own supplier base or they do not make investments in the cluster infrastructure in the amounts locally managed firms do.
6. The combination of being a firm with production and design capabilities, having many local suppliers that are important for quality and innovation and having full management responsibility locally seems the best combination for leader firm effects.
7. The total amount of supplies coming from the region is not an important factor for leader firm behavior, but the number of important suppliers in the region is of influence. Many local supplies or suppliers do not automatically lead to high levels of leader firm behavior. Regarding suppliers, the adagium 'quality is more important than quantity' seems just.

10 Conclusions and recommendations

This study shows that leader firms are an important element of clusters in general and in seaport clusters in particular. In the fields of innovation, production systems and cluster governance the leader firms play a central role in the competitiveness of the cluster.

In this concluding chapter the research findings are presented in relation to the questions formulated in chapter 2. These questions were divided in theoretical and empirical/analytical questions. It is of importance to make this distinction because the theoretical findings can be generalized in a broader context than the empirical findings.

10.1 Concepts for identifying leader firms

One important question in this study was what concepts can be used to understand the role of leader firms. From the theoretical exploration it follows that many insights from studies on clusters, networks, industrial districts and, to a lesser extent, supply chains are very useful when analyzing the role of leader firms. Based on a combination of these insights and knowledge about the sector a method to select leader firms in a cluster was developed.

From the theoretical discussion it followed that the ability and incentives of a company to be a leader are the most important elements, leading to the following definition of leader firms:

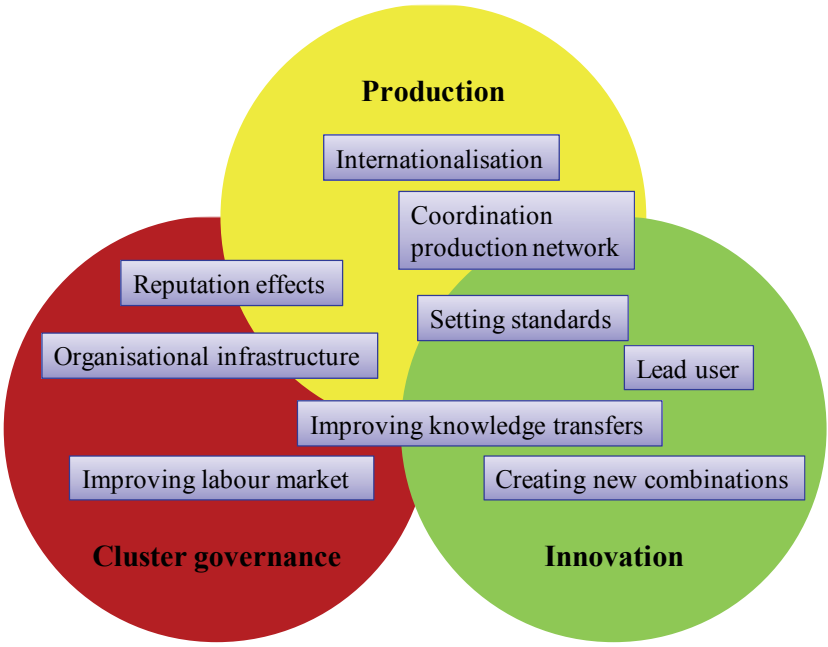
"*Leader firms are firms in a cluster that have -because of their* ***size, market position, knowledge and entrepreneurial skills****- the ability and incentive to make investments with positive side-effects for other companies in the cluster."*

In the empirical part, the identification of the leader firms received a lot of attention. The selection was done with precision to make sure that the likeliness of actually finding leader firm behavior was maximized. The combination of company data and expert opinion proved to be a very useful method. Identifying leader firms can be done by analyzing indicators that show whether a company *could* be a leader firm. This should be combined with expert opinions to determine that a firm *is* a leader firm. Based on this study a new way of recognizing leader firms is available. Next to the factors mentioned in the definition, in the empirical part the local presence of a headquarter and the ownership structure prove to be important factors.

10.2 Roles of leader firms

A second question that was answered in the study is how individual firms can help the development of a cluster. This question is answered with a combination of theoretical and empirical findings. From the literature several roles were identified that a firm can have in the development of others, such as being a *lead user* or by *creating new combinations*. In the empirical exploration of the leader firm concept in the Dutch maritime cluster more role were identified. In total nine forms of leader firm behavior are distinguished. Leader firm behavior has effects in the field of innovation, production and cluster governance. Some forms of leader firm behavior only have effect in one field, while other behavior has its influence on all three. Figure 10-1 shows the nine forms of leader firm behavior and gives an indication of the field where the effects of this behavior can be seen.

Figure 10-1: Nine forms of leader firm behavior in three fields



10.3 Leader firms in the port of Rotterdam

Port clusters

In this study the port cluster was defined based on geographical situation and port(related) activities. The construction of the cluster is somewhat different from earlier studies on port clusters, because the (petro) chemical industry was left out. Further analysis of the firms showed that the choice not to included chemicals production in the cluster construct are justified by the absence of knowledge relations and substantial input-output relations between these companies and companies that are more closely involved in the core port activities.

The port of Rotterdam seems to locate two different clusters, the maritime cluster and the port-using chemical production cluster. Both clusters operate in the same area and use the direct access to the sea, but have limited functional and knowledge relations with each other. In future studies the construction of seaport clusters should be done more carefully and recognize the possible bias created by the viewpoint that is chosen in the research.

The geographical boundaries of the cluster were defined by using a measure that combines the absolute and the relative amount of port activities in an area defined by postal codes. This is novel; up to date, clusters are defined by the total number of firms or the specialization of an area in a certain industry. Including both measures at the same time does more just to the specific setting of a seaport. The absolute number of activities is important because it provides mass for knowledge spillovers and collective action. The relative amount of port activities is important because it shows the importance of the industry for the local economy and the local government. For seaports this is a very relevant issue since ports are in most cases dependent on government policies for new investments.

After analyzing the Rotterdam port cluster and seeing that there are several sub clusters, the term port-cluster does not do just to the diversity of the companies that are included in the cluster. The cluster could better be called a delta cluster; it's not necessarily the port function (stevedoring) that is the core of the cluster. One can argue that there are several industries or sectors that can be considered core of the cluster.

Leader firms

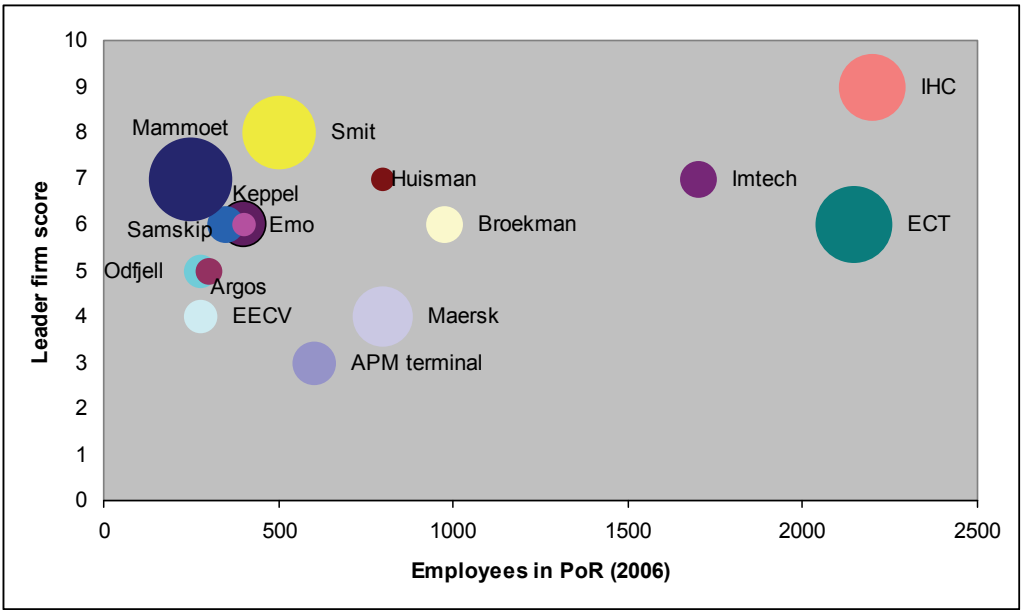
About 5000 organizations are located in, or closely related to the port of Rotterdam. The majority of the companies are rather small; only 103 firms have more than 100 employees. In the port there are 73 'core companies', companies large enough to have a substantial impact in the port. These are companies that have more than 100 employees and have a total equity of more than 50 million euro or a net turnover of more than 10 million euro. Closer research shows that 27 companies qualify as potential leader firms.

Name of Company		**Name of Company**
APM Terminals Rotterdam		Interforest
Argos Groep		Jo Tankers
Bakker Sliedrecht Electro Industrie		Keppel Verolme
Boskalis		Koninklijke Vopak
Broekman Group		Kühne & Nagel
EECV		Mammoet
Europe Container terminals		Maersk lines
Europees Massagoed Overslagbedrijf (EMO)		Odfjell Terminals (Rotterdam)
Gevelco		Samskip
Havenbedrijf Rotterdam		Schenker International
Hoyer Nederland		Seabrex Rotterdam
Huisman Itrec		Smit Internationale
IHC Merwede		Van Oord
Imtech marine & offshore		

The leader firms that were identified differ in the range of external effects they have in the cluster and on their suppliers. In the study 15 leader firms are scored based on these external effects. The leader firms are an important factor in the cluster; the positive externalities they provide help the cluster to remain competitive. Because of this, a cluster should wish to have a substantial set of leader firms. In the Rotterdam cluster such a set is present. However, the amount of leader firm effects differs per company. Not every leader firms shows the same amount of leader firm behavior, the figure below ranks the analyzed leader firms according to their impact on the Rotterdam port cluster.

Figure 10-2: Leader firm score and number of employees

The size of the bubble represents the value added produced



Many firms in the port of Rotterdam, particularly the leader firms in transport and stevedoring focus on operational excellence. They try to maintain high productivity and efficiency. The innovation spillovers of these companies are limited compared to those companies that are involved in the production of complex products, such as ships, or companies that are involved in demanding projects, such as salvage.

However the transport and stevedoring companies still have a leader firm role. Not so much in innovation, but primarily in attracting cargo, increasing efficiency and minimizing environmental impact from the cargo flows; leading the cargo flows through the most efficient and least polluting port is beneficial for the overall environment.

Attracting cargo is the result of leader firms that perform better than their competitors in other ports and by companies that offer services not found elsewhere. Attracting this cargo leads to more business in the port of Rotterdam; the size of the goods flow and the number of ships that come in the port largely define the amount of related services that develop in the port.

Some leader firms have an important role in the development towards sustainable transport. The transport company Samskip for example invests in the development of intermodal networks and stimulates its clients to make more use of rail and barge transportation. The stevedoring company EECV invests in all sorts of techniques to minimize spills in loading, offloading and during storage of coal. The stevedores ECT and APM-terminals work together with the port authority to develop a container transferium in the hinterland connected with barge links to the deep-sea terminals. This will reduce polluting trucks and congestion on the highways in Rotterdam.

