

## MASTER

### Collaboration with SME's innovation networks within the Dutch maritime industry

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Eindhoven, June 2008

**Collaboration with SME's;  
Innovation networks within the  
Dutch Maritime Industry**

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In partial fulfilment of the requirements for the degree of

**Master of Science**

**in innovation management**

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## Abstract

The objective of this research is to investigate the relations between a large enterprise (LE) and different SME's. This thesis is conducted in a five month internship at MTI Holland, which is one of the business units from IHC Merwede.

This report describes the research approach, results and practical guidelines to upgrade the performance of the network. It's conducted within the maritime sector, and therefore results are possible not applicable in other sectors.

## Preface

This report contains my master thesis, finishing the master program Innovation management at the Technical University of Eindhoven. The project has been carried out within the department of Organizational Science and Marketing (OSM).

The thesis was conducted in a five month internship at IHC Merwede, at the business unit MTI Holland.

First, I am very grateful for the advice during my master thesis project of my university supervisors, Dr. J.A. Keizer and Prof. Dr. A. van Weele. In particular their critical suggestions and valuable input during the project was very helpful to me.

Secondly I would like thank my company supervisors Henk van Muijen and Robert van de Ketterij for the opportunity to conduct my master thesis at MTI Holland and for their suggestions during the project. Also I would like to thank all my other colleagues who gives advice and made time available during my master thesis.

Last but not definitely not least, my gratitude goes to my co-students, friends, family, girlfriend Kim Bastiaansen and my parents Peter and Jose Snoeijs. Without their support, love and believe in my capabilities this thesis would not be as it is now.

With all the support and advice of others, I could not have accomplished this thesis project.

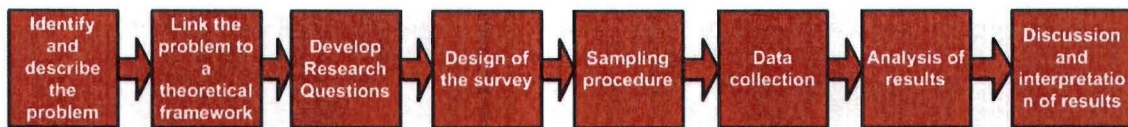
Ben Snoeijs,

June 2008

## Executive Summary

### *Introduction*

This report describes the findings on a research on partner collaboration between SME's and LE's. The research is conducted within the Dutch maritime industry at IHC Merwede. IHC Merwede develops and builds equipment for the dredging and offshore markets. IHC Merwede has gone through a rapid growth the last years. Since this growth cannot be catch only internally collaboration with other parties is favourable. Furthermore products and technologies are becoming more complex and need more disciplines from different fields of engineering, which also drives the need for collaboration. Since most companies in the network of IHC Merwede are SME's the following main question is raised: How should IHC Merwede position and manage their innovation network in relation with SME's? In order to solve this question a research strategy is formulated as visualized in Figure 1.



**Figure 1: Research methodology**

### *Theoretical framework*

The research is supported with a theoretical framework on alliances management from literature. In this framework four main subjects which are relevant for the research are discussed. First some basic theory on innovation networks and important success factors on alliance performance are discussed. After that innovation efforts of SME's are explained. These subjects combined together introduce the next subject namely large enterprise versus SME's relations and their influence on the company performance. The last relevant theory takes into account social network analysis and how it can be used to visualize and evaluate alliance networks.

### *Research questions*

In order to gain answers to the main question, the following five research questions are formed:

1. What is the actual network situation of IHC Merwede?
2. Which network situation and position is favorable for IHC Merwede?
3. How should partners be selected and evaluated?
4. Which factors stimulate the performance outcome of the network?
5. What would be the best organizational context and governance structure for the network?

#### *Data collection*

The data is collected by an internal in depth interview and an external survey. The internal interview was used to gain some major insights in the innovation policy of the firm. Al together 45 people were interviewed through different business units and disciplines. The interview consists of both open en closed questions on various items related to innovation. The external survey was mainly conducted to gain data to solve the research questions. In total 253 surveys were send to 172 companies. The survey designed with relation to the theoretical framework of the research. Multiple items were mostly measured and a five point likelihood scale.

#### *Data analysis*

The data analysis can be divided into three main parts. Which are a social network analysis of the alliances network, a structural equation model on variables influencing partner selection and at last a structural equation model on success factors that influence alliance performance.

The social network analysis of the network is visualized in Figure 2. This is only one of the cross section of the different social network analysis and represents the total amount of networking partners. What points out from al the network analysis is that most of them can be seen as a rather weak-tie-network with not many multiple partnerships.

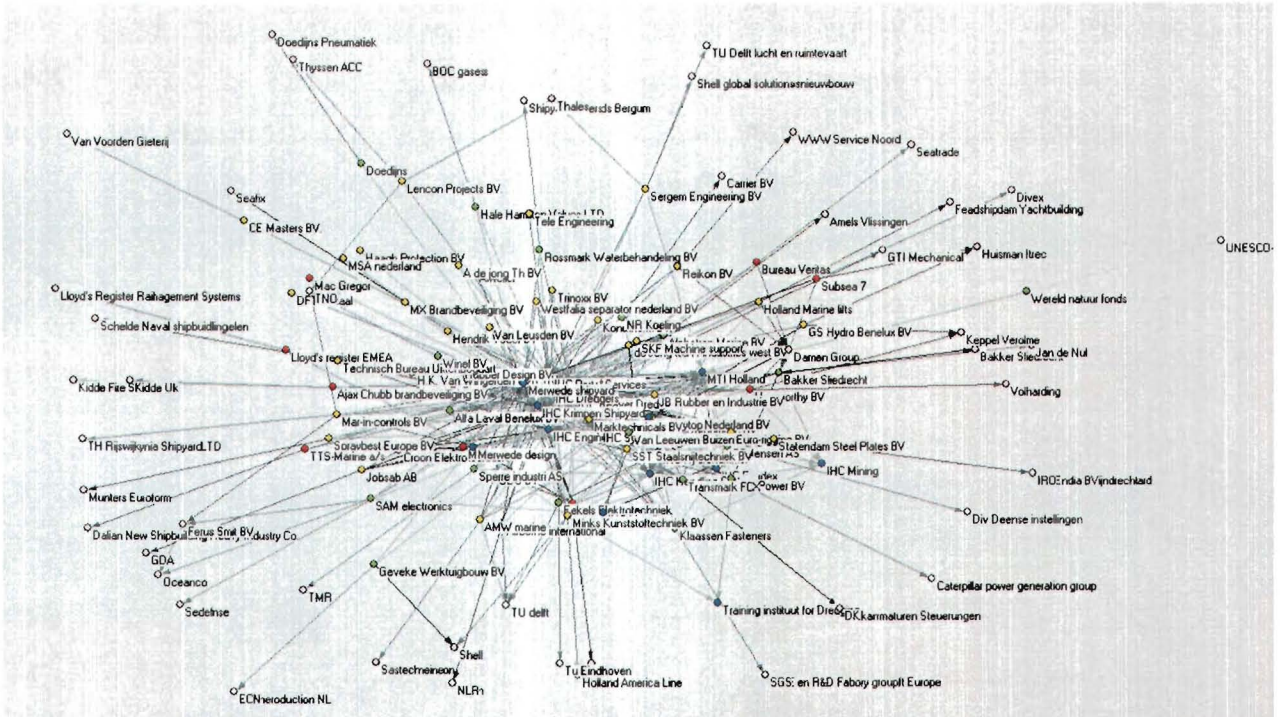


Figure 2: Totalpartner network with clusters

The structural equation analysis of the first model which measures the influence of internal variables on performance of the alliance is visualized in Figure 3. Main findings from the model where that all the internal variables did not had any influence on performance of the alliance and therefore could not be used as a tool for partner selection.

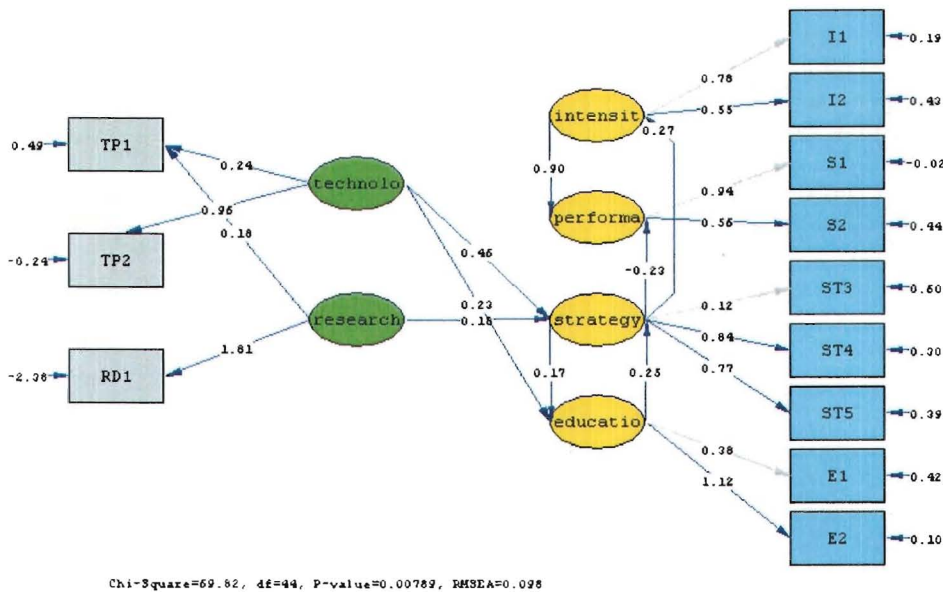


Figure 3: Structural equation model partner selection



The second structural equation model measures the influence of success factors from literature on alliance performance and intensity and is visualized in Figure 4. Quite surprising in this analysis is the negative relation with governance structures and trust on both performance and intensity. Positive relations on intensity and performance exist for the success factors commitment and communication.

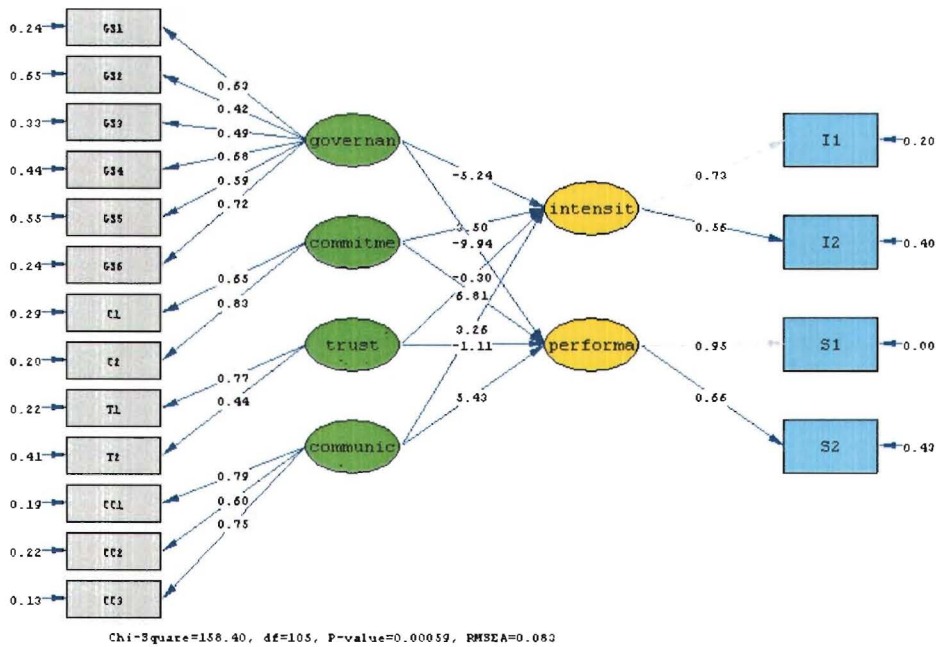


Figure 4: Structural equation model succes factors

### Partner toolkit

Main point in the partner toolkit is made of the transition from a weak-tie-network with not many multiple partnerships to a strong-tie-network with multiple partnerships. Main findings from the data analysis are used to support this transition. So relations should establish with simple governance structures, high commitment and intensive communication flows.

### Conclusions

What points out in the current network situation is the weak-tie based network with not much multiple partnerships. Opportunities arise to transform this into a strong-tie network with multiple relations. One of the main remarkable findings of the research is the fact the SME based alliance differ from alliance between large enterprises. Best

practices from alliances literature are not always relevant for SME's. The partner selection cannot be based on internal variables since these variables do not significantly influence partner performance. For the success factors only commitment and communication are positively related to alliance performance. Negative relation on alliance performance exists for governance structures and trust. Therefore it would be wise to build on relations with simple governance structures, with high commitment and intensive communication. Furthermore IHC Merwede shouldn't trust their partners too much. At last it seems to be very recommendable to start with technology roadmap in order to stimulate the network, joint R&D project and knowledge spill-over's.

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## 1. Introduction

### 1.1 Theoretical frame of reference

The last decade's strategic alliances are becoming more and more a strategy to outperform competitors. This trend is driven by the fact that industrial innovations are becoming more open and change the companies' innovation policies. (Chesbrough, 2004) This open innovation model is further stimulated by the change of a market economy in network economy (de Man, 2004). Important elements for success in these open environments are external sources of innovation (Chesbrough, 2004). Therefore the interest in managing innovation networks between firms is growing. A lot of research has been conducted to find the effect of these networks on the innovation policy of the firm. When looking at R&D alliance between large enterprises and SME's (small and medium size enterprises) this area is still has to be exploited. This is quite remarkable since SME's have a reputation as boosters of employment, economic growth and economic dynamics (Keizer et al, 2002). These facts combined together give a huge potential for innovation for large enterprises to team up with SME in a network environment.

### 1.2 Company description

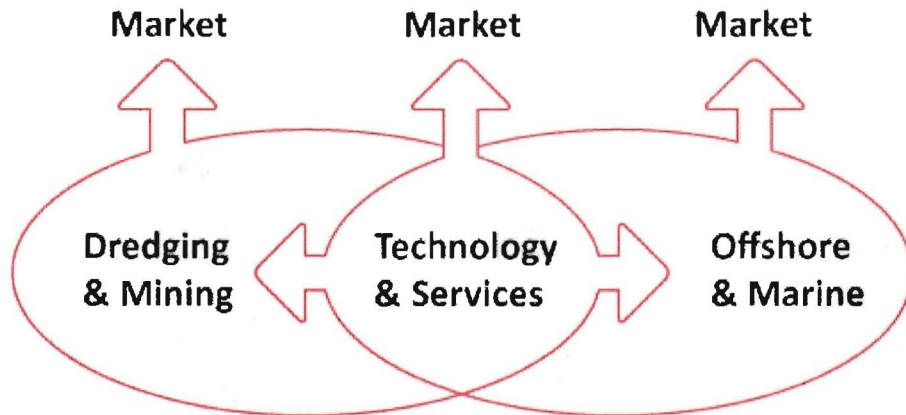
The master thesis is executed at MTI Holland, which is business unit of the IHC Merwede group.

IHC Merwede develops and builds equipment for the dredging and offshore markets. The equipment is used in projects that safeguard a sustainable future for the world, a future that depends on security, economic stability, supplies of raw materials and smooth possibilities. IHC Merwede forms an indispensable link in the chain of logistics and energy production. The projects in this chain create the conditions for a sustainable world and form the backdrop to their operations. IHC Merwede is a technology innovator. The goal of IHC Merwede is to lead the development of new technology which results in innovative products and equipment and to unique production vessels.

IHC Merwede's two core markets are the dredging and the offshore markets. Secondary markets for IHC Merwede are the cruise and ferry markets, the market for military auxiliary vessels and other special vessels, and the foundations market. Where appropriate, IHC Merwede combines and integrates the dredging and offshore production equipment they build, inspiring new and unique production vessels. IHC Merwede uses its specific knowledge and expertise to become the market leader in their working fields. IHC Merwede builds durable equipment with a long operational economical life. That is their responsibility as the technology innovator. IHC Merwede builds stable and enduring partnerships with their clients through close cooperation and long-term service. IHC Merwede's products are vital to the operational processes of their customers: dredging companies, oil and gas groups, offshore contractors and governments around the world.

IHC Merwede employs about 2,200 people at locations in Hardinxveld-Giessendam, Kinderdijk, Krimpen aan den IJssel, Sliedrecht, Apeldoorn, Delfgauw, Goes, Hendrik-Ido-Ambacht and Heusden. Outside the Netherlands, IHC Merwede has permanent operations in China, the United States, India, the Middle East and Singapore.

The structure of the group and the positions of the different business units are visualized in [Figure 5](#)



**Dredging & Mining**

- IHC Beaver Dredgers B.V.
- IHC Dredgers B.V.
- IHC Engineering Services B.V.
- IHC Holland B.V.
- IHC Krimpen Shipyard B.V.
- IHC Mining
- MTI Holland B.V.
- Training Institute for Dredging (T.I.D.)
- Verenigde Scheepswerf Heusden B.V.

**Technology & Services**

- IHC Fundex Equipment B.V.
- IHC Handling Systems V.O.F.
- IHC Hydrohammer B.V.
- IHC Hytop B.V.
- IHC Lagersmit B.V.
- IHC Metalix B.V.
- IHC Offshore Systems B.V.
- IHC Parts & Services B.V.
- IHC Piping B.V.
- IHC Systems B.V.
- IHC Engineering Business Limited
- IHC Vremac Cylinders B.V.
- Merwede Interior B.V.
- Verenigde Scheepswerf Heusden B.V.

**Offshore & Marine**

- IHC Krimpen Shipyard B.V.
- MERWEDE DESIGN, s.r.o.
- Merwede Repair B.V.
- Merwede Shipyard B.V.

**Figure 5: IHC Merwede group structure**

The thesis project is being carried out within MTI Holland.

*MTI Holland*

MTI HOLLAND B.V., member of the IHC Merwede group, was founded in 1942 in Delft. MTI Holland (MTI) is one of the world's leading research and consultancy institutes for dredging processes, dredging methods and equipment. The scope of activities for IHC Merwede and for third parties includes consultancy and advisory services, research and development for the dredging and wet mining industry, modeling and dynamic simulation of operational processes, conceptual design studies, intellectual property protection, tool development and measuring services. With more than 50 years of experience, MTI has gained access to a vast network of information and capability sources.

### 1.3 Research Problem

IHC Merwede has gone through a rapid growth the last years (374.6 million Euros revenue in 2003 to 774.3 million revenue in 2007 with an intake of new orders of 1,456.6 million Euros). This rapid growth is not only stressing the internal processes of the company, but also its supplier network and innovation performance. Due to this rapid growth cooperation with suppliers and R&D collaboration with other companies is favorable. This collaboration is further stimulated by new markets and products which are developed together with other companies. Some of these markets or products and technologies are not directly related to IHC Merwedens' past core business which explains this collaboration with third parties. SME's are flexible organization which can support IHC Merwede on these processes.

Another driver for collaboration is regulations from the government. IHC Merwede is one of the leading companies in the maritime innovation platform of the Dutch government. Drivers in this program are cooperation between companies, knowledge retention and development and innovation in the sector. This open innovational approach with collaboration of a lot of partners is rather new for IHC Merwede. This raises the question what position IHC Merwede should have in this network and which organizational structures are favorable?

Much of the companies in the network of IHC Merwede are small to medium sized enterprises. Innovation networks with a lot of SME's possible need other governance structures and network structures then normal alliances networks. In literature not much has been written about alliances between large enterprises and SME's.

Together these factors raise the following main question:

How should IHC Merwede position and manage their innovation network in relation with SME's?



## 1.4 Research design

The research model as visualized in Figure 6 is based on guide for the design of a social research proposal from Miller and Salkind (2002).

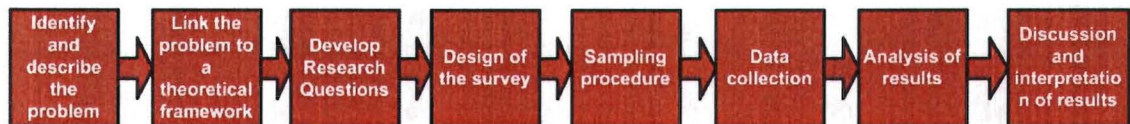


Figure 6: Research model

### 1.4.1 Identify and describe the research problem

The research problem is defined in paragraph 1.3 with links to important and relevant concepts. The same main question guides the research: How should IHC Merwede position and manage their innovation network in relation with SME's? The statement is relevant since its focus is on a gap in literature, namely SME's based alliances. The design of the research will be based on pre-experimental (survey) research approach.

### 1.4.2 Link the theory to a theoretical framework

The research problem is related to a theoretical framework with previous research on network theory, innovation in SME's, large enterprises and SME's relations and social network analysis. Combined, these theories give some inputs for the research questions and expected relevant concepts.

### 1.4.3 Develop research questions

Based on the theoretical framework research questions are developed. Independent and dependent variables are formulated as well as the instruments to assess these variables. Also some discussion about possible shortcomings is given.

### 1.4.4. Design of the survey

After the research questions are formulated the survey to assess these questions is developed and discussed. Each construct is measured with multiple items on a five point scale. The survey design will be discussed more in depth later in this report.

#### **1.4.5. Sampling procedures**

The survey is sent to a sample of the population which represent a reliable cross section of the network of IHC Merwedens' partners and also of the Dutch maritime industry. Given the time constraints on the research, no control sample is used to further verify research results.

#### **1.4.6 Data collection**

The data are collected to internal interviews with important key-employees and external with a 10 minutes taking questionnaire sent by email.

#### **1.4.7. Analysis of the results**

To analyze the results three data analysis instruments are used which are exploratory factor analysis, structural equation modelling and social network analysis. These analyses are conducted with different software packages. For the exploratory factor analysis SPSS is used (also used to define sampling reliability). The structural equation modelling is conducted with help of Lisrel. And finally Pajek is used for the social-network-analysis. These analyses will result in some possible patterns for SME based alliances.

#### **1.4.8 Discussion and interpretation of results**

At last the results are discussed and interpreted with managerial implications. The shortcomings of the research will be discussed and directions for further research are developed.

### 1.5 Structure of the report

The structure of the report is based on the research model is explained in the previous section. The structure is visualized in Figure 7.

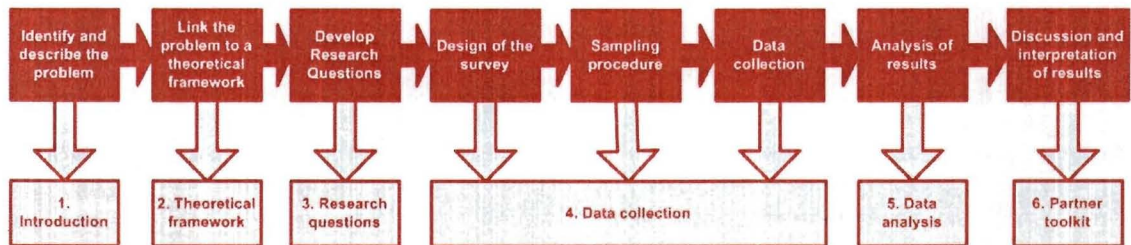


Figure 7: Structure of the report

First of all the research problem, company description and the research design is given in the introduction. After that the theoretical framework behind the research is discussed in chapter 2. The research questions which are based on the research problem and theoretical framework are worked out in chapter 3. As well as the way they will be assessed. In chapter 4 the data collection is discussed. First the focus is on the internal data collection and after that the external data collection is taken into account. This chapter also covers the sampling procedure and the design of the survey. The analysis of the results from the data collection is discussed in chapter 5. This chapter is covering the current network situation, factors the influence alliance performance and the model to select partners on. The results are interpreted in the next chapter with introduction of the partner toolkit. Furthermore the recommended situation and implementation plan is discussed. The report ends with a conclusion in chapter 7.

## 2. Theoretical framework

This chapter gives an overview of the theoretical framework which is used during the research. First some basic theory on innovation networks and important success factors on alliance performance are discussed in 2.1. After that innovation efforts of SME's are discussed in 2.2. These facts combined together introduce the next paragraph (2.3), namely large enterprise versus SME's relation and their influence on the company performance. The chapter ends with some theory on social network analysis and how it can be used to visualize alliance networks.

### 2.1 Innovation networks

When multiple organizations work together networks emerge. De Man (2004) defines a network as selected sets of multiple autonomous organizations, which interact directly or indirectly, based on one or more alliances agreements between them. The aim of networks is to gain a competitive advantage for the individual organizations involved and occasionally for the networks as a whole as well.

Strategic alliances can be defined as voluntary arrangements between firms involving exchange, sharing, or co development of products, technologies, or services. (Gulatti 1998)

A number of studies have recognized that *inter-organizational* learning is critical to competitive success. Organizations learn by collaborating with other firms as well as by observing and importing their practices (March and Simon, 1958: 188; Powell *et al.*, 1996; Levinson and Asahi, 1996). Primary driver for innovative ideas are a firm's customers and suppliers (Von Hippel, 1988, Porter 1990)

A lot a factors influence the performance of an alliance. The factors that have a positive influence on the performance, which are found in literature, are visualized in Table 1. A more elaborate explanation of these factors can be found back in appendix 1.

Influencing Variable	Found in
Financial capital	Bullinger et al, 2004
Government regulations	Bullinger et al, 2004; Rothwell and Zegveld, 1982
Research institutes	Fukugawa, 2006; Bullinger et al 2004
Interdependence	Mohr et al, 2005
Appropriate governance structures	Mohr et al, 2005; de Man 2004
Commitment	Mohr et al 2005; Pansiri 2008; Shah and Swaminathan, 2008
Trust	Mohr et al, 2005; Pansiri 2008; Shah and Swaminathan, 2008
Communication	Karlsson and Olson, 1998; Mohr et al, 2005
Compatible corporate cultures	Mohr et al 2005, de Man 2004

**Table 1: Succes factors on alliance performance**

## 2.2 Innovation within SME's

Before starting the discussion about innovation in SME's boundaries between large enterprises and SME's are set. According to Karlsson and Olson (1998) SME's are enterprises employing less than 500 people. There is also often a distinction between small enterprises (<100 or <50 employees) and medium sized enterprises, but the general discussion is usually in terms of large enterprises versus SME's.

Innovations are an important driver for SME's to increase employment, economic growth and economic dynamics (Keizer et al, 2002). Keizer et al (2002) made a framework from literature to explain innovation efforts of SME's. They divided it into external and internal variables. External variables that were found are: collaboration with other firms, linkage with knowledge centre's and utilizing financial resources or support regulations. Internal conditions that influence innovation arte strategy, structure, technology policy, level of education and investments in R&D. (a more elaborate explanation can be found in attachment 1)

From these variables three were found significant by Keizer et al which are: using innovation subsidies, having links with knowledge centre's, and the percentage of turnover invested in R&D.

Weaver and Dickson (1998) investigated variables that influence alliances outcomes between SME's. They found that the firm's industry, size, and financial strength, aren't of particularly importance. The financial return provided by the SME's alliances relationship was found to be the most important factor related to outcome quality. Other factors that found to be significant were contract noncompliance and the perceived behaviors of the SME's alliance partner. Additionally, the notion that SME-based alliance relationships are generally marked by assumptions of trust rather than opportunism was supported.

### **2.3 Large enterprises versus SME's relations**

SME-based alliances are unique and differ from alliances between two (or more large enterprises) Weaver and Dickson (1999) found that in SME-based alliances, control variables (a number of resource and environment based determinants) didn't significantly influence alliances outcomes. Furthermore they found that cumulative experience of the SME is of major impact in determining the quality of alliances outcomes.

Dyer and Nobake (2000) defined three dilemmas for the collaboration of SME's on an inter-organizational level which are: (1) motivate members to participate and openly share knowledge, (2) prevent members from free riding and, (3) efficiently transfer both explicit and (most importantly) tacit knowledge. Dyer and Nobake (2000) found the solution in this problem by creating a highly interconnected, strong tie network.

## 2.4 Social network analysis

One way to analyze large alliance networks is with help of social network analysis. Social network analysis views social relationships in terms of nodes and ties. Nodes are the individual actors within the networks, and ties are the relationships between the actors. An example of a social network diagram is visualized in Figure 8. The underlying theory of social network analysis can be found in psychology, namely the theory of social capital. The term social capital initially appeared in community studies, highlighting the central importance of the networks of strong, crosscutting personal relationships developed over time that provide the basis for trust, cooperation, and collective action in such communities (Jacobs, 1965 in Nahapiet and Ghoshal, 1998)

Networks can be characterized by measurements of density and centrality. In general the number of ties can be much higher than the number of nodes. Such networks are called dense. A network is called sparse if the number of ties is of the same order as the number of nodes. (Mrvar, 2008) When talking about centrality undirected and directed networks should be distinguished. The term centrality measures us used for undirected networks. Example: A city is central, if a lot of roads are passing through it. The term prestige on the other hand is used for directed networks. Two different types of prestige can be defined: one for outgoing arcs (measures of influence) and one for incoming arcs (measures of support) (Mrvar, 2008). Where centrality and hence, independence are evenly distributed, there will be no leader, many errors, high activity, slow organization, and high satisfaction (Leavitt, 1951).

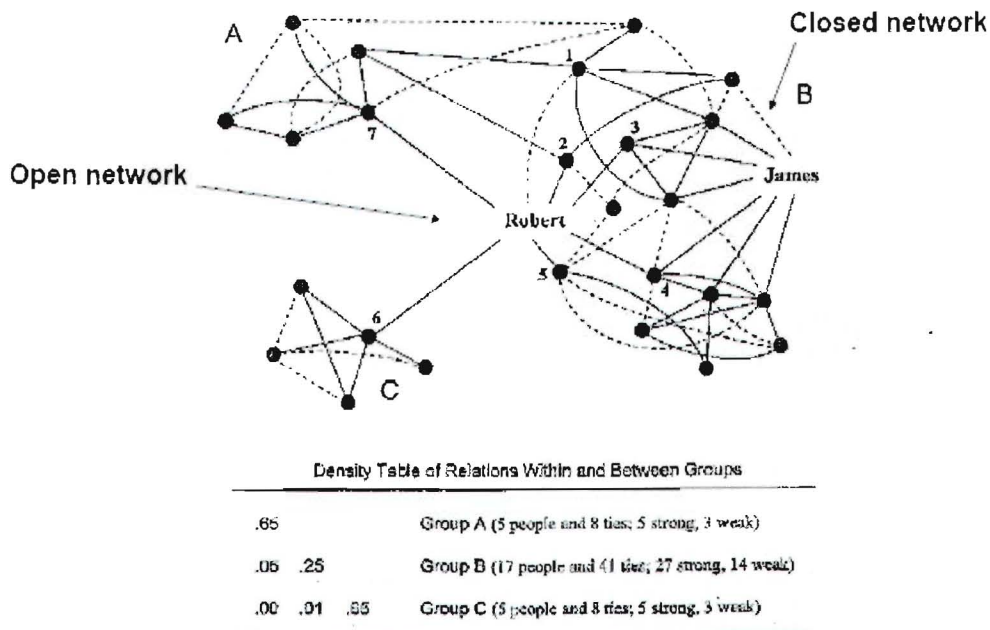


Figure 8: Closed versus open network (source: Burt 2000)

Companies can strive for different positions in the network according to the achievements they want to make. Furthermore different structures are optimal in different situations.

When looking at the debate between a strong-tie-network and weak-tie-network researchers are not ambiguous about the best performing network.

Dyer and Nobaka (2000) found a highly interconnected, strong-tie-network is well suited for the diffusion (exploitation) of existing knowledge rather than exploration for new knowledge (which is the strength of a weak-tie-network). Moreover, a highly interconnected, strong-tie-network is effective at the diffusion of tacit knowledge because (1) the redundant ties make it easier for network members to locate potentially valuable knowledge, and (2) strong ties produce the trust (social capital) necessary to facilitate the transfer of tacit knowledge.

Rowley et al (2000) and Granovetter (1973) found weak ties are positively related to firm performance. Furthermore Rowley et al (2000) found that strong ties are negatively related with performance



### 3. Research questions

In this chapter the 5 main research questions are discussed, as well as their way they are assigned and related to the theoretical framework. The different research questions will give some important answers to the main question as stated earlier: How should IHC Merwede position and manage their innovation network in relation with SME's?

#### 3.1 Research question 1

<b>What is the actual network situation of IHC Merwede?</b>
---

This question is formulated to give some insights about the actual situation. This question is linked to the theoretical framework of social network analysis. The question is stated since you first need to know the current network situation before you can state the direction where you want to go. Or as stated by Confucius (551 BB-479 BC): "Study the past if you would define the future".

To answer the research question a social network analysis is conducted with help of Pajek. Pajek is a program, for Windows, for analysis and visualization of large networks having some thousands or even millions of vertices. In Slovenian language the word Pajek means spider. The latest version of Pajek is freely available, for noncommercial use. With Pajek you can: find clusters (components, neighborhoods of 'important' vertices, cores, etc.) in a network, extract vertices that belong to the same clusters and show them separately, possibly with the parts of the context (detailed local view), shrink vertices in clusters and show relations among clusters (Batagelj and Mrvar, 2008).

The data for this analysis will be collected with help of interviews (internal) and a questionnaire (external). Clusters can be made, based on the information asked in the question, into internal partners, primary partners, secondary partners and research institutes. Furthermore the strength of ties is assessed on a 5 point scale based on the frequency of contact, importance for innovation and continuity.