For the port of Rotterdam the score of both the number of leader firms and for the amount of leader firm behavior can be considered fair (which is in line with previous research of De Langen, 2004). There is a considerable amount of leader firm effects but the levels could be higher with more and better connected leader firms. The port business does not seem an environment where leader firms emerge and flourish easily. There are three reasons for that

1. The port business is an international but location dependent business. Service firms can only expand by operating multiple locations; local production for global customers is not possible. This leads to global organizations with many subsidiaries. Ports are therefore often characterized by a large number of subsidiaries instead of many leader firms.
2. Transport markets are mostly cost-driven and innovation is not the first priority. Many leader firm effects are related to investments in innovations, as a result the leader firm effects in ports are relatively limited.
3. Many port companies are part of a chain which is controlled by a party not directly related to the port; port facilities function as a cost centre, not as a centre of expertise, which could have leader firm effects.

The not so fertile ground for leader firms is partly an explanation for the weaknesses that are identified for the port of Rotterdam in the introduction. Especially in the fields of innovation and coordination, which are two issues in which leader firms can play an important role and are issues that prevent the port of Rotterdam to develop to its full potential.

Innovation often stems from a combination of companies; when there is a common problem or goal, firms tend to combine knowledge and find new concepts or techniques. The networks of the leader firms show that the chances of combining knowledge are low in

most markets; only the off-shore sector has a close network with shared suppliers. The transport and stevedoring companies face common challenges (congestion, price competition, environmental concerns, and labor market) but initiatives for joint action on these issues are scarce and innovative solutions are not found in substantial quantities.

10.4 Characteristics of leader firms

In the study the leader firms were assessed and the score in this assessment was compared with the characteristics of the leader firms. The factors size, profitability, local suppliers, foreign owners and purchasing quote were analyzed. The main conclusion from this analysis is that there is not one ideal set of qualities and characteristics that cause leader firm behavior, but that several characteristics do have an influence on the amount of leader firm behavior.

Size

The size of a company is measured in different ways, the turnover, the value added produced and the number of employees. The turnover gives an indication of the dimensions of the external relations, while the value added and the number of employees primarily indicates the in-house production capacity. A positive relation was found between turnover and number of employees and leader firm behavior, but no significant relation with the value added. This only partly corresponds with the expectation that larger firms have a greater incentive to act as a leader firm because they are also the one that will profit the most from improvements in the cluster. Apparently the size of external relations is more important than production size.

Profits

The profit margin of a company does have a positive relation with leader firm behavior. But having higher profits is not always a guarantee for leader firm behavior. This could mean that leader firm behavior raises profit margins. However, the relation might also be reverse; a company with relatively high profits has more opportunities to make investments with leader firm effects. In other terms: a reasonably high profit margin is a necessary, but not a sufficient condition for leader firm behavior.

Foreign parent

A negative relation exists between a foreign parent company and being a leader firm. On average the companies with a foreign parent show less leader firm behavior than companies with their headquarters in Rotterdam. The firms with foreign owners show less leader firm behavior because they do not manage their own supplier base or they do not make investments in the cluster-infrastructure in the amounts locally managed firms do. This leads to less interaction with other companies in the cluster and consequently to less knowledge spillovers, less cooperation and fewer investments in solutions to collective action problems.

This does not mean that all locally controlled companies show leader firm behavior. Only within the group of leader firms the parent company effect is significant, local control is not a sufficient condition for leader firm behavior. The presence of (regional) headquarters in the region or cluster does seem to be a necessary condition for a leader firm.

Suppliers and clients

Companies that purchase a lot of goods do not have more leader firm effects than other companies. The purchasing quote has no direct relation with the degree of leader firm behavior. The leader firms that were assessed with a high score on leader firm behavior do not have the highest purchasing quotes. Also, the firms with the highest purchasing quote do not show more leader firm behavior than the other firms.

The total amount of supplies coming from the region is also not an important factor for leader firm behavior, but the number of *important suppliers* in the region is of influence. This largely coincides with the local innovation networks. The more a company is relying on local suppliers for its innovation, the more leader firm behavior it shows in the cluster.

Production and service companies

Another conclusion is that producing companies in general have more incentives to act as leader firms. In our sample, the production companies show the most leader firm behavior. Reasons for this are twofold. First, producing firms experience more directly the quality of the input they use for their production and they have to cooperate closer with their core suppliers in order to match design and production processes. Second, the physical products of the leader firms are often complex products that have a high ‘reputation value’ leading not only to more reputation effects but also to strong effects on standards and creation of new combinations. The service firms that do receive high scores in leader firm behavior

are those firms that use complex equipment and are involved in the design of these products, such as Smit and Mammoet.

Characteristics that lead to leader firm behavior

The combination of being a firm with production and design capabilities, having many local suppliers that are important for quality and innovation and having full management responsibility locally seems the best combination for leader firm effects. This is also the combination of characteristics that the company with the highest leader firm score (IHC Merwede) possesses. However, also the other companies that have many leader firm effects score high on these characteristics.

The reasons for leader firm behavior seem far more complex than only the above mentioned characteristics and combinations of factors. For many companies that showed a substantial amount of leader firm behavior the management said to 'belief' in the necessity to invest in the cluster. The personality and profile of the managers are two factors not included in the research but could prove to be important predictors of leader firm behavior.

10.5 Leader firms and suppliers

From the study on leader firm strategies and behavior towards their suppliers we can learn that there is no port wide strategy for managing supplier relations and supplier development. We can also conclude that companies in the port of Rotterdam only use purchasing management techniques to a limited extend. Further, the connectedness with the local suppliers is important for leader firm behavior and thus for cluster performance.

The Rotterdam based port (related) leader firms in general can be characterized as developing their purchasing management. No examples are found of cutting edge purchasing management. Typically the port(related) companies learn from companies in manufacturing industries and try to implement elements of purchasing management from these industries. In this respect deliberately hiring purchasing managers that have worked in other industries could be a good strategy for port companies. The most developed purchasing management and supplier development is found in the IHC-Merwede organization - not surprisingly a product-based company with a high purchasing quote. Other companies are gradually implementing a supplier strategy and try to streamline their purchasing. Supplier development initiatives however are rare in the port of Rotterdam. There are two reasons for this.

First, many suppliers that are important to the Rotterdam leader firms are world-wide suppliers of products or services and are too large or advanced to be part of a supplier development initiative. Second, many supplies are bought on very competitive markets, where market pressure is the most appropriate way to stimulate suppliers. The incentive to invest in suppliers is low in these cases because the benefits are not likely to exceed the costs of investing time and money in suppliers.

Supplier strategies

More than half of the leader firms use competitive pressure as a way to improve the performance of their suppliers. For the leader firms it means that they explicitly communicate to their suppliers that a certain performance will lead to more business.

Evaluation procedures are used sometimes by most leader firms. According to the leader firms, evaluation is only a viable strategy towards suppliers with who there is a structural, long term relation. A strategy to give financial incentives to suppliers is not a standard procedure with any of the leader firms. Most firms never use this strategy. Other firms use it sometimes or only in a specific case, for example when a supplier and a leader firm work on a joint investment in new techniques.

Direct involvement in the operations of suppliers is a strategy most leader firms never use. These leader firms have the opinion that suppliers should use their own resources to develop better services or products. Involvement of suppliers in innovation projects is done by most leader firms, but not very often. Leader firms pick projects and suppliers carefully before starting a joint project, but every leader firm acknowledges that involving suppliers in innovation is very important for getting new insights and ideas.

Reputation

By acting as a leader firm, the company creates goodwill in the cluster, especially when customers and suppliers are located in the cluster a company benefits from a growing reputation. On the other hand, leader firms might be a threat to other companies. In the case when a company is so large it can dictate the market, it does no longer benefit from the position as a leader firm. Buyers and suppliers might try to avoid the leader firm because of the power imbalance. Acting as a leader firm when there is a large power imbalance could lead to growing dependence of the suppliers. A situation some suppliers want to avoid.

Supplier Networks

The networks in the port of Rotterdam are to a large extent not confined to the cluster boundaries. For most leader firms the turnover is realized by customers outside the cluster. Also for many companies the important suppliers are located outside the cluster. The most important suppliers for the leader firms are shown in the table below.

Supplier	Connections	Centrality score
Wärtsilä	4	36
ABB	2	21
GTI	3	20
Rolls Royce	2	19
Croon	2	19
Heinen & hopman	2	19
Radio Holland	2	16
Siemens	2	12
Nacap	2	4
Nemag	2	1
Noell	2	1
ZPMC	2	1

10.6 Recommendations

In this paragraph some recommendations are formulated for different actors in the port of Rotterdam; the port authority in its role as cluster manager, the port community as a whole and the individual leader firms.

Port authority and local government

For governments it can be of great importance to identify the leader firms in their geographical area. It enables them to put any industrial policy to greater use. Especially in the case of innovation stimulus it proves to be important.

Bring innovative companies together

Innovation is the driver of economic development. The port authority is the prime stakeholder in the economic development of the Rotterdam port and is thus a logical party to stimulate innovation by creating an innovative climate. One way to do this is to bring companies together in a setting were knowledge is easily shared; especially those companies that do not interact with each other in their daily operations and are part of

different networks. The aim then is to form ties that cut across the small world networks and facilitate knowledge spillover between previously unconnected firms.

Keep control over strong leader firms locally

The companies with the most leader firm effects are those that are controlled locally. There are reasons to exert influence to try to maintain the decision making units of leader firms in the Rotterdam area. The benefits of this are larger than only the presence of high skill jobs; it also brings forth positive effects in the broader business community. In this light the recent investment of the Hamburg local government in Hapag-lloyd to prevent a takeover by a foreign company makes sense, and might be an example for the Rotterdam port community[31].

Stimulate operational excellence

Most companies in the port are not in a highly innovative; primarily as a result of the industry they are operating in where costs are the main issue. Successful innovations in this type of industries are innovations that increase efficiency in the production process. When stimulating innovations in the transport and stevedoring sector, a focus on innovations that lead to operational excellence have the most impact and should therefore be done first.

Tell the story

The belief-system of managers seems to be an important, but hard to recognize, factor in leader firm behavior. In order to enhance the leader firm effects in the Rotterdam port cluster the port authority might want to make more managers aware of the benefits leader firm behavior has for the cluster and for the leader firm itself.

Port community

Show your best practices

The reputation effects of some leader firms are of world scale. For example the salvage projects done by Smit international, the unprecedented heavy lift projects by Mammoet or the production of very large off-shore constructions by Keppel and Huisman-itrec. These companies all contribute to the 'Rotterdam brand', making marketing for all companies in Rotterdam easier. Also for other companies than the aforementioned -obvious- examples it

[31] Hamburg consortium's bid highest for Hapag-Lloyd, lloyd list 04-08-2008 through http://www.lloydslist.com/ll/news/viewArticle.htm?articleId=1217532616870&src=rss

is wise the show their best practices extensively. It brings a positive attitude towards Rotterdam companies, it shows customers that they chose the right supplier, it shows suppliers that they work with a world class buyer and might raise interest with other companies to cooperate in mutual beneficial projects.