This strategy will result in some major lessons and/or insights which can be learned from the networks, furthermore it will also answer the question if the network of IHC Merwede is a highly interconnected, strong tie network or a rather weak tie network.

### 3.2 Research question 2

**Which network situation and position is favorable for IHC Merwede?**

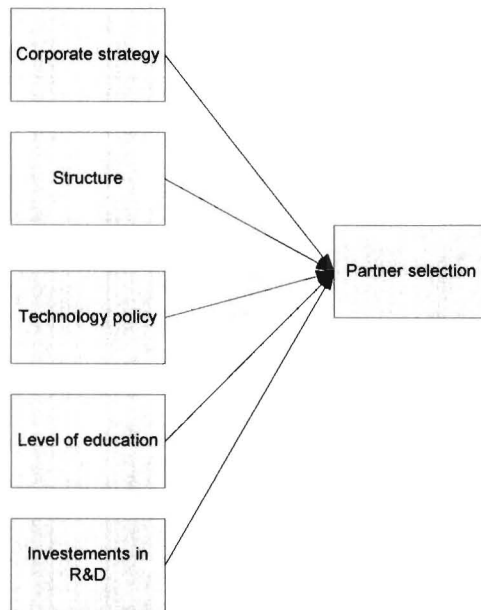
This question is logic continuation from the first question. And will be solved with help from theory and insights form the first question. This question is also linked to theoretical framework of social network analysis en networking theory. Some advice will be given how IHC Merwede can stimulate and build on his total network. This will be related to the weaknesses of the current network and how they can be overcome. This question is stated to give some clear directions and possibilities and their implications for the network. Or as quoted by Laurence J. Peter (1919-1988): "If you don't know where you are going, you will probably end up somewhere else."

### 3.3 Research question 3

**How should partners be selected and evaluated?**

After analyzing the current network position and the favorable network position, in the first two questions, partners should be chosen to cooperate with. Therefore this question is chosen to find out which variables are important for selecting the right partner?

This question is linked to the theoretical framework of Keizer et al (2002) from which the internal variables were tested to find out or they are of any influence on partner performance? This model is visualized in Figure 9. The different variables are all measured on five point scale in the external survey.



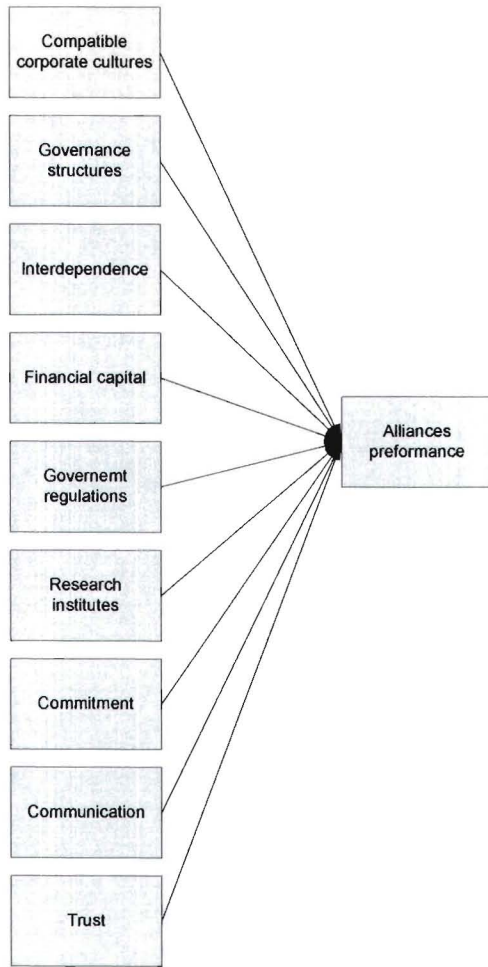
**Figure 9: Partner selection model**

The data from the survey is first analyzed on reliability and normality with help of SPSS. After that an exploratory factor analysis will be conducted to find out which variables are of any influence and which not. This will result in a structural equation model which will be tested and validated in Lisrel. Output from Lisrel will be used as advice in the partner toolkit.

### 3.4 Research question 4

**Which factors stimulate the performance outcome of the network?**

When partner are selected, to establish a strong relation, it is of course important to know which factors make the relation a success. A lot have been written about success factors and their influence on alliance performance. These factors are already discussed in paragraph 2.1. These factors together made the performance model as visualized in Figure 10. The question is to what extend they are also relevant in SME based alliances? The different variables are measured with multiple items on five point scale in the external survey.



**Figure 10: Performance model**

The data from the survey are first analyzed on reliability and normality with help of SPSS. After that an exploratory factor analysis will be conducted to find out which variables are of any influence and which are not. This will result in a structural equation model which will be tested and validated in Lisrel. Output from Lisrel will be used as advice in the partner toolkit.

### 3.5 Research question 5

What would be the best organizational context and governance structure for the network?

The next stage in alliance management, after measuring the actual situation, the preferable situation, partner selecting and success factors, is the organization of the network. This question is stated to give some managerial implications to realize the desired network situation. The question will be solved with help of the input from previous question and theoretical guideline from literature.

## **4. Data collection**

This chapter describes how the data collection is executed. First the initial internal data collection is described in paragraph 4.1. After that the external data collection is discussed in 4.2

### **4.1 Initial orientation**

#### **4.1.1 Interviews with key employees**

To gain insights in the innovation policy of the company an open in depth interview, of approximately one and a half hour, was designed to give some impressions about the thought of a sample of different managers in different functions. A list of respondent can be found back in appendix 5. In total 45 people were interviewed to give some first directions for the research. Most questions were established in close cooperation with the company to gain some insights about the general innovation management policy. Major findings from these interviews were that almost 95% found that innovation was of major importance for the company. Furthermore 80% indicated that IHC Merwede should collaborate more with external parties on innovation. Other findings from these interviews were some first indication of the innovation network of the company and some major fails and success of the companies' innovations and the process towards them. A more elaborate discussion of the results of this first structured open in depth interview can be found back in appendix 7.

#### **4.1.2 Interviews with purchase and R&D managers**

The initial interviews with key-players gave some indications for the further research directions. After the research design was established the purchase and R&D managers of the major units were asked to give their opinion on the research design. A list of the interviewed people can be found back in appendix 8. These interviews were not structured. But it certainly leads to some major improvements of the research. First of some major suggestion to questionnaire were discussed, and some open questions were also inserted. Furthermore some suggestions were made to find reliable cross sections of IHC Merwede and their partner network. Contact information was either given or looked up into databases. At last some major links were established to establish results in the organization. The research is linked to the purchase commission of IHC Merwede and the programme called “integrated cooperation”. The purchase commission is involved for further collaboration in the supplier network of IHC Merwede. The program integrated cooperation is looking into more cooperation between the parties at the Dutch maritime industry. A program which has a lot in common with this research, therefore outcomes of the research will be presented in this program

#### **4.2 External data collection**

##### **4.2.1. Outgoing surveys**

The external data collection is executed by a digital questionnaire send directly by email to the respondents. In the Netherlands 824 companies are active in the maritime sector (see appendix 2). In total 253 surveys were send to 172 companies. According to Miller and Salkind (2002) the sample size is large (>30). The sample reflects reliable cross sections of IHC Merwedens’ partner networks. A two way approach is chosen to get this reliable cross section. First R&D managers from al business units are asked to give there impression of relevant partners. Secondly al the purchase managers are asked to give there impression about their strategic partners. And at last all suppliers form the last two innovative ships (Toisa Pegasus and Seven Seas, see also appendix 3 and 4.) are selected and contacted by email. The notified companies and their respondents can be found back in attachment 9.

#### **4.2.2 Response ratio and relevance**

From the 172 companies 89 send a response, which is a response rate from approximately 50%. From this response 75 useful surveys from 69 different companies were collected. Approximately 80% of the responding companies can be categorized as SME's. The digital questionnaire was designed to be filled in within 10 minutes in order to gain a high respond rate. Other actions which were undertaken to gain a high respond rate were an introductory letter and follow-up mail. According to Miller and Salkind (2002) this are some of the major techniques to increase the percentage of returns.

#### **4.2.3 Design of the survey**

In the survey multiple dependent and independent variables are measured with items on a five point scale. The items that are measured are related to the theoretical framework as discussed in chapter 2. Each variable of the frameworks on partner selection and success factors are measured by at least two items. The data is expected to be normally distributed.

The survey can further distribute into nine major elements. In the first part some demographic questions about the respondent and his or her company are raised. Secondly the intensity of the relations is measured by multiple items on five point scale. This is the first dependent variable in the research model. In the third element frequency of contacts with the different business units are asked on a five point scale. This will result in the first cluster for the social network analysis. After that the main other partnerships form the companies are asked in the next element. They are measured on a five point scale with respect to their importance for innovation and continuity of the firm. This will be the secondary input and cluster for the social network analysis. The fifth part of the survey is asking the main partnerships with research institutes. They are also measured on a five point scale with respect to their importance for innovation and continuity of the firm. This will be the third input and cluster for the social network analysis. The next element of the survey is measuring the dependent variable from the different theoretical models, namely alliance performance. This construct is also measured by multiple items on a five point scale. After that the model of success factors is tested with statements on a five point scale which are related to the different variables from the theoretical framework. In



the next section of the survey the partner selection model is tested. This is also done with statements on a five point scale which are related to the different variables from the theoretical framework. At last the questionnaire ends with some important open questions which are:

Would you like to be closely associated with the R&D of IHC Merwede, and if so in which way?

Would you appreciate, if IHC Merwede would be closely associated with your own R&D en how would you see this role?

Additional comments.

The completed survey can be found back in appendix 11 and 12.

## 5. Data analysis

This chapter describes the main results from the data analysis as discussed earlier in the research design. First of all a social network analysis on the current network situation is discussed in 5.1. After that the factor analysis and structural equation model on partner selection are discussed in 5.2. The last data analysis is conducted on the performance model and will also cover a factor analysis and structural equation model and will be discussed in 5.3.

### 5.1 Current network situation

The current network of IHC Merwede consists of multiple partners. This paragraph describes the social network analysis of IHC Merwedes' network on different cross sections. First the internal relations between business units are analysed based on the internal interviews. After that the external data from the email survey is analyzed with cross sections on network partners and relations with research institutes. At last all the data are combined and analyzed with help of cluster analysis. This section only discussed the main finding of the total social network analysis. Further discussion is given in appendix 13.

#### 5.1.1 Internal relations business units

In Figure 11 the internal relations between different business units of IHC Merwede is visualized. This figure is based on the data of the internal interviews. At 45 people in the different business units the questions was asked, which units work together on innovations.

In the figure the dredging cluster (as stated in the group structure) is clearly visible. The network in this cluster consists of multi-partner strong partnerships. The cluster is encircled by the small circle in the middle. The strong relations between these units were expected since the dredging cluster delivers highly integrated solutions to their customers. The dredging cluster is also marked with a rich history.

In the second larger circle some of the technology and service units are grouped together. In this network only a few multi partner relations exist. Furthermore it has developed some bridges to the dredging cluster. But these bridges are not multiplexed. This means that the relations are established between both units. This is remarkable since it means that the dredging units cooperate with the technology and service units on innovations, but the technology and service units do not cooperate with the dredging units on innovations. The fact the technology and service units are not yet highly interconnected can be declared by the fact that they are relatively new in the group structure.

At last the offshore and marine division consist only of a few partnerships. This was also expected and can be explained by two main reasons. First the marine and offshore division is also rather new and established a few years ago. Secondly the marine and offshore division has not yet established the same position as the dredging cluster. Although IHC Merwede wants to deliver highly integrated technical solutions in the offshore cluster, this position still has to be grounded and further developed.

The density of the network is high in the dredging cluster, but average when looking at the total network (16 nodes with 60 ties). The centrality of the network is high since measurements of centrality differ significantly between units (see also appendix 13). In this respect part and service has the most important role with a centrality of 0.88. This in contrast with the lowest value of 0.38, which belongs to Krimpen Shipyard.

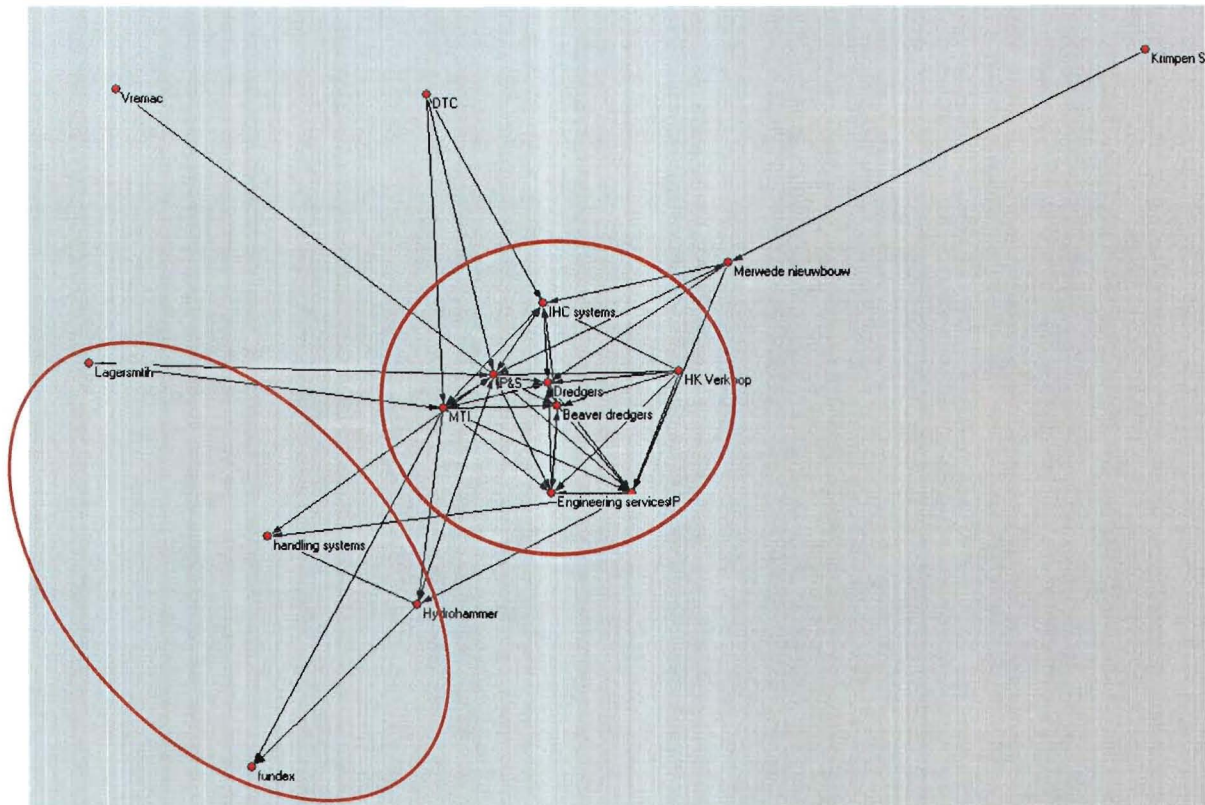


Figure 11: Internal relations BU

### 5.1.2 External relations companies

The external relations of IHC Merwede as a group are visualized in Figure 12. In this figure first and second order partnerships are clearly visible. The figure is based on data from the external survey. Approximately 40 companies answered the question what their most important strategic partnerships were.

As can be seen in the figure the network has a low density. This feeling is validated by the fact that only 127 ties exist between 112 nodes. This low density is also stated when the nodes with less than 2 ties are excluded, only 28 nodes are then left over. On the other hand the centrality is high in the network. IHC Merwede is clearly visible in the middle of the network. This was also expected since IHC Merwede is the facilitator from which the questionnaires are distributed to the different respondents.

On forehand a highly interconnected network was expected. This expectation was settled because IHC Merwede offers complex integrated technologies on his ships. Therefore a lot of cooperation in between partner was expected to offer these technologies. Furthermore product development would benefit from such collaboration since different products are connected and influence each other.