Learn from your neighbors

In the port of Rotterdam and the surrounding regions there are many companies that show entrepreneurial and innovative skills that could be useful for other companies. The examples of leader firms that invest in new technology or develop and manage relations with their suppliers can be very informative for other companies. At the same time the networks within the port(related) industries are somewhat separated, limiting the opportunities for cross-sectoral learning. Actively searching for valuable examples of successful innovation projects, organization structures, supplier management in industries that are related but outside the 'small world network' is likely to be a successful learning strategy.

Leader firms

The notion of leader firms causing knowledge spillovers gives implications for the companies involved.

Recognize the leader firm effects

For the leader firm it is of importance to recognize the spillover effects they generate. Being aware of the spillovers a firm can try to control the direction of the spillovers to a certain extent and try to regain part of the benefits they have created themselves. This involves especially a close examination of the knowledge flows to and from the firm. This information can be used in selecting partners. Selecting partners for a business project that already are part of the informal knowledge network of the company leads to a recapture of the knowledge that was initially 'spilled-over'.

Know your suppliers

Some leader firms have a very good understanding of the possibilities and the knowhow of their suppliers. This proves to be very valuable knowledge when bringing design teams together or for selecting a specific supplier for international support. Shipbuilder IHC has the most advanced system of supplier monitoring of the researched leader firms. The practice of this company can be an example for all firms in the port. But also the initiatives of several other leader firms to build structural relationships with suppliers prove to be

beneficial because it leads to more commitment from the supplier, less failure and eventually lowers transaction costs.

Become a stronger leader firm for your supplier

Analysis in this study show that companies that act as leader firms towards their suppliers do perform better than other companies. These leader firms invest in cooperation with their suppliers when developing new products and services and have regular, structured meetings with their suppliers. Both core suppliers and some commodity suppliers are involved in these evaluation meetings.

Play a role in preventing becoming a blind spot

Clusters can start innovative and later change into ‘blind spots’ when the structure of the cluster becomes a restriction for firms to innovate and collect knowledge from outside the cluster (Pouder & st. John, 1992). Leader firms should strive to be the companies that prevent the cluster from becoming a ‘blind spot’ by having an open view on innovation and forming a bridge between the cluster and knowledge from other industries and clusters.

10.7 Suggestions for further research

The results of this study lead to the identification of opportunities for further research, the following research subjects are the most interesting and relevant.

- The research focused on the role of leader firms in the Rotterdam port and concluded that buyer-supplier relations are the most important link and that innovation is the most important theme for leader firm behavior. However, during the research other relations and themes were identified. Especially further research into the role of leader firms in creating sustainable development in cooperation with the business community *and* the government seems a very relevant expansion of the research.
- In this study the role of the leader firms was analyzed, without making a distinction between the firm and the management. In many cases it seemed that the beliefs and attitude of the management was rather influential on the leader firm effects of the company. Further research about the relation between the mental map of the company's management and leader firm behavior could provide valuable insight.
- One of the most significant characteristics of firms that determine their ability to act as a leader firm is the location of control over the firm. Firms with foreign headquarters show less leader firm behavior. Further research into the underlying mechanisms and motives would provide valuable insight for governments and business.

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Interviewees

Regarding the selection of Leader Firms

A.N. Roos	Director	CBRB	Rotterdam	19-04-2002
M.W. Bloem	Director	HME	Rotterdam	26-09-2001
J.H.M. Rovers	Director	VBKO	Gouda	19-11-2001
R.J. Schouten	Director	VNSI	Zoetermeer	03-10-2001
P.A.Th. van Agtmaal	Director	KVNR	Rotterdam	15-04-2002
H.P. de Boer	Director	IRO	Zoetermeer	03-10-2001
CJ. Asselbergs	Director	Deltalinqs	Rotterdam	17-04-2002
R.C. Bagchus	Director	Deltalinqs	Rotterdam	07-02-2007
R. van der Moolen	Director	KMR	Rotterdam	20-01-2005
E. Langstraten	Projectleader	Syntens	Rotterdam	21-01-2005

Regarding Leader firm behavior in general

J. Meerbach	Chemgas Shipping	Rotterdam	09-05-2002
R. Zimmerman	Mercurius	Zwijndrecht	**-07-2002
R. Riemen	Broekman B.V.	Rotterdam	**-07-2002
B. Ellemeet	Koninklijke Vopak	Rotterdam	17-09-2002
E.P. Heerema	Allseas	Delft	28-05-2002
H. Heerema	Bluewater Energy Services	Hoofddorp	22-05-2002
S.A.W Janse	IHC Gusto engineering	Schiedam	16-07-2002
J. van Ijsseldijk	Tideway bv	Breda	10-05-2002
A.Lubbes	Fugro (Marine)	Leidschendam	03-10-2002
F. van Riet	Mammoet BV	Schiedam	08-07-2002
Ph. Swolfs	Conoship International	Groningen	10-06-2002
K. Damen	Damen Shipyards	Gorinchem	20-05-2002
J. van Sliedregtt	IHC Holland	Sliedrecht	08-07-2002
H.P. Winkel	Bakker Sliedrecht Electro	Sliedrecht	22-05-2002, 28-04-2004

M. vd Valk	Centraalstaal	Groningen	10-06-2002
E.R. Haarman	Rotor B.V.	Eibergen	**-06-2002
H. Oortwijn	Winel	Assen	11-06-2002
J. Roodenburg	Huisman Itrec	Schiedam	**-08-2002
W.C. van Rijn	Imtech marine & offshore	Rotterdam	07-08-2002
F. Verhoeven	Boskalis Westminster	Rotterdam	**-06-2002
A van de Kerk	Van Oord ACZ	Gorinchem	**-06-2002
H. Velema	Feadship Holland	Haarlem	24-05-2002
W. Pronk	Geest Lines	Rotterdam	**-06-2002
R. van Westenbrugge	Jo Tankers	Spijkenisse	**-07-2002
R. van Slobbe	P&O Nedlloyd	Rotterdam	05-06-2002
A. Engelsman	Wagenborg	Delfzijl	10-06-2002

Related to innovation networks of leader firms:

P.Kortekaas	General manager engineering	Smit internationale	01-03-2005
B. de feyter	Purchasing & logistics manager	Smit Internationale	01-03-2005
W. Kruijt	Director BU products	Imtech Marine & offshore	05-04-2005
T.P. Blankestijn	maritime policies &regulatory affairs manager	P&O Nedlloyd	04-03-2005
P. Westerman	team leader Business development	Nerefco	07-03-2005
J. Roodenburg	director	Huisman-itrec	17-03-2005
R. van Kuilenburg	IP & Technical Development Manager	Huisman-Itrec	17-03-2005
H. Engelberts	Manager support & development	ECT	18-03-2005
D. Leunissen	Technology manager	Huntsman Nederland	04-04-2005
T. van der Leer	projectmanager	EMO	02-03-2005
W. Pronk	Director	Geest North Sea lines	22-02-2005, 30-03-2005

Regarding buyer supplier relations of leader firms:

B. van Geluk	Purchasing manager	Maersk Line	Rotterdam	08-01-2008
W. Milder	Managing Director Corporate Division	Broekman Group	Rotterdam	17-12-2007
P. Swaak	Director	Samskip	Rotterdam	18-12-2007
J.Heinen	Manager projets & development	EECV	Rotterdam	10-01-2008
T. van Leer	project manager	EMO Rotterdam	Rotterdam	19-11-2007
K. Van Steenbergen	head of purchasing	EMO	Rotterdam	19-11-2009
T. van Nordennen	Technical Director	IHC- Merwede	Sliedrecht	14-11-2007
G. Hamers	President	IHC- Holland Merwede	Sliedrecht	09-05-2007
M. de Jonge	general manager SVMS	Smit internationale	Rotterdam	03-12-2007
C. Pronk	Purchasing manager	Odfjell	Rotterdam	19-12-2007
K. Zwarts	Purchasing manager	Keppel Verolme	Rotterdam	04-12-2007
R. de Wit	Purchasing manager ai	APM Terminals	Rotterdam	04-12-2007
H. Speelman	Board member	Argos oil	Rotterdam	18-01-2008

Regarding the societal role of leader firms

J.A.M. Janssen	Head of external affairs	Shell	Rotterdam	08-01-2004
L. Walder	Manager public relations	Smit Internationale	Rotterdam	09-01-2004
B. Ellemeet	Director Corporate Communications & Investor Relations	Vopak	Rotterdam	07-01-2004
T.P. Blankestijn	Manager maritime policies and regulatory affairs	Nedlloyd	Rotterdam	17-12-2003
B Zaaijer	Manager SHE&Q	Vopak	Rotterdam	06-11-2009

Appendix 1: Questionnaire Dutch Maritime Cluster

This questionnaire was used to structure the interviews with the managers in the Dutch Maritime Cluster

De rol van 'leader firms' in de maritieme cluster

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Doel onderzoek

Het doel van dit onderzoek is het verkrijgen van inzicht in de vraag onder welke condities en in welke mate bedrijven in de NMC (Nederlandse maritieme cluster) zich gedragen als leader firms.

Onderwerpen

Netwerken van leader firms

Relaties met toeleveranciers

Relaties met klanten

Relaties met concurrenten

Innovatienetwerken

Internationalisering

Betrokkenheid bij cluster governance

Motieven voor leader firm gedrag

Gegevens respondent/bedrijf

Naam en organisatie: _____

Functie: _____

Aantal werknemers bedrijf in Nederland _____

Actief in de volgende componenten van de cluster:

Alvorens met de vragen te beginnen definiëren we kort enkele kernbegrippen

Leader firms:

Netwerken: relaties tussen verschillende organisaties (producenten, toeleveranciers, klanten, brancheorganisaties, kennisinstellingen e.a) met bepaalde specifieke doelstellingen. Wij onderscheiden netwerken op het gebied van 'voortbrenging van producten', innovatie, internationalisering en arbeidsmarkt.

Innovatie: onder innovatie wordt verstaan:

- Technische vernieuwing(nieuwe producten of productiemethoden)
- Organisatorische vernieuwing (vernieuwende manier van organisatie inrichting of samenwerking)
- Marktvernieuwing (vernieuwende manier van marktbenadering)

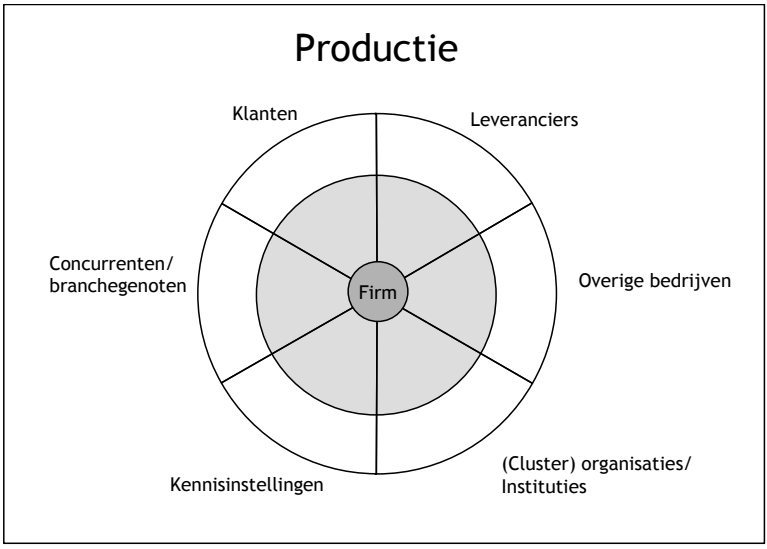
Externe effecten van leader firms: positieve effecten van investeringen van leader firms op andere bedrijven in de cluster, zonder dat deze effecten worden 'doorberekend'

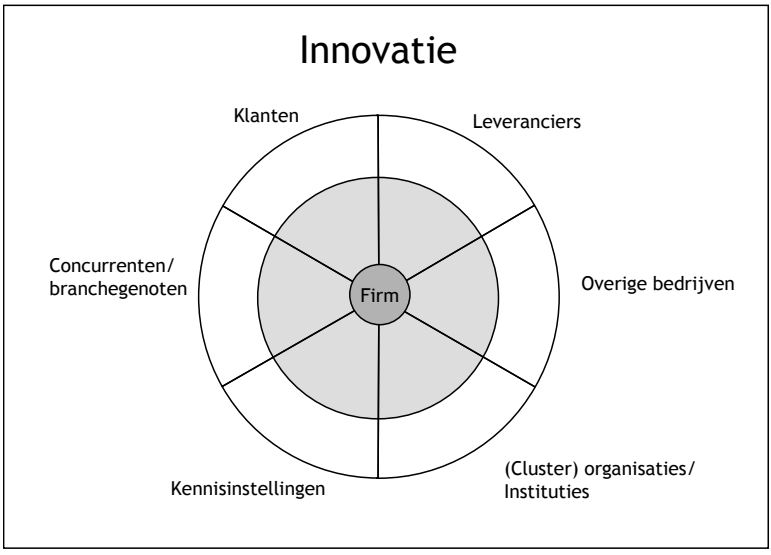
Cluster Governance: alle inspanningen gericht is op het verbeteren van de concurrentiekracht van de cluster b.v. door:

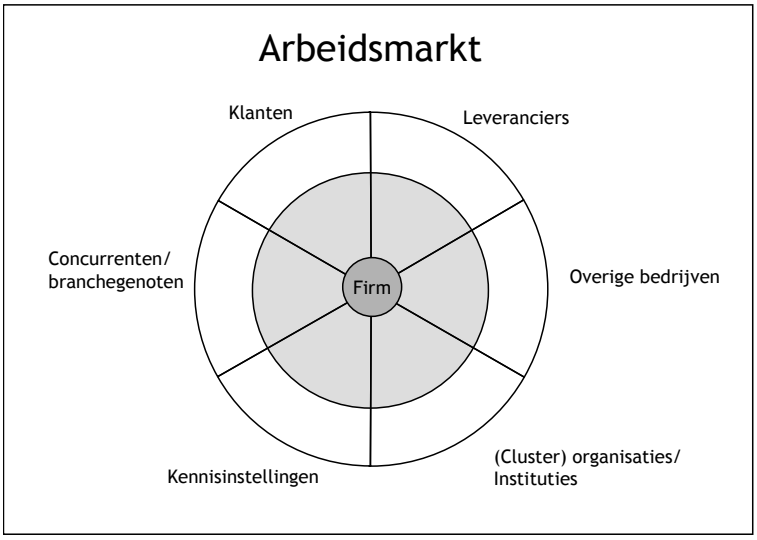
- Intensivering van relaties binnen de cluster
- Gezamenlijke projecten op het gebied van scholing, imagoverbetering e.d.

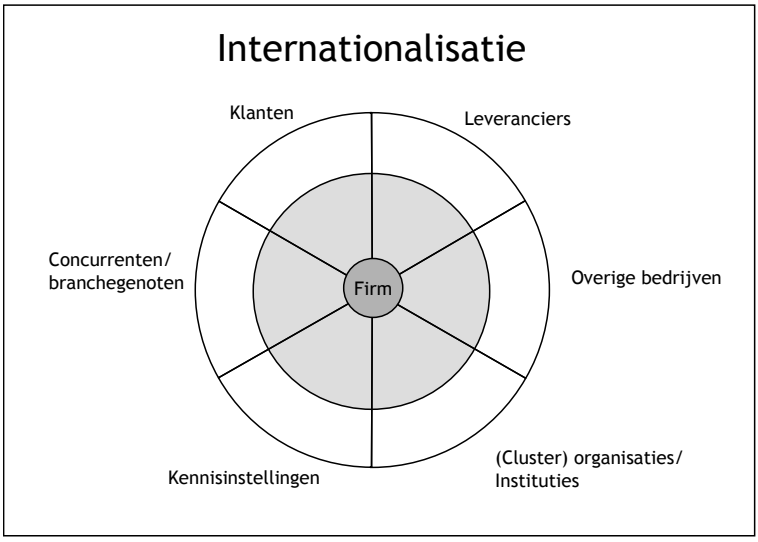
Netwerken

Voor dit onderzoek onderscheiden we vier soorten netwerken (een productienetwerk, een kennis en innovatienetwerk een internationaliseringsnetwerk en een arbeidsmarktnetwerk. In elk netwerk staat een ander doel centraal. We willen voor elk van de leader firms deze netwerken in kaart brengen.






Arbeidsmarkt
Klanten
Leveranciers
Concurrenten/
branchegenoten
Firm
Overige bedrijven
Kennisinstellingen
(Cluster) organisaties/
Instituties


Internationalisatie
Klanten
Leveranciers
Concurrenten/
branchegenoten
Firm
Overige bedrijven
Kennisinstellingen
(Cluster) organisaties/
Instituties

Hoe sterk is uw bedrijf 'ingebed' in de vier genoemde netwerken?

Netwerk					
Productienetwerk	Niet	nauwelijks	matig	sterk	Zeer sterk
Kennis en innovatienetwerk	Niet	nauwelijks	matig	sterk	Zeer sterk
Internationaliseringsnetwerk	Niet	nauwelijks	matig	sterk	Zeer sterk
Arbeidsmarktnetwerk	Niet	nauwelijks	matig	sterk	Zeer sterk

In de eerder besproken figuren zijn 6 soorten organisaties onderscheiden. Geef voor elk van de vier netwerken aan wat het belang is van deze 6 soorten door 30 'punten' te verdelen over de 6 organisaties (dit is gemiddeld 5 per type organisatie). Meer punten betekent van groter belang.

	Productie-netwerk	Kennis en innovatie-netwerk	Internationaliserings-netwerk	Arbeidsmarkt-netwerk
Klanten				
Toeleveranciers				
Concurrenten				
Overige bedrijven				
Branche-organisaties				
Kennisinstellingen				
Totaal	30	30	30	30

Relaties met toeleveranciers

Hoeveel van de 10 belangrijkste toeleveranciers zijn gevestigd in Nederland? ___ stuks

Hoeveel toeleveranciers zijn sterk afhankelijk van jullie orders? ___ stuks

Relaties met klanten

Hoeveel van de 10 belangrijkste klanten zijn in Nederland gevestigd? ___ stuks

Hoeveel klanten zijn sterk afhankelijk van jullie leveringen ___ stuks

Relaties met concurrenten

Op welk van de onderstaande gebieden werkt u samen met uw concurrenten

Innovatie	Ja / nee
Onderwijs en scholing	Ja / nee
Internationale expansie	Ja / nee
Uitbesteding deel van productie	Ja / nee

Innovatienetwerken

Hoe vooraanstaand is uw bedrijf op het gebied van innovatie?

_____ Een 'internationale industry leader'
_____ Een 'early adopter', dwz relatief vroeg 'erbij' op het gebied van innovatie
_____ Gemiddeld, dwz niet significant beter of slechter dan de 'industry average'
Beneden gemiddeld, achterblijvend op het gebied van innovatie

De rollen van ons bedrijf in innovatienetwerken zijn:

Rollen		
Optreden als 'lead user' (kritisch vooruitdenkende klant)	Wel	Niet
Regisseur netwerk (bijeenbrengen partijen)	Wel	Niet
Financiering van innovatietrajecten	Wel	Niet
'Operationeel management' van het innovatienetwerk	Wel	Niet
Inbreng van kennis en informatie	Wel	Niet

Hoe 'clustergebonden' zijn de innovatienetwerken waar uw bedrijf deel van uit maakt?

Niet/nauwelijks clustergebonden	Matig clustergebonden	Sterk/Zeer sterk clustergebonden

Beoordeel de kwaliteit van de NMC op het gebied van vernieuwing:

Aspect	Score (1 = zwak, 5 = sterk)				
Aanwezigheid van 'lead users' in de netwerken	1	2	3	4	5
Kwaliteit van de regisseurs	1	2	3	4	5
Kwaliteit van de toeleveranciers	1	2	3	4	5
Kwaliteit van de publieke kennisinfrastructuur	1	2	3	4	5
Kwaliteit van het 'subsidieklimaat voor vernieuwing'	1	2	3	4	5

Wij gebruiken de volgende methoden om innovaties bij toeleveranciers te stimuleren:

Methode		
Nauw omschreven eisenpakket	wel	niet
Vroegtijdig betrekken bij innovatietrajecten	wel	niet
Hoge productiviteitseisen	wel	niet

Internationalisering

Export als percentage van de omzet _____%

Aantal (eigen) vestigingen in het buitenland ___ stuks

Aantal deelnemingen in het buitenland ____ stuks

Onderdeel van buitenlands moederconcern ja/ Nee

Welk percentage van de totale productie van uw bedrijf vindt plaats in Nederland respectievelijk het buitenland?