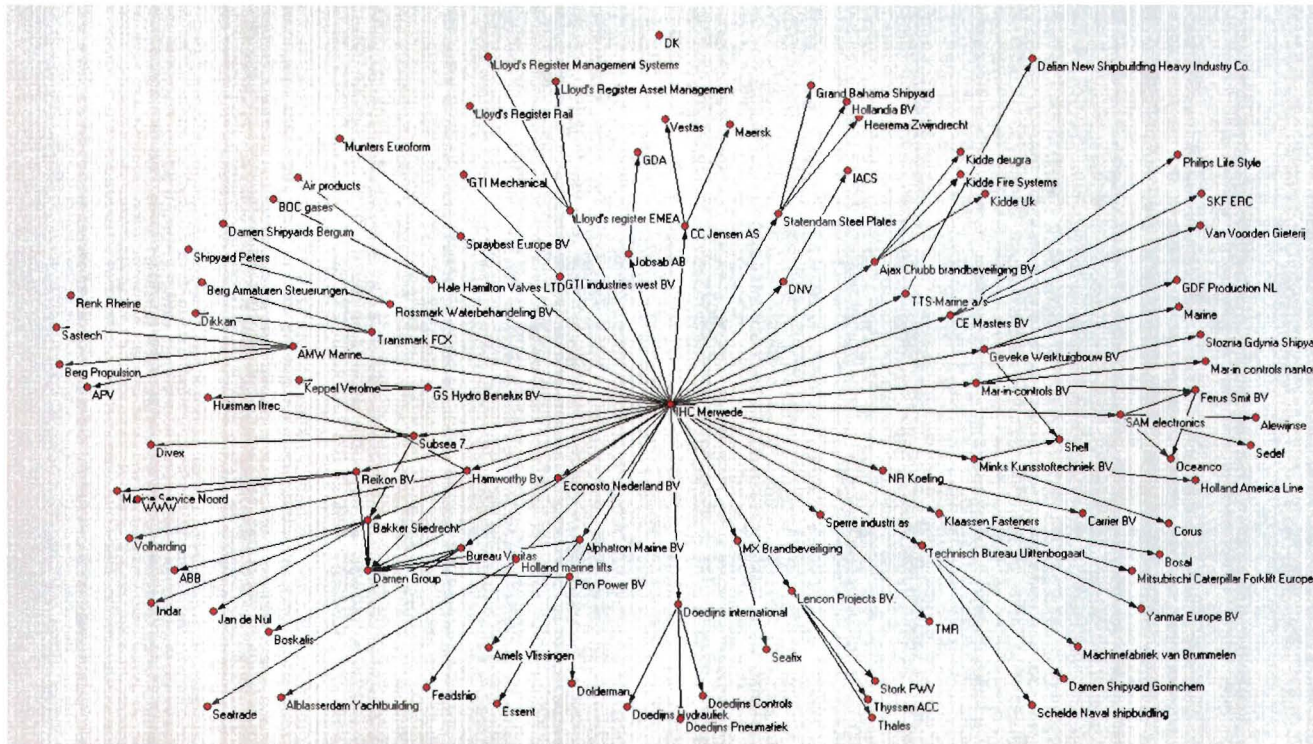


Figure 12: Primary and secondary relations companies

Therefore it is quite surprising that almost no interconnected relations pop up in the network of IHC Merwede. When looking at the network as visualized in Figure 12 the first and second order ties are clearly visible. Where a lot of relations between the partners was expected, only a few interconnections exist and also only in the second order network.

When looking at these interconnected relations, some companies have strong links with the Damen group, which is quite logical since Damen is the largest shipyard group in the Netherlands. A more remarkable alliance can be found back between OceAnco, Ferus Smit and SAM electronics. It is namely the only multiple alliance where more than 3 partners that are related together with one goal. The declarations for the few interconnections can possibly lying in the maritime industry. This industry can be categorized as very conservative, technical and highly protected. Knowledge is value in this network and therefore not easily shared between members.

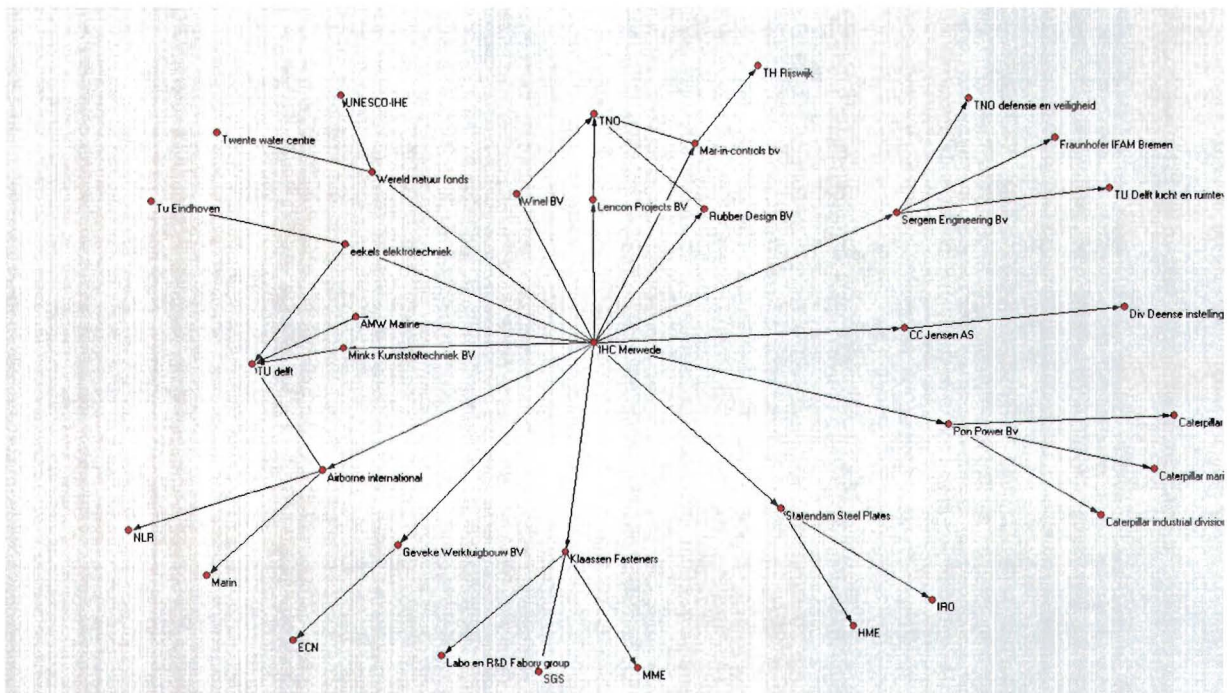
Opportunities arise for companies to cooperate intensively. The company that is the first one to use existing best practise on alliance management is expected to outperform competitors. This opportunity will further discussed in the next chapter.

What further points out in the network is the relation with unexpected partners. A lot of the second order partner ships do not have any affinity with the maritime industry. Examples are: Shell, Essent, ABB, STORK and so on. A declaration for this phenomenon is lying in the technology which is used in the products of IHC Merwede. A lot of supporting technologies are lying in the field of mechanical engineering.

### **5.1.3 External relation research institutes**

The relations between companies and research institutes are visualized in Figure 13. The figure is based on data from the external survey. Approximately 20 companies answered the question what their most important strategic partnerships with research institutes were. This response ratio already brings forward the first issue. Apparently only a few companies of the total population have relations which research institutes. Whereas the maritime research institutes are clearly located in the Delft/Rotterdam region and promoted themselves as a tight cluster. This is not supported by the data and companies.

When looking at the network analysis as visualised in Figure 13, two major parties are mentioned multiple times which are TNO and TU Delft. The relation with TU delft was expected since it accommodates the only university based maritime education in the Netherlands. What further pointed out is that almost none of the members established links with MARIN, although it is one of the major maritime research institutes in the Netherlands.



**Figure 13: Relations with research institutes**

As mentioned earlier it is quite surprising that only such a few relation with research institutes exist, while the sector is categorized as innovative, the cooperation with research institutes is promoted by the government and the research institutes promote themselves as the maritime cluster. These few relation also results in a very sparse network. Opportunities arise for as well companies as research institutes arise to cooperate on an intensive base. But research institutes as companies should work more on their relations in order to strengthen the Dutch maritime industry.

#### 5.1.4 Total overview with clusters

The previous network analyses are combined in a total network analysis as visualized in Figure 14. In this figure nodes are clustered on colours. Explanation of the colours is given in Table 2. The network analysis is based on 45 internal interviews as well as the 80 externals surveys.

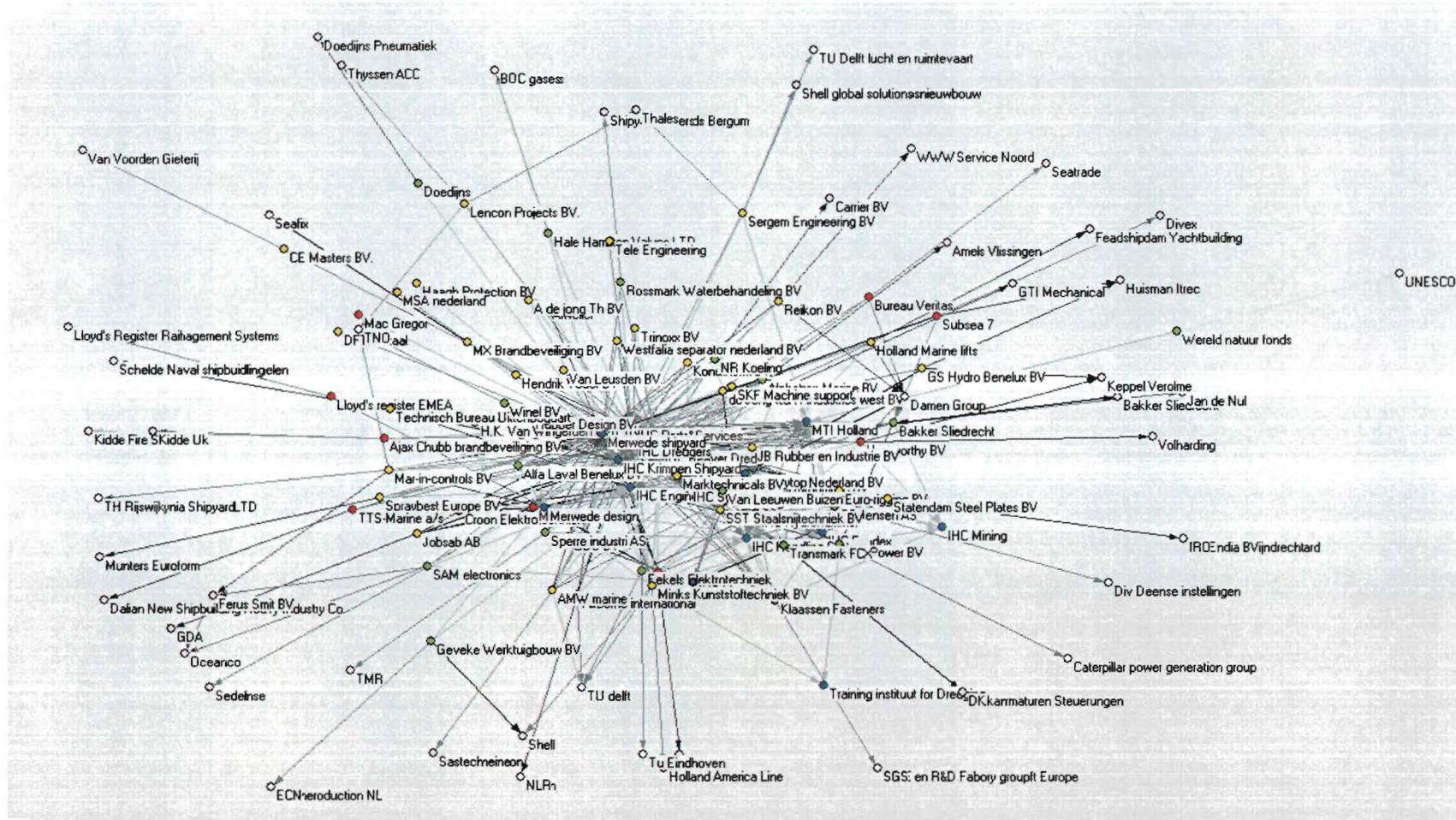


Figure 14: Clustered relations total



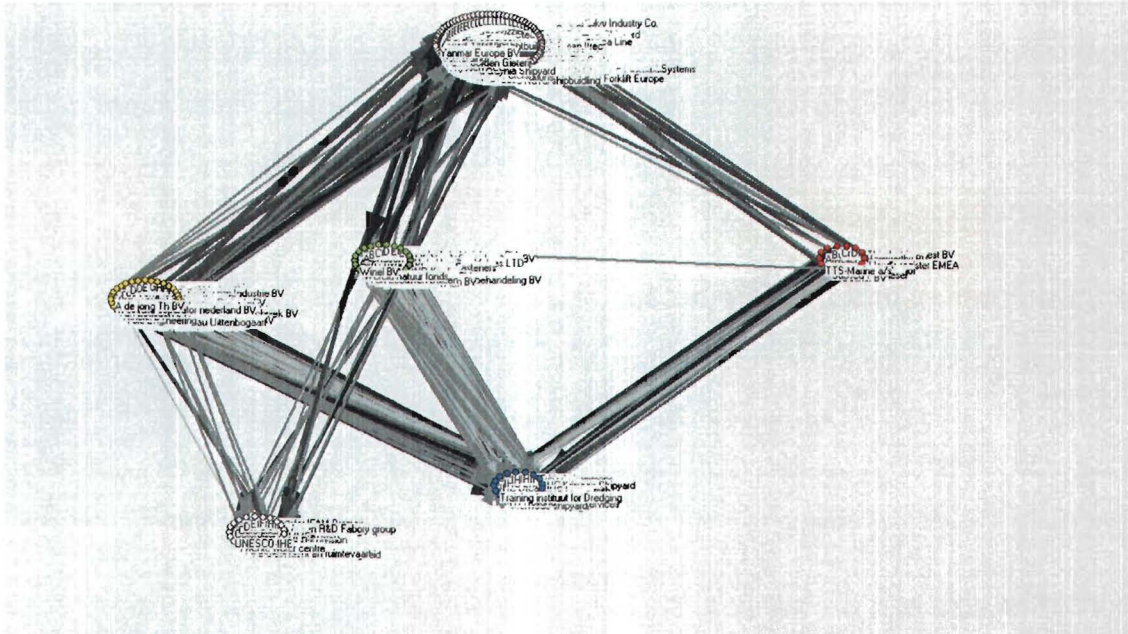
Color	Explanation
Blue	IHC Merwede units
Yellow	Small enterprises
Green	Medium enterprises
Red	Large enterprises
White	Research institutes
Gray/light purple	Unknown sized partners

**Table 2: Legenda of network analysis**

Within this figure also a further analysis of the group structure is made by split into different business units and their relations with external companies. Again the network is not very dense and interconnected, with exception of the relations within and to different business units. For the centrality, three major units play an important role, which are Merwede Shipyard, Dredgers and Parts and Services. They have significant higher centrality scores than the other nodes in the network.

Although it is difficult to see some highlights are pointed out from the figure. First of all the rather weak position of IHC Merwedede's research institute, MTI Holland, is remarkable. Almost none of the respondents has a relations based on innovation with MTI Holland. Opportunists arise for MTI Holland to collaborate with research partners and share knowledge. What further point's out are the relatively strong positions of the technology and service units: IHC Fundex, IHC Hytop, IHC Handling systems, IHC Hydrohammer and IHC Lagersmith. Apparently they already cooperate a lot with external partners on innovation. A declaration possible can be found in the relatively small size and specific differentiated product offerings of these units, which make cooperation necessary in order to offer total solutions to customers. Another unit that has a surprising strong position is the IHC Krimpen shipyard. The IHC Krimpen shipyard is opened less than a year ago and already has a strong relation with multiple partners. Underlying reason is, that it makes use of the network of the Merwede shipyard, which seems a good strategy to establish a multiple relational network in a very short time.

A second cross section of the total network analysis is made in Figure 15. In this figure the same data is visualized in a different manner. The clusters are visualized in circle related to each other.



**Figure 15: Relations visualized on clusters**

Also from this figure a few highlights can be made. What points out very clearly in this figure is that none of the large enterprise partners has relations with research institutes. This is very remarkable since mostly SME's lack in their relations with research institutes. Apparently the relations between SME's and research institutes are not that bad in the maritime sector. What further points out is the fact that SME's have weak relations with IHC Merwede but strong relations with their partners whereas this is vice versa for large enterprises. Large enterprises have strong relations with IHC Merwede and rather weak with their partners. Main attention for the IHC Merwede should therefore be given to stimulate relations with SME's, and second order relations of large enterprise with companies and research institutes.

This section only discussed the main finding of the total social network analysis. Further discussion is given in appendix 13.

### **5.1.5 Further research directions**

To develop the network and their ties further, more partners could be selected to answer questions about partnerships. Also the partners of the partners could be taken into account and their opinion on their major partnerships. It would be interesting to see or suggested partners also link back to the primary partners and if so, or they think the relations can be categorized identical. This would also be of interest to found out the level of interdependence in the network.

## **5.2 Companies that perform better**

The first model to be tested is the partner selection model. This will point out or internal factors that are related to innovation performance also affect the alliance performance. Due to the sample size some critics should be placed about the generalizability of results. But the statistics are reliable enough to identify some possible patterns in the populations.