	Nederland	Buitenland
Huidige verdeling	%	%
5 jaar geleden	%	%

Geef de mate van onafhankelijkheid van buitenlandse vestigingen aan door één van onderstaande beschrijvingen te kiezen:

Omschrijving	keuze
De vestigingen worden in hoge mate centraal aangestuurd	
De vestigingen zijn operationeel onafhankelijk, en verantwoordelijk voor hun resultaten	
De vestigingen zijn grotendeels onafhankelijk, doen zelf aan klanten werving en tot op zekere hoogte investeringsbeslissingen	

Mate waarin buitenlandse vestigingen/deelnemingen gebruik maken van Nederlandse toeleveranciers:

0-20%	20-40%	40-60%	60-80%	80-100%

Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling	Mening		
A. Export is voor ons belangrijker dan de Nederlandse markt	Eens	Oneens	Geen mening
B. Het niveau van toeleveranciers in de NMC ligt hoger dan het niveau van buitenlandse toeleveranciers	Eens	Oneens	Geen mening
C. Wij moedigen toeleveranciers aan om met ons mee te internationaliseren	Eens	Oneens	Geen mening
D. Een belangrijke reden om te internationaliseren is de vraag van een klant uit de NMC	Eens	Oneens	Geen mening
E. Onze 'kritische vraag' schept onze toeleveranciers de mogelijkheden om hun internationale marktpositie te verbeteren	Eens	Oneens	Geen mening

Wij gebruiken de volgende manieren om toeleveranciers aan te moedigen om met ons mee te internationaliseren:

Maatregel	Antwoord	
Wij bieden aan contracten met een lange looptijd te sluiten	wel	Niet
Wij bieden aan mee te investeren	wel	Niet
Wij bieden een lokatie 'on site', dwz op het terrein van onze eigen vestiging aan	wel	Niet
Wij treden op als matchmaker voor het vinden van een lokale partner	wel	Niet

Cluster governance

Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling	Mening		
A. Wij stellen ons op als 'leader firm' bij het initiëren van gezamenlijke projecten	Eens	Oneens	Geen mening
B. Wij dragen actief bij aan de kwaliteit van de voor onze sector/cluster relevante brancheverenigingen	Eens	Oneens	Geen mening
C. Zonder de actieve ondersteuning van enkele leidende bedrijven komen initiatieven in het clusterbelang niet of nauwelijks van de grond.	Eens	Oneens	Geen mening
D. Voor ons bedrijf is de concurrentiekracht van andere bedrijven in de cluster zo belangrijk dat we investeringen doen waarvan de 'benefits' in het algemeen belang zijn.	Eens	Oneens	Geen mening
E. Cluster-organisaties die een gezamenlijk project initiëren krijgen doorgaans meer steun dan bedrijven die hetzelfde doen	Eens	Oneens	Geen mening

Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling	Mening		
A. Interne concurrentie draagt bij aan de kwaliteit van onze toeleveranciers	Eens	Oneens	Geen mening
B. Wij dragen bij aan het waarborgen van concurrentie tussen toeleveranciers binnen de NMC	Eens	Oneens	Geen mening
C. Interne concurrentie houdt ons scherp en draagt zo bij aan onze concurrentiekracht	Eens	Oneens	Geen mening

Leader firm investeringen

Op welke van de volgende gebieden heeft uw bedrijf het afgelopen jaar investeringen gedaan met relatief grote 'baten' voor andere partijen in het netwerk/ de cluster ?

	Wel/geen investering	Partners	Trekkende rol	Omvang investering (1000 EURO)
Productie				
Integrale ketenlogistiek				
Informatie-uitwisseling				

Ontwikkelen van standaarden				
Innovatie				
Gezamenlijk(e) innovatieproject(en)				
Internationalisering				
Investeren in internationalisatie toeleveranciers				
Arbeidsmarkt				
Investeren in gezamenlijke scholingsprojecten				
Investeren in promotie van de cluster				
Overige clusterinvesteringen				
Bijdrage branche-verenigingen				

Motieven om op te treden als leader firm in de NMC

Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling	Mening
A. Ons bedrijf stelt zich alleen op als leader als dit in ons directe eigenbelang is	Eens/ Oneens/ Geen mening
B. Ons bedrijf stelt zich op als leader omdat een sterke concurrentiekracht van de cluster op lange termijn onze concurrentiepositie ten goede komt	Eens/ Oneens/ Geen mening
C. De betrokkenheid van ons topmanagement bij de ontwikkeling van de NMC is een belangrijke reden voor onze opstelling als leader firms	Eens/ Oneens/ Geen mening
D. Goede persoonlijke relaties van ons topmanagement met andere bedrijven in de NMC is een belangrijke reden voor onze opstelling als leader firm	Eens/ Oneens/ Geen mening
E. De Nederlandse cluster is voor ons niet van groot belang. Wij zijn in de eerste plaats een leader firm in onze eigen internationale netwerken.	Eens/ Oneens/ Geen mening

Appendix 2: Questionnaire Innovation

This questionnaire was used to structure interviews with managers of leader firms on their role in innovation networks

Vragen, innovatie in het HIC

In het interview komen vragen aan de orde over de volgende onderwerpen: Innovativiteit; Investeren in innovatie; Innovatie-netwerk; Innovatie en beleid

Bedrijf (in Rijnmond)

Omzet _____
aantal octrooien _____

Balanstotaal _____
Aantal licenties _____
Personeel _____

Haven en Stad

1. Hoeveel procent van de toeleveranciers is in de regio gevestigd? _____
2. Hoeveel procent van de klanten is in de regio gevestigd? _____
3. Welk percentage van de omzet wordt in de regio behaald? _____
4. Wie zijn de belangrijkste….

Klanten	leveranciers	Concurrenten
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Innovaties

5. Aantal nieuwe of vernieuwde producten laatste 5 jaar (ongeveer)_____
6. Aantal Procesinnovaties laatste 5 jaar (ongeveer) _____
7. De innovaties binnen het bedrijf zijn voornamelijk:

Productinnovaties	O O O O	Procesinnovaties
Technologisch	O O O O	Niet-technologisch

8. Hoe vooraanstaand is uw bedrijf op het gebied van innovatie?

____ Een 'internationale industry leader'
____ Een 'early adopter', dwz relatief vroeg 'erbij' op het gebied van innovatie
____ Gemiddeld, dwz niet significant beter of slechter dan de 'industry average'
____ Beneden gemiddeld, dwz achterblijvend op het gebied van innovatie

9. Wat zijn de afgelopen jaren de belangrijkste innovaties geweest binnen uw bedrijf?
10. Hebben andere organisaties daaraan bijgedragen?
11. Maakte uw bedrijf daarbij gebruik van innovatie-stimulerings maatregelen?

Investeren in innovatie

12. Wat zijn, over het algemeen, de belangrijkste redenen voor innovatie?
    O Klantvraag O Voorblijven concurrentie O Verlaging kosten

13. Hoeveel wordt er per jaar uitgegeven aan R&D? _____
14. Hoeveel personeel houdt zich bezig met R&D? _____

15. Hoe belangrijk zijn de verschillende inputs voor innovatie?

	Onbelangrijk	Enigszins belangrijk	Belangrijk	Zeer belangrijk
Licenties				
Eigen R&D				
Octrooi onderzoek				
Reverse engineering				
Vakbijeenkomsten				
Informele circuits				
Wetenschappelijke publicaties				
In dienst nemen werknemers innoverende onderneming				

Innovatie netwerk

16. Hoe sterk is uw bedrijf 'ingebed' in innovatienetwerken?

Niet	nauwelijks	matig	sterk	Zeer sterk

17. Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling		Oneens				Eens
A.	Innovaties van ons bedrijf worden voornamelijk binnen de regio rijnmond gerealiseerd	1	2	3	4	5
B.	Voor het doen van innovaties maken wij gebruik van partnerships	1	2	3	4	5

18. Onze innovatie-partners bevinden zich voornamelijk (meer dan 50%) in:

O Rijnmond O Zuid-Holland O Nederland O Europa O Wereld

19. Wie zijn de belangrijkste innovatie-partners?

_____ _____ _ _____

_____ _____ _ _____

20. Hoe belangrijk zijn de onderstaande partijen voor innovaties?

	Onbelangrijk	Enigszins belangrijk	Belangrijk	Zeer belangrijk
Afnemers				
Leveranciers				
Branchegenoten				
Andere bedrijven				
Brancheorganisaties				
Kennisinstellingen				

Spillovers

21. Wij gebruiken de volgende methoden om innovaties bij toeleveranciers te stimuleren:

	Niet				In sterke mate
Nauw omschreven eisenpakket	1	2	3	4	5
Vroegtijdig betrekken bij innovatietrajecten	1	2	3	4	5
Beschikbaar stellen kennis & technieken	1	2	3	4	5
Hoge productiviteitseisen	1	2	3	4	5

22. Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling		Oneens				Eens
A.	Onze vraag is veeleisend; toeleveranciers komen door deze vraag vroegtijdig in aanraking met toekomstige standaarden.	1	2	3	4	5
B.	Onze producten zijn vernieuwend; hierdoor kunnen onze afnemers nieuwe, betere producten en diensten leveren.	1	2	3	4	5
C.	Onze 'kritische vraag' schept onze toeleveranciers de mogelijkheden om hun internationale marktpositie te verbeteren	1	2	3	4	5
D.	Onze innovatie-inspanningen leveren spillovers op voor andere bedrijven	1	2	3	4	5

23. De kennis vanuit ons bedrijf verspreidt zich op de volgende manieren:

	Niet	In beperkte mate	In ruime mate	In hoge mate
Licenties				
Octrooi onderzoek door anderen				
Reverse engineering door anderen				
Vakbijeenkomsten				
Informele circuits				
Wetenschappelijke publicaties				
In dienst nemen van onze werknemers door andere onderneming				

24. Is er de afgelopen jaren een spin-off ontstaan uit het bedrijf

Kwaliteit van de omgeving

25. Hoe beoordeelt u het innovatieklimaat in de regio?

O Slecht O Matig O Neutraal O Goed O Uitstekend

26. Zijn er plaatsen waar dit klimaat beter zou zijn voor het bedrijf? Ja/Nee

27. Zo ja, welke en waarom?

Innovatie en beleid

28. In hoeverre maakt uw bedrijf gebruik van subsidies voor innovaties?

O Niet O In beperkte mate O In ruime mate O In hoge mate

29. Van welke innovatiebevorderende maatregelen heeft u gebruik gemaakt?

_____

_____

30. In hoeverre wordt er gebruik gemaakt van publieke kennisinfrastructuur?

O Niet O In beperkte mate O In ruime mate O In hoge mate

31. Geef aan of u het eens of oneens bent met onderstaande stellingen:

Stelling		Oneens				Eens
A.	R&D subsidies zijn belangrijk voor innovaties	1	2	3	4	5
B.	Fiscale maatregelen zijn belangrijk voor innovaties	1	2	3	4	5
C.	De overheid moet investeren in innovatieve samenwerking tussen bedrijven en kennisinstellingen	1	2	3	4	5
D.	Kennisuitwisseling tussen bedrijven gaat beter als de overheid een actieve rol speelt	1	2	3	4	5

32. Welke randvoorwaarden zijn belangrijk voor innovatie?

	Niet belangrijk				Zeer belangrijk
Onderwijsbeleid	1	2	3	4	5
Arbeidsmarktbeleid	1	2	3	4	5
Mededingingsbeleid	1	2	3	4	5
Vestigingsplaatsbeleid	1	2	3	4	5
……	1	2	3	4	5
……	1	2	3	4	5

33. Hoe beoordeelt u de kwaliteit van deze voorwaarden in de Rotterdamse regio?

	Slecht				Goed
Onderwijsbeleid	1	2	3	4	5
Arbeidsmarktbeleid	1	2	3	4	5
Mededingingsbeleid	1	2	3	4	5
Vestigingsplaatsbeleid	1	2	3	4	5
……	1	2	3	4	5
……	1	2	3	4	5

34. Welke overheidsinstellingen zijn naar uw idee het meest belangrijk als het gaat om innovaties?

_____

_____

35. Wat is uw mening over de lokale overheid?

	Zij draagt bij aan een innovatief klimaat
	Zij belemmert innovativiteit
	Zij heeft een innovatie-neutrale rol

Appendix 3: Questionnaire Supplier relations

This questionnaire was used to structure interviews with leader firms in Rotterdam about their relations with suppliers.

Interviewvragen leader firms - leveranciers

Eigenschappen van het bedrijf

Naam en organisatie: _____

Functie: _____

Aantal werknemers bedrijf in Rijnmond _____

Aantal vestigingen in het buitenland _____ In hoeveel landen _____

Onderdeel van buitenlands moederconcern Ja/ Nee

Export als percentage van de omzet _____ %

Leveranciers en inkoop

Wat is de verhouding inkoop / verkoop binnen uw bedrijf?

Beschikt uw bedrijf over een aparte inkoopafdeling?

Op welk niveau vindt de inkoopfunctie plaats? (directie, MT, staf,….)

Hoeveel procent van de leveringen (in €) is uit de regio afkomstig? _____

Welke ingekochte producten en diensten zijn cruciaal voor uw eigen productie?

_____ _____ _____

_____ _____ _____

Zijn deze producten of diensten eenvoudig te verkrijgen?

(aantal aanbieders, prijsvorming, levertijden)

Welke bedrijven zijn de belangrijkste leveranciers?

Naam	Product	Waarom belangrijk
_____	_____	_____
_____	_____	_____

_____ _____ _____

_____ _____ _____

Hoe vaak is er face-to-face contact met deze belangrijkste leveranciers?

Welke onderwerpen worden er besproken bij deze meetings?

Hoeveel van de belangrijkste toeleveranciers zijn gevestigd in Rijnmond? ___

Hoeveel procent van de totale input (€) leveren zij? ___

Hoeveel van deze toeleveranciers zijn sterk afhankelijk van jullie orders? ___

Is de afgelopen jaren de leveranciers portefeuille veranderd? ___

Er bestaan verschillende strategieën ten opzichte van leveranciers. Hoe zou u in het algemeen de houding van uw bedrijf typeren?

Geef aan in welke mate u de volgende benaderingen gebruikt ten opzichte van Uw leveranciers:

1. Competitive pressure: De inkopende partij gebruikt zijn marktmacht om de beste leveranciers te belonen. De beste leveranciers krijgen meer business.

Altijd / soms / nooit / in specifieke gevallen, namelijk:

2. Evaluation and certification systems: Door routinematig leveranciers te evalueren en de resultaten terug te koppelen blijven leveranciers scherper op hun kwaliteit.

Altijd / soms / nooit / in specifieke gevallen, namelijk:

3. Incentives: Door het geven van financiële prikkels kunnen leveranciers gestimuleerd worden hun product of proces te verbeteren. Bijvoorbeeld door hen te laten delen in kostenbesparingen.

Altijd / soms / nooit / in specifieke gevallen, namelijk:

4. Direct involvement: Bedrijven kunnen direct investeren in hun leveranciers, direct in assets of via een deelneming. Ook het detacheren van mensen of het beschikbaar stellen van organisatie capaciteit kunnen manieren zijn om een leverancier te helpen ontwikkelen.

Altijd / soms / nooit / in specifieke gevallen, namelijk:

De productie / dienstverlening

Wie zijn uw belangrijkste klanten?

_____ _____ _____

_____ _____ _____

Hoeveel procent van uw omzet is gerelateerd aan klanten in Rijnmond? _____

Waarmee onderscheidt uw bedrijf zich? (bv. lage kosten, efficiëntie, maatwerk, uniek product, innovativiteit), waaruit blijkt dit?

Welke leveranciers dragen bij aan dit onderscheidend vermogen?

Hoe belangrijk is de kwaliteit van uw toeleveranciers *in Rijnmond* voor uw concurrentiekracht?

Zeer onbelangrijk	Onbelangrijk	Redelijk belangrijk	Belangrijk	Zeer belangrijk

Op welke manier dragen leveranciers in Rijnmond bij aan de concurrentiekracht? (Geef een rangorde, 1= meest belangrijke)

_____ Kwaliteit van product/diensten
_____ Snelheid van productie
_____ Betrouwbaarheid van levering
_____ Innovativiteit
Kosten

Samenwerking

Op welke van de volgende gebieden heeft uw bedrijf de afgelopen 5 jaar een gezamenlijk project met leveranciers uitgevoerd?

Project	Initiator?	Samen met leverancier:
Scholing van personeel	Ja/ nee	
Imagoverbetering	Ja/ nee	
Gezamenlijke deelname aan beurzen	Ja/ nee	
Anders:..	Ja/ nee	

Met welke leveranciers is in de afgelopen jaren een 'verbeteringstraject' ingezet?

Wat was de aanleiding?

Wie nam het initiatief?

Was er van tevoren een duidelijk doel?

Wat waren de beoogde voordelen voor klant en leverancier?

Zijn die doelen en voordelen ook behaald?

Welke obstakels hebben zich voorgedaan tijdens de samenwerking?

Wat waren de achtergronden van die obstakels? (bv. organisatie, financiën, kennis)

Leveranciers en innovaties

	Niet				In sterke mate
Hoe belangrijk zijn leveranciers voor uw innovaties?	1	2	3	4	5

Wat zijn de afgelopen jaren de belangrijkste innovaties geweest binnen uw bedrijf?

Hebben leveranciers daaraan bijgedragen? Op welke manier?

Wat was belangrijkste aanleiding voor de innovatie?

O Klantvraag O Voorblijven concurrentie O Verlaging kosten O Wetgeving

In hoeverre gebruikt U de volgende methoden om innovaties bij toeleveranciers te stimuleren?

	Niet				In sterke mate
Nauw omschreven eisenpakket	1	2	3	4	5
Functioneel specificeren	1	2	3	4	5
Vroegtijdig betrekken bij innovatietrajecten	1	2	3	4	5
Beschikbaar stellen kennis & technieken	1	2	3	4	5

Internationalisering (wel/niet van toepassing?)

Hebt U weleens een leverancier betrokken bij internationale activiteiten?

Welke leverancier(s)?

Waarom?

Hoe?

Mate waarin buitenlandse vestigingen/deelnemingen gebruik maken van Rijnmondse toeleveranciers:

0-20%	20-40%	40-60%	60-80%	80-100%

Om toeleveranciers aan te moedigen om met ons mee te internationaliseren bieden wij

	Niet				In sterke mate
Contracten met een lange looptijd te sluiten	1	2	3	4	5
Mee te investeren	1	2	3	4	5
Een lokatie 'on site'	1	2	3	4	5
Optreden als matchmaker voor het vinden van een lokale partner	1	2	3	4	5

Summary

Introduction

Ports are often analyzed as a node in a transport chain, and less often as a regional business setting. Concepts such as clusters, industrial districts, regional systems and networks are scarcely applied to seaports. This is surprising because the seaport can be seen as a typical geographical concentration of related businesses. In this study the port cluster of Rotterdam is analyzed with a focus on the role of leader firms. *Leader firms* are important in (port)clusters, they are companies that add positive effects to the cluster by doing business in such a way that also the local business community benefits from their presence. The research addresses the following research question:

"How do leader firms add to the competitiveness of the Rotterdam port cluster and what are the characteristics of these firms?"

Research structure

In this thesis the role of leader firms in the development and performance of the Rotterdam port cluster is analyzed. The analysis is done in the following steps:

1. Exploration of the relevant academic fields
2. Exploration of leader firm behavior and effects in the maritime industry
3. Analysis of the role of leader firms for innovation and buyer supplier relationships in the Rotterdam port cluster
4. Analysis of the characteristics and motives of the leader firms

Theoretical building blocks

The theoretical building blocks for this study are found in multiple fields of which the most important are the cluster theory as formulated by Porter (1990), industrial districts analysis based on the insights of Marshall (1890), national/regional systems of innovation and buyer supplier relationships. In the current research leader firms are defined as follows:

"Leader firms are firms in a cluster that have -because of their size, market position, knowledge and entrepreneurial skills- the *ability* and *incentive* to make investments with positive side-effects for other companies in the cluster."

Selecting leader firms

In this thesis a stepwise model is used to select the core companies in a cluster that *could* be leader firms. In the empirical research a clear distinction is made between firm characteristics and actual leader firm *behavior*. Potential leader firms are identified based on the following characteristics:

Size; the size indicates a firm's ability to make investments with externalities for other companies. It also predicts the incentives a company has to make these investments.

Market position; the market position of a firm is of importance because it determines which (potential) relations a firm has that can be useful in promoting leader firm effects. A leader firm has strong relations with suppliers and / or customers. A leader firm has a leading position in its market; otherwise, it will not be the focal point of the suppliers, customers and competitors.

Knowledge; innovation is one of the most recognized fields in which leader firms play an important role. Innovation is the result of the knowledge a firm has and the ability to use this knowledge. Innovation studies often assume the closeness of firms an important factor in the success of innovation. Porter's cluster theory for example relies heavily on the expected knowledge spillovers from related industries, competitors and suppliers in a cluster. These spillovers have been identified in studies by Krugman (1991) and Romer (1986).

Entrepreneurial skills; the entrepreneurial skills of a company are probably the most 'vague' and therefore hard to measure. It refers to the mentality of the general management and its ability to run a company well and to create positive externalities for their environment.

Location; the location of a firm's headquarter is important for the spatial scale of the leader firm effects. These effects are likely to be greater in the area where the decision centre is located.

Being and behavior; Most characteristics show the potential of being a leader firm, but that is no guarantee for leader firm behavior. Therefore the selection incorporates factors that show the potential of a company for being a leader firm and the actual behavior of the firm.

Empirical results

The empirical study consists of two parts: First, an explorative study in the Dutch maritime industry; Second, an analysis of leader firms in the Rotterdam port cluster. In the explorative study, nine forms of leader firm behavior are identified.

1. Coordination of production networks; leader firms invest in the coordination of their network. As a consequence the whole network becomes more competitive.

2. Role as lead user; by expressing a more sophisticated demand than other firms in the market, leader firms improve the innovativeness of their suppliers.

3. Creating standards; leader firms set new standards and other firms, especially suppliers that are confronted with such standards in an early stage, benefit.

4. Creating 'new combinations'; leader firms have a central role in creating new combinations of previously unrelated technologies. The combination of such technologies leads to new products. Other firms in the production network benefit from this product development.