### **5.2.1 Data check**

Before starting the analysis the data is checked on multiple items. First of all the check was made of consistency within the surveys. If they aren't consistent in answering surveys are left out. After that the statements were checked on reversed scaling. For the partner selection model none of the statements needed to be reversed scaled. Next the different items are checked on normality of the data by plotting the histograms together with the normal curves. The plot of different histograms can be found back in appendix 14. At last the data is checked on reliability by use of Cronbach's alpha. The result of this analysis can be found back in appendix 15. Most of the items had Cronbach alpha of 0.6 or higher which can be considered as sufficient by Hair et al (2006). Only the items on structure did not show a high reliability and were therefore deleted. This is also confirmed in the factor analysis next paragraph.

### 5.2.2 Factor analysis

First an exploratory factor analysis in SPSS is conducted to explore the structure of the data and loadings on different items. The measurement of sample adequacy exceeds 0.5 which is an adequate measure according to Hair et al (2006). With the results of the factors analysis some items which did not have any significant correlation were deleted. This counted for the items ST1 and ST2, the remaining constructs and factors were used as input for the confirmatory factor analysis as discussed in the next section. The total outcomes of the factor analysis can be found back in appendix 16.

### 5.2.3 Structural equation model

The model as described earlier in the research design is tested by a confirmatory factor analysis with help of Lisrel. Detailed finding and Lisrel statistics can be found back in appendix 17. The guidelines of Hair et al (2006) are used to asses the overall model fit. The indices for the model fit are visualized in Table 3. Since not all fit indices are adequate the generalizability of results is somewhat questionable and therefore interesting for further research.

Name of Statistics	Value	Should be at least	Adequate
X <sup>2</sup>	90.62	Significant p-value	yes
P value	0.0001		
RMSEA	0.15	<0.1	no
GFI	0.79	>0.85	no
CFI	0.85	>0.85	yes

Table 3: Lisrel fit indices for the partner selection model

Ben Snoeijs

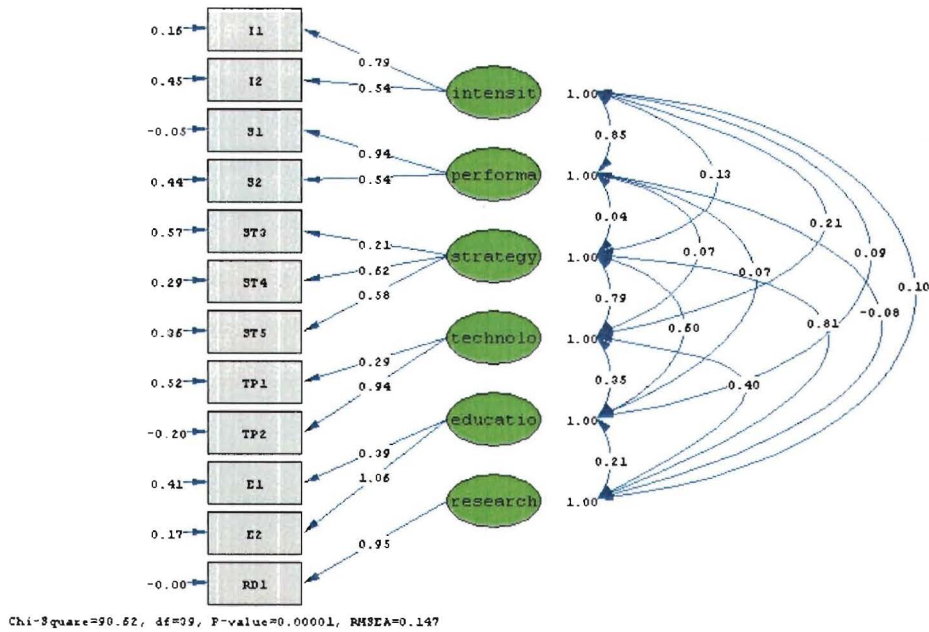


Figure 16: Path diagram and results of the Lisrel analysis

The result from the Lisrel analysis and loadings is visualized in Figure 16. According to Hair et al (2006) loading should be at least 0.5 or higher to be of relevance. The results and loadings are quite remarkable since none of the internal factor significantly influence partnership performance. They are not positively or negatively strong related to alliance performance. These findings are also supported by the Keizer et al (2002) who found that most of the factors were not of significantly importance for innovation.

These finding have major implications on research question 3: How should partners be selected and evaluated? Since the internal factors do not influence alliance performance or alliance intensity partners cannot be selected on internal variables which probably could have been measured.

The only loadings that are significant are the ones from investments in R&D and the level of education of employees on corporate strategy with loading of respectively 0.81 and 0.50. Furthermore the intensity of the relation is positive related to the performance of the relation with a loading of 0.85. Apparently intensive relations lead to better performance in the alliance. Since not all fit indices are adequate a second model is developed in order to gain more insights in the under lying structure, this model is based on the modification indices of Lisrel. Fit indices for this model a given in Table 4. This model is fitting the data better since the majority of fit indices are relevant and adequate.

Name of Statistics	Value	Should be at least	Adequate
X <sup>2</sup>	69.82	Significant p-value	yes
P value	0.0079		
RMSEA	0.09	<0.1	yes
GFI	0.83	>0.85	almost
CFI	0.93	>0.85	Yes

**Table 4: Fit indices lisrell second model**

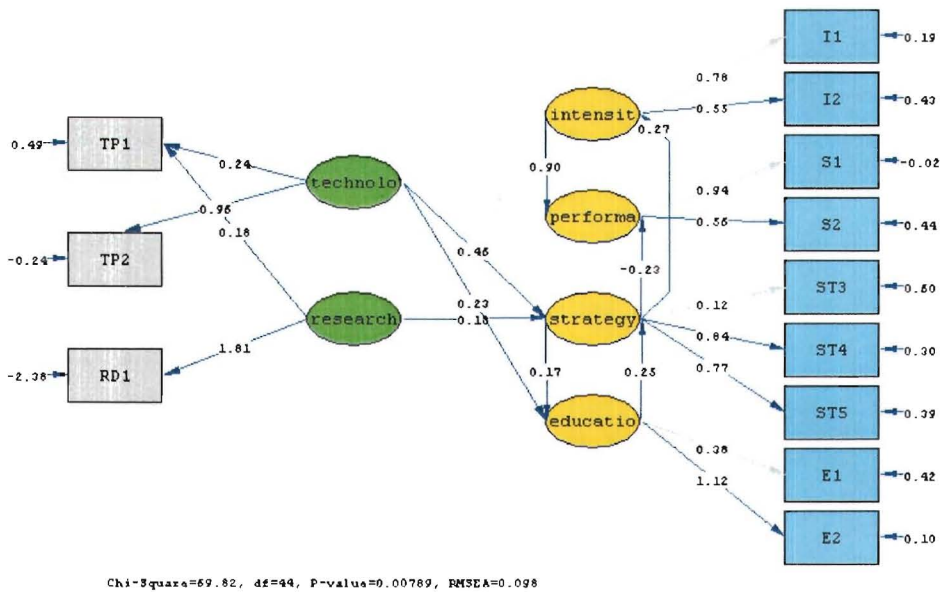


Figure 17: Second conceptual diagram

Also in this model most of the loadings are not significant. Again the positive relation (0.90) between intensity of the relation and performance points out. Furthermore some patterns exist with a light negative relation of partner strategy on performance of -0.23. Some positive patterns arise between technology policy and strategy of 0.46. Other light positive relations exist between technology policy and education (0.23), education and strategy (0.25) and strategy and intensity (0.27). If these patterns are true it would mean that technology policy, research and education are positively related to corporate strategy. Corporate strategy would then be negatively related with alliance performance but positively on intensity of the relation.

#### 5.2.4 Further research directions

Not all statistic results are reliable and most of the conclusions are settled to find some possible patterns among the maritime industry. These patterns should be tested and validate further in order to gain results which can be generalized.

### **5.3 Factors that stimulated the alliances network**

The second model to be tested is the success factor model. This will point out or success factors as found in literature also relate to better alliance performance within SME based alliances. Due to the sample size some critics should be placed about the generalizability of results. But the statistics are reliable enough to identify some possible patterns in the populations.

#### **5.3.1 Data checks**

Before starting the analysis the data is checked on multiple items. First of all the check was made of consistency within the surveys. If they aren't consistent in answering surveys are left out. After that the statements were checked on reversed scaling. For the success factor model the statements GS2 and F2 needed to be reversed scaled. Next the different items are checked on normality of the data by plotting the histograms together with the normal curves. The plot of different histograms can be found back in appendix 18. At last the data is checked on reliability by use of Cronbach's alpha. The result of this analysis can be found back in appendix 19. Most of the items had Cronbach alpha of 0.6 or higher which can be considered as sufficient by Hair et al (2006). Only the items on financial capital and interdependence did not show a high reliability and were therefore deleted. This is also confirmed in the factor analysis next paragraph.

#### **5.3.2. Factor Analysis**

First an exploratory factor analysis in SPSS is conducted to found out the structure of the data and loadings on different items. The measurement of sample adequacy exceeds 0.5 which is an adequate measure according to Hair et al (2006). With the results of the factors analysis some items which did not have any significant correlation were deleted. This counted for the items on governmental regulations and research institutes, the remaining constructs and factors were used as input for the confirmatory factor analysis as discussed in the next section. The total outcomes of the factor analysis can be found back in appendix 20.



### 5.3.3. Structural equation model

The model as described earlier in the research design is tested by a confirmatory factor analysis with help of Lisrel. Detailed finding and Lisrel statistics can be found back in appendix 21. The guidelines of Hair et al (2006) are used to asses the overall model fit. The indices for the model fit are visualized in Table 5. Since the majority of the indices indicate a good model fit, the model can be seen as acceptable.

Name of Statistics	Value	Should be at least	Adequate
X <sup>2</sup>	158.40	Significant p-value	yes
P value	0.00059		
RMSEA	0.083	>0.1	yes
GFI	0.80	<0.85	no
CFI	0.98	<0.85	yes

Table 5: Fit indices lisrel from the succes factor model

The result from the Lisrel analysis and loadings is visualized in Figure 18. According to Hair et al (2006) loading should be at least 0.5 or higher to be of relevance. The model is further supported with a good fit of the loading of the items on the different constructs. This means that the actual structure is in line with the theoretical structure.

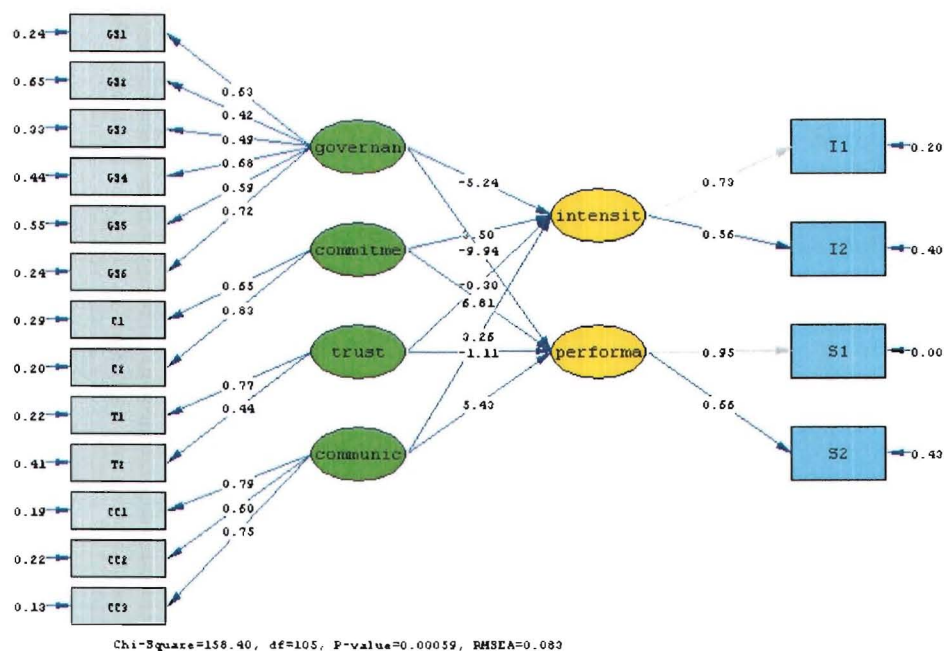


Figure 18: Path diagram and loadings succes factor model

When looking at the loadings some remarkable results pop up, which have major implication for research question 4: Which factors stimulate the performance outcome of the network?

First of all the most interesting results are the influences of governance structures. Governance structures are highly negatively related with alliance performance as well as the intensity of the relation. Loadings on performance and intensity are respectively -9.84 and -5.24. This finding are not in line with general alliance management literature who suggest that appropriate governance structures are an important success factor on alliance performance. Apparently SME based alliance prosper better when less or simple governance structures are settled. A second negative factor is found on trust. Although the loadings are not extremely high, a negative relation between trust and performance of -1.11 is present. This means that relations with high trust perform worse then relation with low trust. A declaration for this finding cannot be found.

Besides this negative relation also positive relations are found. When looking at the driving success factors commitment and communication are of major positive impact on alliances performance. The loading of commitment on performance and intensity are 5.81

and 3.50. These findings suggest that, partners who are highly committed to the relations will significantly perform better and create stronger relations than the ones who are less committed. The second major success factor is communication with loadings of 5.43 on performance and 3.24 on intensity. This suggests that relations with intensive communication patterns outperform alliances with less communication.

#### **5.3.4 Further research directions**

Although the statistics are significant the generalizability of results is questionable due to the relative small sample size. Conclusions are settled to find some possible patterns among the maritime industry. These patterns should be tested and validated further in order to gain results which can be generalized. Also the variables that are left out because of unreliability or low correlations should be assigned again in order to validate that they are not of significant relevance on alliance performance.

## 6. Partner toolkit

In this chapter research findings from previous chapter are combined with existing literature in order to gain some advice of organizational structure for the partner network of IHC Merwede. First the recommended situation is discussed in paragraph 6.1 and after that the implementation plan is discussed in chapter 6.2.

### 6.1 Recommended situation

When looking at the recommended situation some opportunities arise for IHC Merwede. First of all, there is a huge innovation potential of SME's which isn't enforced. Secondly IHC Merwede could be one of the first companies in the maritime sector which is aware of his network position and is able to manage it into a strong tie multi partnered network.

#### 6.1.1. Preferable network position

According to de Man (2004) companies in a network with low level of clustering, should keep an eye open for opportunities for clustering. When looking at the social networks analysis a lot of these opportunities arise within the network of IHC Merwede. An example of a highly clustered network is given in Figure 19. When looking at the network of IHC Merwede not many clustering occur. Most of the partners do not have interconnected relations. The company that is the first one to use existing best practise on alliance management significantly will have competitive advantage over companies who do not operate make use of alliance management. Further opportunities arise to create a strong-tie-network within the Dutch maritime industry.

IHC Merwede could play a key role in creating such a network. It should stimulate the network and knowledge sharing within the network in order to create multilateral partner network. This stimulation should be focused on some key areas within the network. First of all the relations with SME's suppliers has to be strengthened. Secondly multiple partnerships should be stimulated in order to create the strong-tie-network. A third area of attention is the relation with research institutes. Also here multiple partnerships should be stimulated.

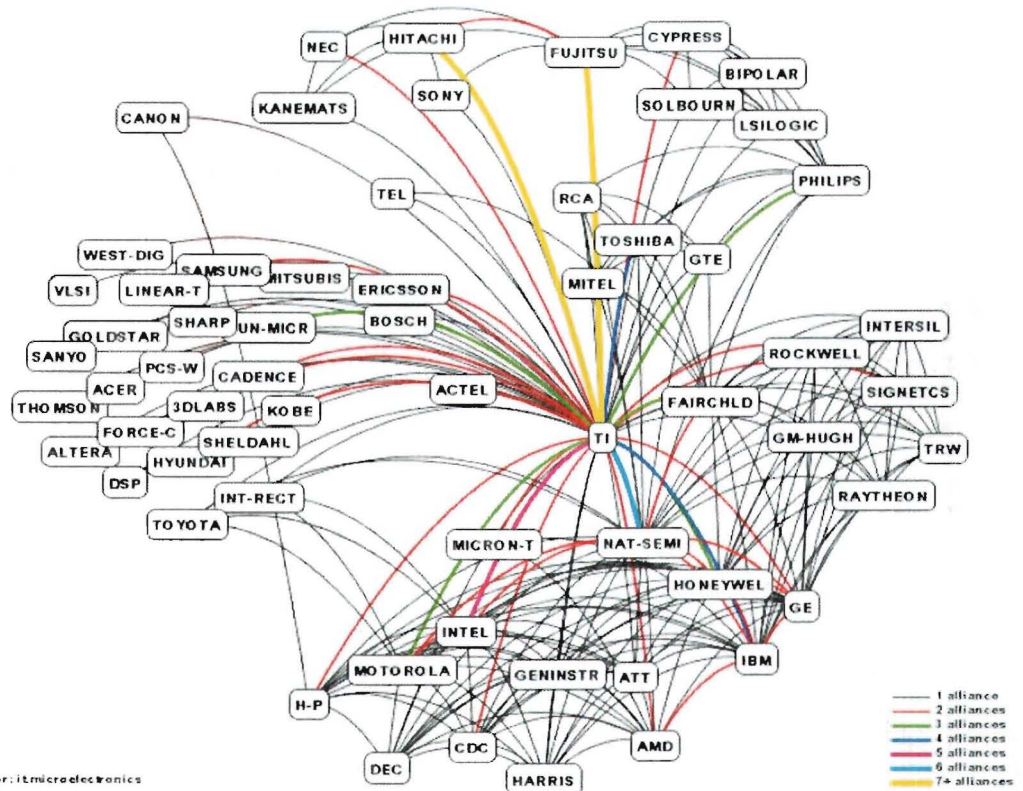


Figure 19: Alliances Texas instruments

An important role in the stimulation of the network is the role of MTI Holland. Collaboration with research partners should be established and knowledge should be shared within the network. .In order to facilitate this role MTI Holland should start up with technology road mapping within the company. Technologies and their developments should be prospected. Within this technology roadmap, choices on partner cooperation and core technologies should be made. Joint technology roadmaps with important partners should be developed. In order to stimulate this joint R&D projects free consultancy service could be offered to the partners, as in the successful case of Dyer and Nobeoka (2000).