5. Improving the transfer of knowledge; Because of the knowledge they possess and their central role in knowledge networks, leader firms improve the transfer of knowledge in the cluster. A fast diffusion and transfer of knowledge adds to the competitiveness of a cluster.

6 .Encourage and enable internationalization; leader firms compete on international markets. They can start production in other countries and urge or encourage firms in the cluster to internationalize in order to supply them in these countries.

7. Creating reputation; leader firms engage in projects at the frontier of what is possible. Such projects are widely known in the industry and contribute to the reputation of the cluster as a whole.

8. Improving the labor market; the quality of the labor market is important for the competitiveness of the cluster. Leader firms invest to improve the quality of the labor market. Leader firms are often found among the larger firms in a cluster and benefit the most from a well-trained professional labor force which gives them the incentive to invest in education projects.

9. Organizational infrastructure; leader firms play a role in creating and maintaining the organizational infrastructure in the cluster. Such infrastructure is an important condition for effective cluster governance.

Leader firms in the port of Rotterdam

In this study the Rotterdam port cluster is defined by using a measure that combines the absolute and the relative amount of port activities in an area defined by postal codes. This is novel; up to date, clusters are defined by the total number of firms or the specialization of an area in a certain industry. Including both measures for a cluster does more just to the specific setting of a seaport. The absolute number of activities is important because it provides mass for knowledge spillovers and collective action. The relative amount of port activities is important because it shows the importance of the industry for the local government. For seaports this is a very relevant issue since ports are in most cases dependent on government policies for new investments. Areas that show a relative high concentration of port activities, both absolute and relative, are included in the port cluster, as shown in the figure below.

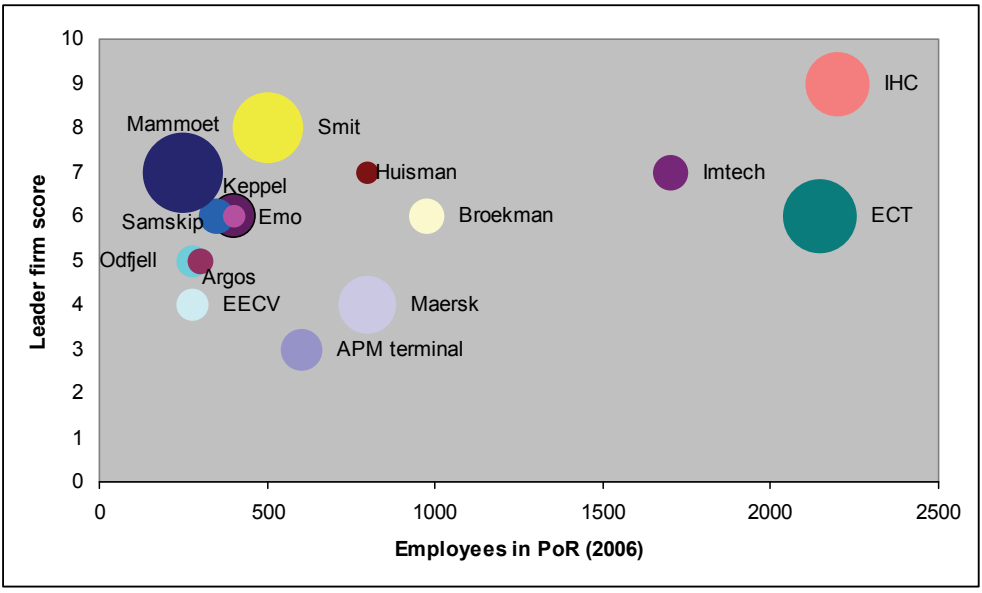
Cluster relevance of areas in Rijnmond based on number of port employees and port specialization of areas. (score= % port employment * LN (# port employment))

In the Rotterdam port cluster the relevant leader firms were identified using firm data and industry expert opinions. About 5000 organizations are located in, or closely related to the port of Rotterdam. The majority of the companies is rather small; only 103 firms have more than 100 employees. In the port there are 73 ‘core companies’, companies large enough to have a substantial impact in the port. These are companies that have more than 100 employees and have a total equity of more than 50 million euro or a net turnover of

more than 10 million euro. Closer research shows that 27 companies qualify as potential leader firms.

The leader firms that were identified differ in the range of external effects they have in the cluster and on the suppliers. In the study 15 leader firms are scored based on these external effects. The leader firms are an important factor in the cluster; the positive externalities they provide help the cluster to remain competitive. Because of this, a cluster should wish to have a substantial set of leader firms. In the Rotterdam cluster such a set is present. However, there is a notable difference in the amount of leader firm effects each company brings about, as shown in the following figure.

Leader firm score and number of employees, the size of the bubble represents the value added produced



Characteristics of leader firms

The following conclusions can be drawn about the characteristics of leader firms.

The combination of being a firm with production and design capabilities, having many local suppliers that are important for quality and innovation and having full management responsibility locally seems the best combination for leader firm effects.

The size of the company measured in employees and net turnover is positively correlated to leader firm behavior. Companies do not have to be large to be a leader firm and leader

firm behavior does not always make a company more successful, but both characteristics do have influence on the amount of leader firm behavior. Size in terms of added value has no influence.

The profit margin of a company has a positive relation with leader firm behavior. Leader firm behavior is associated with higher profits, but having high profits is not always a guarantee for leader firm behavior. A reasonably high profit margin is a necessary, but not a sufficient condition for leader firm behavior.

A negative relation exists between a foreign parent company and being a leader firm. The firms with foreign owners show less leader firm behavior because they do not manage their own supplier base or they do not make investments in the cluster infrastructure in the amounts locally managed firms do.

The total amount of supplies coming from the region is not an important factor for leader firm behavior, but the number of *important* suppliers in the region is of influence. Regarding suppliers, the adagium 'quality is more important than quantity' seems just.

Recommendations

In chapter 10 recommendations are made for the port authority and local government, the business community and the leader firms. The table below summarizes these recommendations.

Port authority and local government	
Bring innovative companies together	*Stimulate local control over strong leader firms*
Tell the story about successful leader firms	*Stimulate operational excellence*
Port community	
Show your best practices	*Learn from your neighbors*
Leader firms	
Recognize your leader firm effects and act on it	*Know your suppliers and benefit from it*
Play a role in preventing the cluster becoming a 'blind spot'	*Become a stronger leader firm for your supplier*

Samenvatting

Havens worden vaak geanalyseerd als een knooppunt in een vervoersketen, maar minder regelmatig als een regionale economische omgeving. Concepten zoals clusters, industriële districten, regionale systemen en netwerken zijn nauwelijks toegepast op zeehavens. Dit is verrassend omdat de zeehaven kan worden gezien als een typisch voorbeeld van een geografische concentratie van verwante bedrijven. In deze studie wordt de cluster in de haven van Rotterdam geanalyseerd met een focus op de rol van *leader firms*. *Dit* zijn bedrijven die positieve effecten genereren in de cluster door zaken te doen op een zodanige wijze dat ook het lokale bedrijfsleven profiteert van hun aanwezigheid. Daarmee is de aanwezigheid van leader firms van belang in (haven) clusters. Het onderzoek richt zich op de volgende onderzoeksvraag:

"Hoe dragen leader firms bij aan de concurrentiepositie van de Rotterdamse haven cluster en wat zijn de kenmerken van deze bedrijven?"

Onderzoek structuur

In dit proefschrift wordt de rol van leader firms in de ontwikkeling en prestaties van de Rotterdamse haven cluster geanalyseerd. De analyse is gedaan in de volgende stappen:

1. Verkenning van relevante wetenschapsgebieden
2. Onderzoek naar leader firm gedrag en de effecten daarvan in de maritieme industrie
3. Analyse van de rol van leader firms voor innovatie en de klant-leverancier relaties in de Rotterdamse havencluster
4. Analyse van de kenmerken van leader firms en de motieven voor leader firm gedrag

Theoretische bouwstenen

De theoretische bouwstenen voor dit onderzoek zijn te vinden in meerdere wetenschapsvelden, waarvan de belangrijkste zijn: de clustertheorie zoals geformuleerd door Porter (1990), Industriële districten analyse op basis van de inzichten van Marshall (1890), nationale / regionale innovatiesystemen en klant-leverancier relaties. In het onderzoek worden leader firms als volgt gedefinieerd:

"*Leader firms* zijn ondernemingen in een cluster die door hun omvang, marktpositie, kennis en ondernemerschap het vermogen en de prikkel hebben om investeringen te doen met positieve neveneffecten voor andere bedrijven in de cluster."

Selectie van leader firms

In dit proefschrift wordt een stapsgewijze model gebruikt om de kernbedrijven in een cluster te identificeren die leader firms zouden *kunnen* zijn. In het empirisch onderzoek wordt een onderscheid gemaakt tussen de kenmerken van een bedrijf en daadwerkelijk leader firm gedrag. Potentiële leader firms zijn geïdentificeerd op basis van de volgende kenmerken:

Grootte: de grootte van een onderneming geeft aan of een bedrijf het vermogen heeft om investeringen te doen met externaliteiten voor de andere bedrijven. Het is ook een indicatie voor de prikkel die een bedrijf heeft voor het doen van deze investeringen.

Marktpositie; de marktpositie van een onderneming is van belang omdat het bepaalt welke (potentiële) relaties een onderneming heeft die bijdragen aan het bevorderen van leader firm effecten. Een leader firm heeft sterke relaties met leveranciers en / of klanten., en heeft een leidende positie in de markt.

Kennis; innovatie is een van de belangrijkste terreinen waarop leader firms een rol spelen. Innovatie is het resultaat van de kennis die een bedrijf heeft en het vermogen om deze kennis te gebruiken. Studies gaan er vaak vanuit dat de nabijheid van bedrijven een belangrijke factor is voor het succes van innovatie. Porter's cluster theorie is bijvoorbeeld sterk afhankelijk van de verwachte kennis spillovers van aanverwante industrieën, concurrenten en leveranciers in een cluster. Deze spillovers zijn onder andere geïdentificeerd in studies van Krugman (1991) en Romer (1986).

Ondernemerschap; de ondernemersvaardigheden van een bedrijf zijn de meest 'vage' en daarom moeilijk te meten factoren. Het verwijst naar de mentaliteit van het management en zijn vermogen om een bedrijf goed te leiden en positieve externaliteiten voor de omgeving te creëren.

Locatie: de locatie van het hoofdkantoor is belangrijk voor de ruimtelijke schaal van de leader firm effecten. Deze effecten zijn doorgaans groter in het gebied waar het beslissingscentrum is gevestigd.

Leidend Gedrag; De meeste kenmerken tonen het potentieel van de onderneming om een leider te zijn, maar dat is geen garantie voor daadwerkelijk leader firm gedrag. Daarom

zijn in de selectie factoren opgenomen die zowel het potentieel van een bedrijf als feitelijke leader firm gedrag van een onderneming laten zien

Empirische resultaten

De empirische studie bestaat uit twee delen: ten eerste, een verkennende studie in de Nederlandse maritieme industrie, ten tweede een analyse van de leader firms in de Rotterdamse haven cluster. In de verkennende studie zijn negen vormen van leader firm gedrag geïdentificeerd.