### 6.1.2 Partner selection

Further research on the partner selection criteria is necessary. Since internal variables did not significantly influence alliance performance it does not seem to be recommendable to select partners on these variables. When relating to the success factor on the alliances performance, partners with high commitment and communication skills should be selected for the alliances.

### 6.1.3 Organization of the alliances structures

According to the tested model on success factors governance structures and trust are negatively related to alliance performance. Therefore relations with a low level of governance structures should be established. Furthermore it seems to be wise to do not trust too much on the partner, since this is negatively influencing the relation. When looking at the positive success factors communication and commitment are of major positive influence. Therefore relations should be established with high level of commitment with open communication between the different parties. This is looking a lot similar to the social capital approach as stated by Coleman (1998) which stated that in order to profit from knowledge transfer, strong, long-term relations need to be built and these relations can only come into tight knit groups. The build of this strong-tie-network is already discussed in 6.1.1. According to de Man (2005) commitment in relations can be established by:

- Clear agreements on each partner's contribution beforehand
- Building up personal relations/relational contracts
- Repeated collaboration with the same partner
- Agree on time horizon for the cooperation
- Agree on flexible timeframes for individual projects
- Allow for several speeds in the network

“Unless commitment is made, there are only promises and hopes... but no plans.”  
Peter Drucker (1909 - 2005)

## 6.2 Managerial implications

A guideline with some steps to make the transition into an innovative network is given in the book of Chesbrough (2004).

First of all it would be wise to take stock of recent innovation activities within IHC Merwede and other companies in the maritime industry. The goal would be to build a strategic map. Important questions to answer are: where have important ideas at IHC Merwede and the maritime industry come from in the past five years? And how did they fit within the business model? What role has start-up organizations played? What role did research institutes play in contributing knowledge? And so on.

After that the strategic roadmap is set, an innovation roadmap can be build. In this roadmap future R&D projects should be detailed in roughly time frame. With help of this roadmap the gaps within the current business should be filled, blind spots should be found and external technologies should be reviewed with external experts. Furthermore it should gain some insights on which technologies should be licensed in and out, or on which technologies partners should be needed.

A second very important guideline is gained during the interviews with help of the open questions. The remarks are further discussed in appendix 21. Most of the companies indicated that they would appreciate a role of IHC Merwede in their innovation program and vice versa. Therefore it would be wise to ask to your partners, suppliers and so on or they would appreciate a bundling of forces on innovation. It would be surprising to see that many positive reaction and relation will be established.

## 7. Conclusion

In this chapter the conclusions that can be drawn as a result of the research are discussed. This is done by discussing the research questions in 7.1 and further research directions in 7.2.

### 7.1 Research questions

The following main question was raised in the beginning of the research:

**How should IHC Merwede position and manage their innovation network in relation with SME's?**

One important answer to this question, which also points out in the different research questions is the fact that difference exist between the management of SME's and well known best practice of current alliance management theory between large enterprises. Based on the above main question five research questions were formulated (see chapter 3). This section provides answers to these questions.

#### *1. What is the actual network situation of IHC Merwede?*

This question was established in order to gain some insights into the current partner network of IHC Merwede. An elaborate discussion of the actual network situation is given in 5.1. The most important insights into the current network were:

- Internally looking, a multi-partnered strong tie network within the dredging units exists, a multi-partnered weak-tie-network within the technology and service units exists and no multi-partner network between the marine and offshore units exists.
- Looking at the external relation almost no multiple interconnected ties between partners exist
- Not many partnerships with research institutes are established
- The research institutes of IHC Merwede, MTI Holland, has a relatively weak position in the external network with partners
- The technology and service units have a surprising strong position within the external network.



## *2. Which network situation and position is favorable for IHC Merwede?*

When looking at the current network situation and position of IHC Merwede a lot of improvements could be made. Generally speaking a highly interconnected network is favorable, in order to stimulate integrated solutions, knowledge spill over, joint innovation program and strong relations. More specifically attention should be paid to the following main areas:

- The relations between SME's and IHC Merwede should be strengthened
- Multi-partner alliance in first and second order should be stimulated
- Multi-partner alliances with research institutes should be stimulated
- The internal cluster within marine and offshore should be stimulated

## *3. How should partners be selected and evaluated?*

This question was tested by validating an internal factor model where partner selection could be grounded on. Unfortunately the data analysis showed that internal variables didn't significantly influence alliances performance. Therefore further research is necessary to find the factors where partners could be selected on. One possible direction could then be found in success factors. Since they are validated partners can be selected on commitment and their communication skills.

## *4. Which factors stimulate the performance outcome of the network?*

A model with success factors from alliance literature was tested within the research. From the variables financial capital, government regulations, research institutes, interdependence, governance structures, commitment, trust, communication and culture, only governance structures, commitment, trust and communication significantly influenced performance.

Governance structures are highly negatively related with alliance performance as well as the intensity of the relation. This finding is not in line with general alliance management literature who suggest that appropriate governance structures are an important success factor on alliance performance. Apparently SME based alliances prosper better when less or simple governance structures are settled. A second negative factor is found on trust. This means that relations with high trust perform worse than relations with low trust. A

declaration for this finding cannot be found and further research on this factor is therefore necessary.

Besides this negative relation also positive relations are found. The first success factor is commitment. This finding suggest that, partners who are highly committed to the relations will significantly perform better and create stronger relations then the ones who are less committed. The second major success factor is communication. This suggests that relations with intensive communication patterns outperform alliances with less communication.

5. *What would be the best organizational context and governance structure for the network?*

According to the tested model on success factors governance structures and trust are negatively related to alliance performance. Therefore relations with a low level of governance structures should be established. Furthermore it seems to be wise to do not trust too much on the partner, since this is negatively influencing the relation. When looking at the positive success factors communication and commitment are of major positive influence. Therefore relations should established with high level of commitment with open communication between the different parties.

## 7.2 Further research directions

As stated earlier the research raises some directions for further research. These directions are:

- A more elaborate research into the alliance network by also questioning the second order partnerships.
- Further research on partner selection variables for alliances within SME's
- Further research on the relation of internal variables to which constructs are they related?
- Further validation of the success factors of alliances performance within SME's by more data from different industries.

## 8. Recommendations

### 8.1 General recommendation

- Apparently the business units Parts en Service and IHC Systems are more related to the dredging cluster than the technology and service units, maybe it would be wise to reorganise their position in the group structure
- The establishment of a roadmap organization in order to stimulate partner cooperation is recommendable
- When relations with SME's are established they should be characterized with simple governance structures and attention should be paid to the commitment and communication in the relation
- Think of possible alliances partners and do not be afraid to establish knowledge sharing relations
- More attention should be paid to multi-partner relations and partnerships with research institutes

### 8.2 Recommendations for other programs

One thing that is pointing out in the open question from the survey is the fact that most of the partners are very willing to cooperate on a more intensive base with IHC Merwede. A lot of partner made suggestions about their role in our research and development programs and our role in their research and development programs. All these suggestion can be found back in appendix 21. One suggestion is pointed out quite a few times namely the thoughts of an emission free environmental ship. This suggestion is already picked up by the research managers of IHC Merwede and will be worked out further into a research proposal.

### 8.2.1 Integrative cooperation

First of all the general recommendations are also founded for the integrative cooperation project. Secondly the integrative cooperation project is already a very good initiative to stimulate multi-partner alliances and cooperation between partners. Still a few recommendations are established.

- The suggestions from the open questions can be taken into account in order the further develop the integrative cooperation network.
- More attention should be paid to collaborate with research institutes in these projects.

### 8.2.2. Supply chain commission

First of all the general recommendations are also founded for the supply chain commission. Secondly the supply chain commission is already a very good initiative to stimulate cooperation between partners. Still a few recommendations are established.

- Questioning your partners, suppliers and so on or they would appreciate a bundling of forces on innovation. It would be surprising to see that many positive reaction and relation will be established.
- When working with SME's it would be wise to select partners that are highly committed
- IT would be wise to pay extra attention to the communication with partners

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## Glossary

### Abbreviations

SME - Small and medium sized enterprises

LE - Large enterprises

Eindhoven, June 2008

**Collaboration with SME's;  
Innovation networks within the  
Dutch Maritime Industry,  
appendices**

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## **Appendix 1: Theoretical framework strategic alliances with SME's**

# Innovation networks for large enterprise and SME's

A literature study as preparation for a master thesis project

Ben Snoeijs, Eindhoven university of technology

20 februari 2008

This literature study gives an overview of the relevant literature of innovation networks between large enterprises and SME's. Not much researchers paid attention to the specific alliances between large enterprises and SME's. This is remarkable since a lot of innovation networks arise between large enterprises and SME's. Therefore the theory of alliances management has still to be supported by research findings in this specific field.

## 1. Introduction

Industrial innovations are becoming more open and change the companies' innovation policies. (Chesbrough 2004) A trend that also drives this open innovation model is the change of a market economy in network economy. (de Man, 2004) External sources of innovation become more important in these open environments in order to be successful. (Chesbrough 2004) This drives the need for the management of innovation networks between firms. A lot of research has been conducted to find the effect of these networks on the innovation

policy of the firm. A wide literature gap arises for R&D alliances between large enterprises and SME's (small and medium size enterprises) This literature study gives an overview of definitions, concepts and research findings on or related to this topic. The body of this literature study is therefore divided in three parts. First the literature of research specific on the topic will be discussed in chapter 3. After that some literature on innovation in SME's will be discussed in chapter 4 and at last literature on innovation networks is discussed in chapter 5. Before the body starts some

general definitions are explained in chapter 2. This literature study will end with further research direction in chapter 7.

## **2. General definitions**

The last decades strategic alliances are becoming more and more a strategy to outperform competitors. But what are exactly strategic alliances and in which forms do they emerge? Strategic alliances can be defined as voluntary arrangements between firms involving exchange, sharing, or co development of products, technologies, or services. (Gulatti 1998)

When multiple organizations work together networks emerge. De Man (2004) defines a network as selected sets of multiple autonomous organizations, which interact directly or indirectly, based on one or more alliances agreements between them. The aim of networks is to gain a competitive advantage for the individual organizations involved and occasionally for the networks as a whole as well. De Man (2004) also defines different network types where the technology driven networks are most interesting for innovation. In this

case two networks types can be identified namely; R&D and standardization networks. R&D networks are defined as networks between companies which aim to share risks, cost and/or competences surrounding the development of new technologies (de Man, 2004) or as contractual structures which are used to organize partnerships in R&D development (Arranz and Arroyabe, 2007). Standardization networks are networks between companies aiming to set the dominant technology or process in a certain area.

## **3. SME's vs large enterprises**

This section gives an overview of the research that is conducted in the field of large enterprises and SME collaborations. This is done in two ways, first literature on alliances with SME's is given (3.1) and after that supplier networks are discussed (3.2)

### **3.1. Alliances with SME's**

Before going into depth boundaries between SME's and large enterprise are defined. According to Karlsson and Olson (1998) SME's are enterprises employing less than 500 people. There is also often a distinction between



small enterprises (<100 or <50 employees) and medium sized enterprises, but the general discussion is usually in terms of large enterprises versus SME's.

According to Keizer et al (2002) small and medium sized enterprises (SME's) have a reputation as boosters of employment, economic growth and economic dynamics. One of the most important drivers behind this success is their capability to realize innovations. Therefore SME's are certainly an interesting partner for large enterprises to team up with, since they mostly lack in the exploration phase. This is supported by Rogers (2004) who found that open innovation is very important for SME's since they rely more heavily on external knowledge networks than do large firms. They have furthermore difficulties in innovating due to the lack of resources. Another trend that drives alliances networks of large enterprises with SME's is globalization. First, there has been a growing use of non-internal technology development, both by outsourcing and strategic alliances. Second, products are increasingly

multi-technological.. Therefore large firms have increasingly sought out SME's as they have developed their use of external networks (Narulja, 2004)

SME-based alliances are unique and differ from alliances between two (or more large enterprises) Weaver and Dickson (1999) found that in SME-based alliances, control variables (a number of resource and environment based determinants) didn't significantly influence alliances outcomes.

Furthermore they found that cumulative experience of the SME is of major impact in determining the quality of alliances outcomes.

According to Dickson et al (2006) some problems arise when companies set up an alliance with an SME.

Especially when the alliances are based on R&D collaboration the potential for opportunistic behavior in the alliances is significant. SME's involved in R&D, unlike larger enterprises, often do not have the specialized and co-specialized assets necessary to take technological developments to the product and market stages. Other problem areas for teaming up with SME's are found by

Dyer and Nobake (2000). They defined three dilemmas for the collaboration of SME's on an inter-organizational level which are: (1) motivate members to participate and openly share knowledge, (2) prevent members from free riding and, (3) efficiently transfer both explicit and (most importantly) tacit knowledge. Dyer and Nobake (2000) found the solution in this problem by creating a highly interconnected, strong tie network. This means a network where members strongly identify with the 'core firm'/network and where there are clear rules for participation in the network's knowledge-sharing activities. Another important factor is that production knowledge is viewed as the property of the network rather than the individual firm.

Rochemont et al (2007) goes deeper in the concept of management of open business models with SME's. They found that SMEs can improve the health of their alliance by using multi partner alliance evaluation tools. With help of these tools partners are able to learn from previous experiences and increase their success. Furthermore

Rochemont et al (2007) found that a neutral alliances coordinator and the use of both formal and relational governance mechanisms are important.

### **3.2. Supplier relations and R&D**

A number of studies have recognized that *inter-organizational* learning is critical to competitive success. Organizations learn by collaborating with other firms as well as by observing and importing their practices (March and Simon, 1958: 188; Powell *et al.*, 1996; Levinson and Asahi, 1996). Primary driver for innovative ideas are a firm's customers and suppliers (Von Hippel, 1988, Porter 1990) . He argues that a production network with superior knowledge transfer mechanisms among users, suppliers, and manufacturers will be able to 'out-innovate' networks with less effective knowledge-sharing routines.

A successful case of supplier relation and knowledge transfer is found by Dyer and Nobake (2000) at Toyota. See also Figure 1. Initially, the network structure was essentially a collection of dyadic ties with the nodal firm (Toyota)

as a hub heavily subsidizing network

participation. In this early stage of

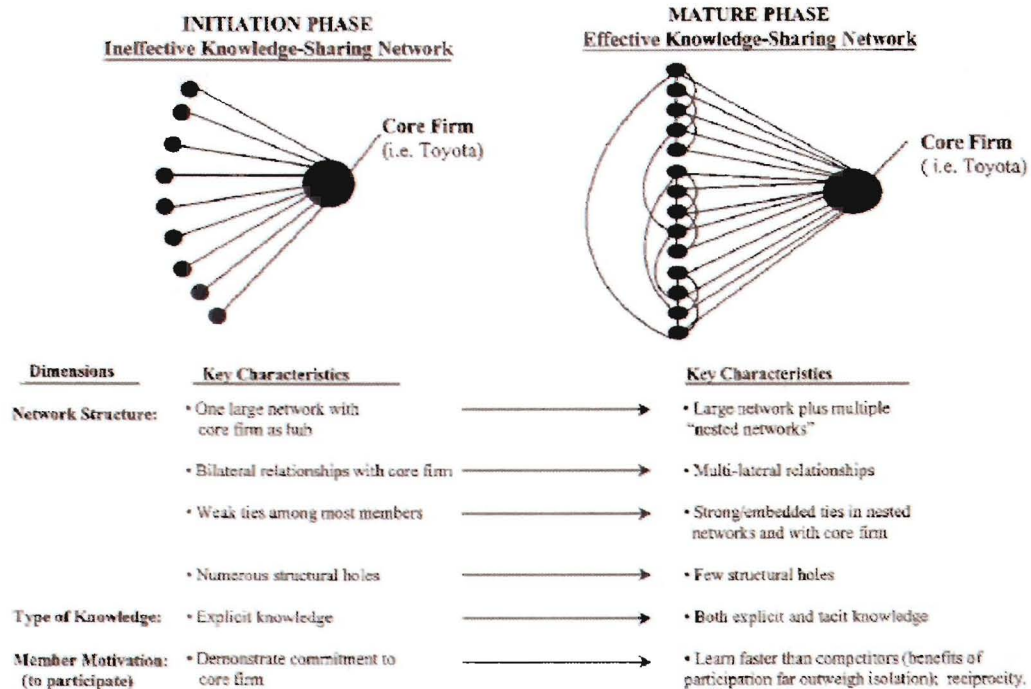


Figure 1: Toyota supplier network, Source Dyer and Nobake (2002)

activities.