1. Coördinatie van de productienetwerken; leader firms investeren in de coördinatie van hun netwerk. Als gevolg daarvan wordt het hele netwerk concurrerender.

2. Rol als *lead user*; met het articuleren van een meer geavanceerde vraag dan andere ondernemingen in de markt dragen leader firms bij aan de innovativiteit van hun leveranciers.

3. Het creëren van standaarden; leader firms zetten nieuwe maatstaven waarvan andere ondernemingen kunnen profiteren, met name de leveranciers die in een vroeg stadium geconfronteerd worden met dergelijke normen,.

4. Het creëren van nieuwe combinaties ', leader firms hebben een centrale rol in het creëren van nieuwe combinaties van kennis en technologieën. De combinatie van deze technologieën leidt tot nieuwe producten. Andere bedrijven in het productie netwerk profiteren van deze product ontwikkeling.

5. Verbetering van de overdracht van kennis; Door de kennis die zij bezitten en hun centrale rol in kennisnetwerken verbeteren leader firms de overdracht van kennis in de cluster. Een snelle verspreiding van kennis draagt bij aan de concurrentiekracht van een cluster.

6. Stimuleren en faciliteren van internationalisering; leader firms concurreren op internationale markten. Ze kunnen andere bedrijven in de cluster een opstap bieden op deze internationale markten, bijvoorbeeld door locale leveranciers ook in het buitenland te gebruiken.

7. Het creëren van reputatie; leader firms ondernemen aansprekende en vooruitstrevende projecten. Dergelijke projecten zijn alom bekend in de industrie en dragen bij aan de reputatie van de cluster als geheel.

8. Verbetering van de arbeidsmarkt; de kwaliteit van de arbeidsmarkt is van belang voor de concurrentiekracht van de cluster. Leader firms investeren in de kwaliteit van de

arbeidsmarkt door training en opleiding. Leader firms zijn vaak de grotere bedrijven in een cluster en profiteren het meest van een goed opgeleide beroepsbevolking, die positie geeft hen de prikkel om te investeren.

9. Organisatorische infrastructuur; leader firms spelen een rol in het creëren en onderhouden van de organisatorische infrastructuur in de cluster. Deze infrastructuur is een belangrijke voorwaarde voor effectief cluster bestuur.

Leader firms in de haven van Rotterdam

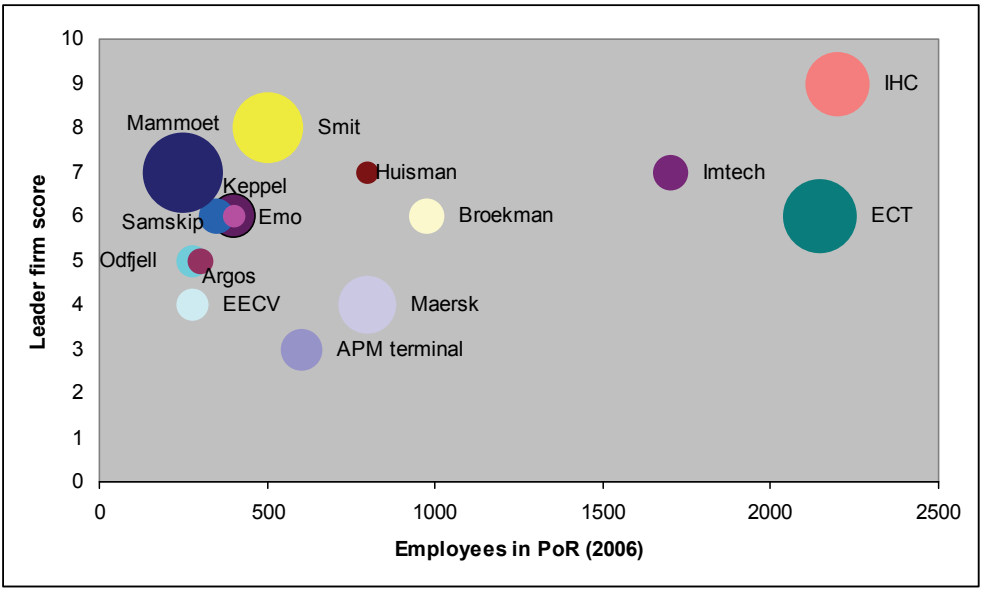
In deze studie wordt de Rotterdamse havencluster gedefinieerd met behulp van een berekening die de absolute en de relatieve omvang van de havenactiviteiten in een gebied combineert. Dit is nieuw; tot nu toe werden clusters gedefinieerd door het totale aantal ondernemingen of de specialisatie van een gebied in een bepaalde sector. De combinatie van beide maatstaven doet meer recht aan de specifieke aard van een zeehaven. Absoluut aantal activiteiten is belangrijk vanwege de massa die nodig is voor kennis spill-overs en collectieve acties. De relatieve omvang van de havenactiviteiten is belangrijk omdat het toont wat het belang van de industrie is voor de lokale overheid. Voor zeehavens is dit een zeer relevante vraag, omdat de havens in de meeste gevallen afhankelijk zijn van overheidsbeleid voor nieuwe investeringen. Gebieden die een relatief hoge concentratie van havenactiviteiten hebben, zowel in absolute als relatieve zin, zijn opgenomen in de haven cluster, zoals weergegeven in de onderstaande figuur.

Cluster relevantie per gebied, gebaseerd op aantal arbeidsplaatsen en specialisatie van een gebied (score = % havengerelateerde arbeid *LN (# aantal havengerelateerde arbeidsplaatsen)

In de Rotterdamse haven cluster zijn de relevante leader firms geïdentificeerd met behulp van date en de opinie van deskundigen. Ongeveer 5000 organisaties zijn gevestigd in de haven, of nauw verbonden met de haven van Rotterdam. De meerderheid van de bedrijven is vrij klein, slechts 103 bedrijven hebben meer dan 100 werknemers in dienst. In de haven zijn 73 kernbedrijven, bedrijven groot genoeg om een substantiële impact hebben in de haven hebben. Dit zijn bedrijven met meer dan 100 werknemers en een totaal eigen vermogen van meer dan 50 miljoen euro of een netto-omzet van meer dan 10 miljoen euro. Nader onderzoek toont aan dat 27 bedrijven als potentiële leader firm gekenmerkt kunnen worden.

De leader firms die werden geïdentificeerd genereren alle positieve externe effecten, maar in verschillende mate. De leader firms zijn een belangrijke factor in de cluster; de positieve externe effecten die zij genereren helpen de cluster om concurrerend te blijven. Hierom zou een cluster gebaat zijn bij een aanzienlijk aantal leader firms binnen zijn grenzen.. In de Rotterdamse cluster is een flink aantal leader firms aanwezig. In de studie zijn 15 leader firms gescoord op basis van deze externe effecten. Er is een duidelijk verschil in de omvang van de leader firm effecten dat elk bedrijf teweeg brengt, zoals weergegeven in de volgende figuur.

Leader firm score en aantal werknemers, de omvang van de cirkel geeft de geproduceerde toegevoegde waarde weer (2006)



Kenmerken van de leader firms

De volgende conclusies kunnen worden getrokken over de kenmerken van de leader firms.

Een bedrijf met lokale productie en ontwerpen afdelingen, met veel lokale leveranciers die belangrijk zijn voor kwaliteit en innovatie en met lokaal volledige verantwoordelijkheid voor het management lijkt de beste combinatie voor het creëren van leader firm effecten.

De grootte van de onderneming, gemeten in werknemers en de netto-omzet is positief gecorreleerd met leader firm gedrag. Bedrijven hoeven niet groot te zijn om een leader firm te zijn en leader firm gedrag maakt een bedrijf niet altijd succesvoller, maar beide kenmerken hebben invloed op de omvang van de positieve externe effecten die een bedrijf genereert.

De winstmarge van een bedrijf heeft een positieve relatie met leader firm gedrag. Leader firm gedrag wordt geassocieerd met een hogere winst, maar een hoge winst is niet altijd een garantie voor leader firm gedrag. Een ruime winstmarge is een noodzakelijke, maar geen voldoende voorwaarde voor leader firm gedrag.

Een negatief verband bestaat tussen een buitenlandse moedermaatschappij en leader firm gedrag. De bedrijven met buitenlandse eigenaren tonen minder leader firm gedrag omdat

zij vaak niet vrij zijn in de keuze van hun leveranciers en zij minder investeringen doen in de cluster infrastructuur dan bedrijven die lokaal beheerd worden.

De totale omvang van leveringen uit de regio is geen belangrijke factor voor leader firm gedrag, maar het aantal belangrijke leveranciers in de regio is wel van invloed. Ten aanzien van leveranciers lijkt het adagium 'kwaliteit is belangrijker dan kwantiteit" van toepassing.

Aanbevelingen

In hoofdstuk 10 zijn aanbevelingen gedaan voor het Havenbedrijf en de lokale overheid, het bedrijfsleven en de leader firms. De onderstaande tabel geeft een overzicht van deze aanbevelingen.

Havenbedrijf en lokale overheid	
Breng innovatieve bedrijven bij elkaar	Stimuleer lokale controle bij de sterke leader firms
Vertel het verhaal over de succesvolle leader firms	Stimuleer operational excelence
Port community	
Laat je ‘best practises’ zien	Leer van je buren
Leader firms	
Herken uw leader firm effecten en handelen er naar	Ken uw leveranciers en profiteren van hun kennis
Speel een rol bij het voorkomen dat de cluster een 'blind spot' wordt,	Wees een sterkere leader firm voor uw leveranciers

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LEADER FIRMS

THE VALUE OF COMPANIES FOR THE COMPETITIVENESS OF THE ROTTERDAM SEAPORT CLUSTER

The port of Rotterdam is the largest seaport in Europe and a huge industrial complex. This seaport has been the focal point of several studies that merely view the port as a transport node. This neglects the fact that it is also a collection of thousands of related businesses that together form the Rotterdam seaport cluster.

This PhD thesis deals with the companies in the Rotterdam seaport cluster and their value for the competitiveness of the port. Companies active in many sectors, such as stevedoring, transport, logistics, off-shore and shipbuilding.

The competitiveness of the port of Rotterdam is dependent on the behavior of the firms located in the port cluster. Some firms create substantially more positive effects than others and are called 'leader firms'. The Characteristics and the behavior of these leader firms are analyzed in this study.

The Rotterdam port cluster is defined and the business structure is researched to select the leader firms. Nine forms of leader firm behavior are identified in the fields of innova.-tion, internationalization and cluster governance. With the use of a qualitative comparative analysis it is researched which firm characteristics foster leader firm behavior.

Conclusions are drawn about the role of leader firms in clusters and the stimulus and obstacles for leader firm behavior. Recommendations are formulated for the business community, government and the leader firms.

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