The partners were subsidized by Toyota in two ways: (1) financial (like money for meeting rooms, social activities, organizing and planning meetings) and (2) valuable knowledge (Toyota internal consultants were send free of charge to participating members)

These subsidizing activities to knowledge-sharing activities were important to motivate members to participate and to ensure that they realized sufficient benefits from

network formation a numerous structural holes exist and ties among members were weak. The driving force for supplier to participate in this network was the hope that Toyota would reward them with more business. In this initial phase most exchanged knowledge was explicit. Toyota continued building strong bilateral relations with suppliers through the one to one knowledge transfer (consultants) and supplier association activities.

The network developed further and suppliers began to receive valuable knowledge at minimal cost. A second motivating factor for participating developed which was the knowledge transfer from Toyota. Furthermore tacit knowledge began to transfer in bilateral (consulting) settings.

The final phase in the evolutionary process was to strengthen multilateral ties among members and develop 'sub-networks' for knowledge sharing within the larger network.

Learning teams which strengthened multilateral ties, were established and facilitated the tacit knowledge transfer among suppliers. The motivating factors to participate in network activities were (1) a recognized need for rapid knowledge acquisition, and (2) reciprocity.

#### **4. Innovation in SME's**

Innovations are an important driver for SME's to increase employment, economic growth and economic dynamics (Keizer et al, 2002). Keizer et al (2002) made a framework from literature to explain innovation efforts of SME's. They divided it into external and internal variables. External

variables that were found are:

collaboration with other firms, linkage with knowledge centres and utilizing financial resources or support regulations. Internal conditions that influence innovation arte strategy, structure, technology policy, level of education and investments in R&D. (a more elaborate explanation can be found in attachment 1)

From these variables three were found significant by Keizer et al which are: using innovation subsidies, having links with knowledge centres, and the percentage of turnover invested in R&D.

Weaver and Dickson (1998)

investigated variables that influences alliances outcomes between SME's. They found that the firm's industry, size, and financial strength, aren't of particularly importance. The financial return provided by the SME's alliances relationship was found to be the most important factor related to outcome quality. Other factors that found to be significant were contract noncompliance and the perceived behaviors of the SME's alliance partner. Additionally, the notion that SME-based alliance relationships are

generally marked by assumptions of trust rather than opportunism was supported.

## **5. Innovation networks**

A lot has been written and investigated about innovation networks and alliances between firms. This section highlights some of the research that also could be of particularly interest for large enterprise and SME's relations. First of all the benefits of networking are mentioned in 5.1. After that the two important research streams on innovation networks are discussed in 5.2. The success factors that are found in literature and influences alliances outcomes are summed up 5.3. These are followed up by governance structures (5.4) and network positions (5.5). The section ends with possible stimulation of the alliances by governmental institutions. (5.6)

### **5.1. Benefits of networking for innovation**

Networks are nowadays an important tool to outperform competitors. When looking at the relation to innovations, some beneficial effects can be found. First of all firms have lower risks in

R&D projects since the risks can be shared between multiple firms (De Man, 2004, Wissema and Euser, 1991). Firms also collaborate on R&D in order to reduce costs (Wissema and Euser, 1991, Gilsing et al, 2007) Furthermore networks of close partnerships could access specialized and complementary competences. (Pisano 1990) for example additional market or technical knowledge (Wissema and Euser, 1991) Also the entrance to international markets could be an important benefit from collaboration (Wissema and Euser, 1991) Thirdly a benefit is the reduction of time to market (Gilsing et al, 2007) Other beneficial effects are the hedge of missing out on a technology (De Man, 2004), set the standard and team up with other companies (de Man 2004, Wissema and Euser, 1991) and cooperation to obtain subsidies or governments grants de Man 2004).

### **5.2. Innovation networks approaches**

As described in the previous section networks can have positive effects on innovation. When looking at the position a company should have into a

network two important research streams emerge. Namely the structural holes approach by Burt (1992) and the social capital approach by Coleman (1988).

According to the structural hole approach companies should avoid group memberships since benefits accruing to bridges are high because of their unique position in the network. (Burt 1992)

The social capital approach states that in order to profit from knowledge and information transfer, trusting, long-term relations need to be built and these relations can only come into being in relatively tight knit groups. (Coleman 1988)

Researchers are ambiguous on which structure is preferable. Gilsing et al (2007) argues that both streams could be preferable in different environmental contexts. The social capital approach of Coleman is most beneficial in situations when trust building, social control and recurrence are important. In contrast the structural hole approach advances the benefits of nondense network structures in view of efficiency and the possibilities to create access to novel

knowledge. (Gilsing et al, 2007) Most literature on SME based alliances is in favor for the social capital approach of Coleman.

### 5.3. Success factors

A lot of factors influence the performance of an alliance. From the literature the following factors influence performance in a positive matter.

*Financial capital:* availability of seed, venture and investment capital.

(Bullinger et al, 2004)

*Government regulations,* as a low cost of infrastructure or loans for start-ups.

(Bullinger et al, 2004)

*Research institutes,* The contact with a research institute in order to gain external knowledge is important to achieve technical success in R&D alliances (Fukugawa 2006, Bullinger et al, 2004)

*interdependence,* both parties must be dependent on the other for some important that is valued and hard to obtain elsewhere. Alliances with low levels of interdependence suffer from a lack of commitment and need. A special case of interdependence arise with partners of very disparate sizes,

special attention should be paid to the governance structure then. (Mohr et al, 2005)

appropriate governance structures, generally governance structures should manage the level of risk in the partnership. A further elaboration on governance structures of alliances will be made in the next section. (Mohr et al, 2005)

commitment, is an important element for strategic alliances to succeed.

Partners who are committed to the relationship are less likely to take advantage of the other partner or to make decisions that may sabotage the long-run viability of the relationship.

(Mohr et al, 2005) Pansiri (2008) defines commitment as the extent to which a partner is willing and able to commit resources (time, tangible and intangible) to fulfill the goals and objectives of the alliance, and be able to display the desire and intent to maintain the alliance.

trust, trust refers to the sense that the other partners will make decisions that serve the best interest of the partnership when one party is vulnerable and will act honestly and benevolently. (Mohr et al 2005) Panziri

(2008) defines trust as a source of confidence in partner cooperation and in strategic alliances. Trust is necessary for the partnership to succeed because it leads to more effective information sharing, a willingness to allocate scarce and sensitive resources to a shared effort, and the sense that both parties will benefit in the long run. (Mohr et al, 2005) Trust in alliances can be explained and stimulated by lowering transaction costs, inducing desirable behaviour, reducing the extent of formal contracts, and facilitating dispute resolution(Pansiri, 2008)., Trust should not only be conceived as an input but also as an output—gradually developed and accumulated over time through the development of a relationship. (Pansire 2008)

communication, effective communication is absolutely critical to success in strategic alliances. (Karlsonn and Olson 1998)

Communication need to be structured, but also informal and unplanned interactions are important elements of communication. (Mohr et al, 2005) compatible corporate cultures, Although two firms may have synergistic skills

that could usefully be shared in a partnership, such synergies are difficult to realize if corporate cultures clash. (Mohr et al, 2005) integrative conflict resolution and negotiation techniques, parties must be willing to resolve conflicts in a way that allows for both partners to have a stake in the outcome, addresses both partners' needs simultaneously, and is mutually beneficial to both.

#### **5.4. Governance structure for networks**

As mentioned in the previous section governance structures is one of the factors contributing to partnership success. Governance structures are the terms, conditions, systems, and processes used to manage the ongoing interactions between two companies. (Mohr et al, 2005) or in other words the formal contractual structures used to organize the partnerships. (Gulatti, 1998)

According to Arranz and Arruyabe two different views on governance structure of alliances can be defined which are the transaction cost perspective and the social capital perspective.

The transaction cost approach, states that different governance modes can vary from more structured forms—close to the enterprise—to less structured forms—close to the market (Williamson, 2002)

The social capital approach considers networks as a social form of interrelation. (Gullati 1998)

According to Heikkinnen et al (2007) managing in nets is possible; they emphasize instances of strategic interventions in nets shaping the inter-organizational cooperation and take into account the embeddedness in networks

Another important part of the governance structures in alliances are the network rules for knowledge protection and value appropriation. In other words the way to deal with intellectual property form different firms and the alliance.

In the successful case of Dyer and Nobake (2000) this was solved by creating a simple rule. The knowledge was not longer owned by a company but reside at the network level.



Boundaries were set (only production knowledge was transferred) but all partners exchanged knowledge within these boundaries. This open mindset was also a conditions to participate in the network.

#### **5.5. Network position / structure**

Companies can strive for different positions in the network according to the achievements they want to make. Furthermore different structures are optimal in different situations. When looking at the debate between a strong tie network and weak tie network researchers are not ambiguous about the best performing network.

Dyer and Nobaka (2000) found a highly interconnected, strong tie network is well suited for the diffusion (exploitation) of existing knowledge rather than exploration for new knowledge (which is the strength of a 'weak tie' network). Moreover, a highly interconnected, strong tie network is effective at the diffusion of tacit knowledge because (1) the redundant ties make it easier for network members to locate potentially valuable knowledge, and (2) strong ties produce

the trust (social capital) necessary to facilitate the transfer of tacit knowledge.

Rowley et al (2000) and Granovetter (1973) weak ties are positively related to firm performance. Furthermore Rowley et al (2000) found that strong ties are negatively related with performance.

#### **5.6. Stimulation of the network by governmental or sectoral institutions**

Innovation networks are often subsidized or supported by governmental or sectoral institutions. Large enterprises should have the leading role in these network and subsidized activities since SME's are less able to cope with government regulations (Rothwell and Zegveld, 1982).

Large firms, on the other hand, have the ability to fund legal services and direct their R&D department to identify the measures that need to be taken. Large enterprises also have a pre-regulatory advantage since they are usually able to fund various lobbying activities. They also have a stronger position vis-à-vis public agents when it

comes to negotiations, because of their role as a major local employer. (Karlsson and Olson, 1998)

## 6. Further research

The following research directions seem interesting to elaborate further into the research proposal:

Dyer's (2000): a comparative study of a sample of different vertical networks with differing degrees of success at knowledge sharing would allow for tests of the ideas offered in this study. Furthermore Gilsing et al (2007) argues that different network approaches are applicable in different environmental context. For large enterprise vs. SME based alliances a strong ties networks seems preferable. These findings should be supported by data.

Furthermore it would be interesting to test the model of success factors which is sketched in the previous sections on alliances performance outcomes. So how do the variables: financial capital, government regulations, research institutes, interdependence, appropriate governance structures, commitment, communication, trust

and compatible corporate cultures relate to alliance performance in SME's based alliances?

Other interesting research direction is to test the factors from de Keizer (2002) which stimulate innovation in SME into research based alliances networks with SME's.

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**Attachment 1:** Summary of literature review about variables influencing innovative efforts of SMEs

External variables	Internal conditions
<p><i>Collaboration with other firms:</i></p> <ul style="list-style-type: none"> <li>● Collaboration with suppliers to overcome size constraints and to spread new technology costs and risks. Continued interactions with suppliers lead to low formalised relations that could be difficult to achieve over long distances (Lipparini and Sobrero, 1994).</li> <li>● Close working relationships with suppliers and customers in co-design and co-makership (Birchall et al., 1996; Meer et al., 1996; Dutch Ministry of Economic Affairs 1993, 1996; Docter and Stokman, 1988; Davenport and Bibby, 1999; Keeble et al., 1999)</li> <li>● Customers are the main source of improved technology for SMEs in the USA (Le Blanc et al., 1997)</li> <li>● Strategic alliances as an integral part of the firm's development plan (Forrest, 1990; Cooke and Willis, 1999)</li> </ul> <p><i>Linkages with knowledge centres:</i></p> <ul style="list-style-type: none"> <li>● Contributions by professional consultants, university researchers and technology centres (Le Blanc et al., 1997; Hoffman et al., 1998; Oerlemans et al., 1998)</li> <li>● Contributions by innovation centres and Chambers of Commerce (Oerlemans et al., 1998)</li> </ul> <p><i>Utilising financial resources or support regulations:</i></p> <ul style="list-style-type: none"> <li>● Availability of R&amp;D funding (Le Blanc et al., 1997; Birchall et al., 1996; Hoffman et al., 1998)</li> <li>● Government financial aid (Dutch Ministry of Economic Affairs, 1993)</li> </ul>	<p><i>Strategy:</i></p> <ul style="list-style-type: none"> <li>● Explicit strategies to increase and stimulate internal creativity and risk taking behaviour (Birchall et al., 1996; Carrier, 1994)</li> <li>● Sound day-to-day and strategic business-management practices (Anonymous, 1999)</li> <li>● Strategies to implement state-of-the-art production technology and automation (Aronson, 1998; Abdul-Nour et al., 1999)</li> </ul> <p><i>Structure:</i></p> <ul style="list-style-type: none"> <li>● Application of project management structures (Larson et al., 1991; Meer et al., 1996)</li> </ul> <p><i>Technology policy:</i></p> <ul style="list-style-type: none"> <li>● Planning for the future (Dokter and Stokman, 1988)</li> <li>● Number of technology policy instruments used by the firm (Oerlemans et al., 1998)</li> </ul> <p><i>Level of education:</i></p> <ul style="list-style-type: none"> <li>● Level of education of founder/manager and employees (Dokter and Stokman, 1988)</li> <li>● Presence of qualified engineers (Le Blanc et al., 1997; Hoffman et al., 1998)</li> </ul> <p><i>Investments in R&amp;D:</i></p> <ul style="list-style-type: none"> <li>● Percentage of sales volume invested in R&amp;D (Birchall et al., 1996;</li> </ul> <p><i>Geographical location:</i></p> <ul style="list-style-type: none"> <li>● Rural or urban location (Hoffman et al., 1998)</li> </ul>

**Table 1:** Adapted from Keizer et al (2002)

## **Appendix 2: Maritime sector information**

	Periode	Branche	Sector
		Bouw, rep. schepen, booreilanden ed	industrie
Aantal vestigingen per 1 jan	2007	824	118644
Aantal startende bedrijven	2006	80	15238
Aantal overige oprichtingen	2006	44	3381
Aantal opheffingen	2006	51	5556
Groei nominale omzet in %	2005	9.6	1.8
Groei nominale omzet in %	2006	2.4	3.3
Groei werkgelegenheid in %	2005	2.0	1.1
Groei werkgelegenheid in %	2006	-1.4	2.1

De cijfers in onderstaande tabel zijn afkomstig uit twee bronnen:

- het aantal bedrijven en het aantal oprichtingen en opheffingen zijn gebaseerd op het handelsregister;
- de ontwikkeling van omzet en werkgelegenheid is gebaseerd op de ERBO-enquête van de kamers van koophandel.

[http://www.kvk.nl/Branches//branche\\_stats.asp?bik=351101&brBranche=Bouw%20en%20rep.%20schepen.%20booreilanden%20e.d.&Type=Cijfers](http://www.kvk.nl/Branches//branche_stats.asp?bik=351101&brBranche=Bouw%20en%20rep.%20schepen.%20booreilanden%20e.d.&Type=Cijfers)



### **Appendix 3: Ship information Toisa Pegasus**



### The task and requirements

For diving operations as well as subsea construction, installation and maintenance on the North Sea and world wide, the client required a flexible state of the art diving support vessel that could be easily adapted to different roles on the charter market. In order to be able to be put to work in different geographical areas the vessel is large enough to be self-supporting in remote areas. To be cost-effective, the design is based on IHC Merwede's versatile 22 meter beam design Merwede Type-22.

### The concept

As an enhanced sister vessel to the Toisa Proteus, but with a fully integrated saturation diving system and a 400 tonne offshore crane, this vessel can support a wide variety of subsea operations worldwide. The age of the existing world fleet of saturation diving vessels averages over 20 years old in 2007. This vessel provides the market with a DP3 vessel capable of meeting the higher and more demanding standards in safety, dynamic positioning operations, saturation diving and the use of environmentally sensitive vessels that can only be met by the introduction of new vessels.

### Innovative solutions

The vessel is built with an integrated 18 person dual bell saturation system. Her under-deck configuration allows for a range of equipment to be installed whilst her large clear deck area provides scope for a range of other applications.

The increasing need for subsea construction vessels to accommodate large numbers of contractor's personnel has also been addressed in designing the ship to accommodate up to 199 persons (excluding any divers in saturation) depending on the charterer's requirements

## **Appendix 4: Ship information seven seas**





#### The task and requirements

The requirement for Seven Seas was a multifunctional, powerful and reliable SURF (Subsea Umbilicals, Risers and Flowlines) vessel capable of flex lay and field development. To reduce building and operational costs, the design and technology used for the Seven Seas is based on the Seven Oceans. The vessel is designed to operate in the Atlantic Triangle: US Gulf, West Africa, Brazil.

#### The concept

The vessel's pipelay installation is fully integrated into the vessel's design. Two under deck carousels and one above deck carousel can take a vast load of flexible pipe and umbilical. Although the main role will be flexlay the vessel is multifunctional and also capable of deepwater offshore construction work, rigid reeled lay, J-lay and ROV work.

#### Innovative solutions

The Seven Seas is equipped with a large work moonpool with bottom door. The bottom door is constructed in such a manner that it streamlines the flow under the vessel whilst sailing. In open position, the door forms part of a damping cofferdam structure that prevents surge in the Moonpool during operations. The pipelay ramp can accommodate up to 24" flexible pipe from the ships carousels as well as rigid reeled pipe from reels and double joint rigid pipes in J-lay mode.

**Appendix 5: List of interviewed employees and their function**

## Namenlijst voor de interviewronde met als doel het in kaart brengen van het R&D beeld bij IHC Merwede

### Platform R&D:

- Cees van den Berg (MTI)
- Hassan Bugdayci (P&S)
- Henk van Muijen (MTI)
- Caspar Kramers (Dredgers)
- Cees de Keizer (IHC Systems)
- Bert Kips (Beaver dredgers)
- Teus van Nordennen (Merwede)
- Vincent Toet (Beaver dredgers)

### Stuurgroep techniek:

- Cees Jan Verkaik (Dredgers)
- Hans Bink (ER engineering)
- Cor van der Wulp (IHC Systems)
- Cor van der Harst (Krimpen)
- Luc Claassen (P&S)
- Henk van Muijen (MTI)
- Wim van Voorde (Merwede)
- Teus van Nordennen (Merwede)
- Eef van Leeuwen (Beavers)
- Peter Koert (ER)

### Marketing:

- Arie Korevaar (Verkoop)
- Walter Hoebee (China Office)
- Hans Maasland (Verkoop)
- Philip de Bats (Verkoop)
- Jan Willem de Wit (Verkoop)

### Operations:

- Erwin Put (P&S)
- Peter Wemmers (P&S)
- Reinier Rijke (Dredgers) (heusden)
- Teus van Nordennen (Merwede)
- Rick van Tol (Beaver dredgers)
- Wouter Blaas (Project management dredgers)
- Jan van Helden (Project management ER)

### MTI

- Jaco van der Hoeve (IP)
- Sergio Ooijens (TID)
- Robert van de Ketterij (Manager kennisontwikkeling)
- Paul Vercruisje (DAS)
- Frits Hofstra (R&D)



Tweede ronde:

- Jan Rooswinkel (Hytap)
- Ruud Vaandrager (Handling)
- Arie Kromhout (Hydrohammer)
- Peter Bouman (Hydrohammer)
- Wim Steenge (Lagersmith)
- Ruud Ouwekerk (DTC)
- Norbert Zandbergen (P&S)
- Sybran Boschma (P&S)
- Alexander Beks (DR)
- Marcel Boor (Beaver)
- Arie de Jager (DR)
- Johan van Vuuren (Merwede)
- Henk Cornege (Merwede)

Extern

- Chris van de Velde (BMC – adviseur R&D/Subsidie)

## **Appendix 6: Questions of open in depth interview**

Datum:  
Naam:  
Functie:  
BU:

Wat zijn de TBV van de geïnterviewde?

Wat versta je onder innovatie?:

- Het invoeren van nieuwe ideeën, goederen, diensten en processen.
- Het op grond van specifieke kennis, kunde en ervaring ontwikkelen en (met succes) implementeren of introduceren van iets nieuws in de maatschappij

Vind je dat IHC MERWEDE als marktleider ook voorop moet lopen op het gebied van innovatie?

- a. Ja
- b. Nee

Vind je dat IHC MERWEDE per definitie geld moet verdienen aan al haar research activiteiten? M.a.w moeten verliesgevende research activiteiten stil gezet worden?

- a. Ja
- b. Nee

Wat zijn de 3 belangrijkste knelpunten voor kennisontwikkeling de komende 5 jaar(IHC MERWEDE)?

Wat zijn de (3) belangrijkste core expertise gebieden van de BU?

Wat zijn de (3) belangrijkste core expertise gebieden van IHC MERWEDE?

Vind je dat IHC MERWEDE elke **uitvinding** moet patenteren?

- a. Nee, gewoon sneller innoveren als de rest
- b. Alleen als het behoort tot core technology
- c. Alleen als het financieel gewin oplevert
- d. Alleen ontdekkingen van publiek toegankelijke vindingen
- e. Ja, alles moet beschermd worden

Als een innovatie niet past binnen de core expertise/business wat is dan de gewenste actie?

- a. Stoppen met de ontwikkeling hiervan
- b. Nieuw bedrijf creëren d.m.v. een spin out
- c. Intrapreneurship, d.m.v. een nieuwe onafhankelijk BU

Welke kennisclusters / expertise gebieden zou je graag verder ontwikkelen de komende jaren?

Denk je dat de Business unit structuur innovaties in de weg staan (waarbij meerdere BU's betrokken zijn)?

- a. Ja
- b. Nee

Als je het kennisnetwerk van IHC Merwede zou beschrijven heeft deze dan een meer

- a. Dichte structuur
- b. Open Structuur

Wederom

- a. Intensieve structuur met veel uitwisseling/linken
- b. Niet intensief met veel eilandjes/weinig linken

Wat is er over 3jaar gebeurd met de BU/IHC MERWEDE/kennisontwikkeling?

Welke vorm van innovatie komt het meest voor in je BU

- a. Product innovaties
- b. Proces innovaties
- c. Marktvernieuwing
- d. Organisatie vernieuwing

Noem een voorbeeld van een succesvolle innovatie en hoe deze tot stand kwam (binnen BU)?

Noem een mislukte innovatie en wat was hiervan de oorzaak (binnen BU)

Hoe zijn de go/no go momenten in je innovatie traject momenteel ingericht?

Zou je een meer geformaliseerde structuur van innovatie trajecten willen?

- a. Ja
- b. Nee

Vind je dat IHC MERWEDE nog meer moet samenwerken met externe partijen om tot innovaties te komen?

- a. Ja
- b. Nee

Wat is de verhouding tussen impliciete / expliciete kennis

Hoe wordt de kennis nu opgeslagen? (best practise transfer, lessons learned database)

Van welke databases zou je het gebruik stimuleren als deze ontwikkeld zouden worden:

- a. Expert database
- b. Best practice database
- c. Lessons learned database
- d. Anders namelijk:

Hoe innovatief is de BU op een schaal van 1 tot 10?

In welke categorie valt de IHC MERWEDE in vergelijking met andere bedrijven in kapitaalgoederen?

- Nummer 1
- Top 3 meest innovatief
- Top 10 meest innovatief
- Middenmoot
- Onder de middenmoot

Welke selectie criteria zou je graag willen hanteren bij de keuze voor een innovatietraject:

- a. Het technische potentieel (Beperkingen die opgeheven worden, nieuwe beperkingen etc)
- b. De toepasbaarheid (meerwaarde van het eindproduct door de technologie, de mate waarin het eindproduct aangepast moet worden aan de technologie etc..)
- c. Effect op de bedrijfsvoering (effect op de huidige processen en benodigde nieuwe processen)
- d. Markt potentieel (Effectiviteit waarmee de vraag van klant vervuld wordt, eventuele kostenreductie en kenmerken van de markt)
- e. Een combinatie van deze met weegfactoren

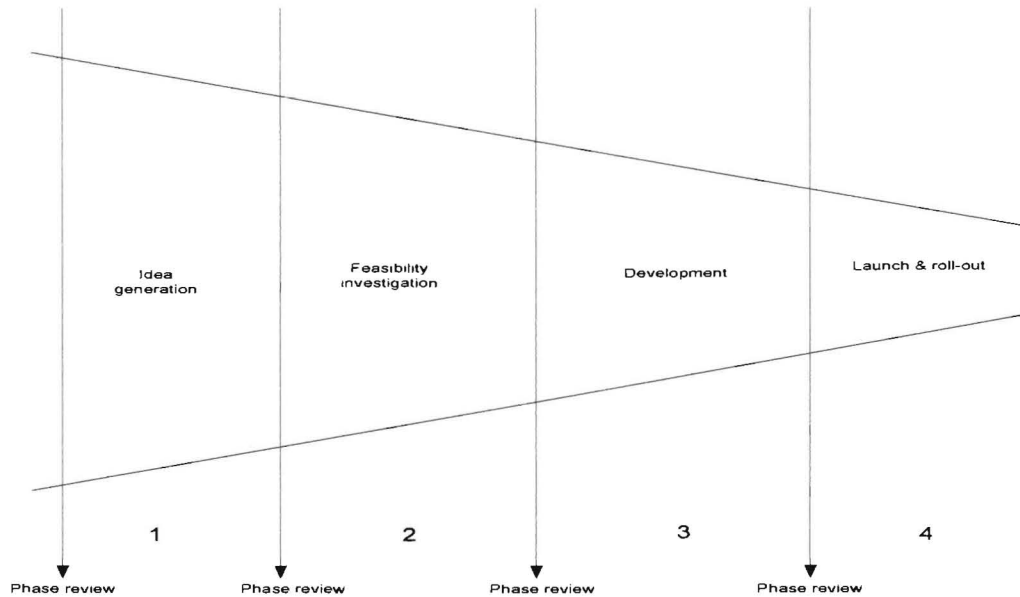
Indien antwoord E welke weegfactoren zou je dan terug willen zien (10 te verdelen)?

Welke andere BU of extern bedrijf is vaak betrokken bij een innovatie (extern)

Welke afdelingen zijn allemaal betrokken bij een innovatie (intern)

Procesomschrijving (overdrachtmoment, black box, primair proces)

Vind je dat jouw BU voldoende betrokken is bij de verschillende fases van productontwikkeling? Hoe betrokken op een schaal van 1-5 en wat is gewenst?



Bij welke van de bovenstaande fases zou je meer input willen van een andere (externe) partij en welke partij?

Ideaalbeeld bedrijf:

Ideaalbeeld kennismangement:

Algemeen:

## **Appendix 7: Total results of open interviews**



## **Appendix 8: Interview list on the research design**

Technical managers:

- Teus van Nordennen (Merwede)
- Caspar Kramers (Dredgers)
- Robert van de Ketterij (MTI)
- Henk van Muijen (MTI)
- Hasan Bugdayci (P&S)

Purchase managers

- Frans Lunenburg (dredgers)
- Peter Bickel (P&S)
- Harrie Nijenhuijzen (Merwede)
- Cees Vermeer (Beaver Dredgers)
- 

External Researchers

- Sicco Santema (senter)
- Ubalt Nienhuis (TU Delft)
- Jeroen van Rijt (Senter)

## **Appendix 9: Data of outgoing questionnaires**

## **Appendix 10: Accompanying mail at the survey**

Geachte heer/mevrouw .....

Via.....heb ik uw e-mail adres verkregen. Graag wil ik uw medewerking vragen voor een onderzoek op het gebied van innovatie en samenwerking binnen de maritieme industrie en IHC Merwede in het bijzonder. Dit onderzoek wordt in samenspraak met de Technische Universiteit van Eindhoven uitgevoerd. U wordt als partner van IHC Merwede aangemerkt en uw bijdrage wordt daarom ook erg gewaardeerd.

Het doel van het onderzoek is om te komen tot een toolkit in de maritieme sector voor het managen van partnernetwerken. Dit moet uiteindelijk leiden tot een hechtere samenwerking en sterkere positie van de maritieme industrie in Nederland. Tevens heeft IHC Merwede de intentie om meer informatie te delen met zijn partners om zo samen tot meer innovaties te komen.

Dit onderzoek is opgestart in overleg met het traject integraal samenwerken wat loopt via de VNSI en de TU Delft. Output uit het onderzoek zal dan ook in dit traject meegenomen worden. Voor meer informatie over integraal samenwerken kunt u kijken op [www.integraalsamenwerken.nl](http://www.integraalsamenwerken.nl), welke op korte termijn online komt.

Ik zou u willen vragen om bijgevoegde enquête in te vullen, op te slaan en vervolgens in een reply naar mij toe te sturen. Het invullen hiervan neemt ongeveer 10 minuten in beslag. Verder zou ik erg geholpen zijn als u dit binnen een week zou willen doen, aangezien onderzoeksresultaten al vrij snel gepresenteerd gaan worden. Ik wil u er verder op wijzen dat het mogelijk is dat er meerdere personen binnen uw bedrijf aangeschreven worden om zo input uit verschillende disciplines te krijgen.

Namens de universiteit wil ik met klem benadrukken dat resultaten altijd anoniem blijven en niet voor commerciële doeleinden gebruikt zullen worden.

Uw bijdrage in dit onderzoek wordt erg op prijs gesteld. Als u de enquête invult wordt u tevens op de hoogte gehouden van alle onderzoeksresultaten. U kunt dan denken aan inzichten over uw positie in het maritieme netwerk in Nederland en mogelijk interessante partners. Verder worden concrete stimulans factoren gegeven waarmee u partnerships tot een groter succes kunt maken. Als laatste is uw bijdrage natuurlijk van invloed op het advies wat aan het traject integraal samenwerken gegeven gaat worden. Rest mij u nog vriendelijk te bedanken voor uw medewerking.

Met vriendelijke groet / kind regards,

**Namens IHC Merwede,**

**Ben Snoeijs**

Project leider kennisontwikkeling / Project engineer knowledge management

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## **Appendix 11: Dutch survey**

# Innovatieonderzoek

*Uw Mening is belangrijk voor ons*



## Deel 1: Gelieve de grijs gemarkeerde velden in te vullen

1.	Bedrijfsnaam:	<i>Naam bedrijf invullen</i>
2.	Land:	<i>Land van de vestiging invullen</i>
3.	Plaats:	<i>Plaats van de vestiging invullen</i>
4.	Naam respondent:	<i>Naam respondent hier invullen</i>
5.	Functie respondent:	<i>Functie invullen</i>
6.	Hoeveel personeelsleden telt uw bedrijf?	<i>Aantal personeelsleden over heel het bedrijf</i>
7.	Hoeveel mensen hiervan werken als R&D?	<i>Aantal personeelsleden met R&amp;D functionaliteit</i>
8.	Indien uw bedrijf bestaat uit meerdere business units, bij welke werkt u dan?	<i>Naam business unit</i>
9.	Hoeveel personeelsleden telt uw business unit?	<i>Alleen invullen indien uw bedrijf uit meerdere business units bestaat</i>
10.	Wat was de omzet van uw bedrijf in 2007 in euro's?	<i>Omzet</i>
11.	Wat was de omzet van uw business unit in 2007 in euro's?	<i>Alleen invullen indien van toepassing</i>

## Deel 2: Gelieve een checkbox per vraag te markeren

12.	<b>Intensiteit van de relatie</b>		<b>Zeer Zwak</b>	<b>Zwak</b>	<b>Neutraal</b>	<b>Hecht</b>	<b>Zeer hecht</b>
		Hoe zou u de relatie van uw bedrijf met IHC Merwede karakteriseren?.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Hoe zou u de relatie op het gebied van innovatie met IHC Merwede karakteriseren?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<b>&lt;10%</b>	<b>10-20%</b>	<b>20-30%</b>	<b>30-40%</b>	<b>&gt;50%</b>
	Hoeveel van uw omzet is gerelateerd aan werk voor IHC Merwede?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13.	<b>Relatie met de verschillende business units van IHC Merwede</b>						
	<b>Op welke basis heeft u contact met onderstaande business units van IHC Merwede?</b>						
		<b>Geen Contact</b>	<b>1 keer per jaar</b>	<b>Elke maand</b>	<b>Elke week</b>	<b>Elke dag</b>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Merwede shipyard					
IHC Dredgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Parts&Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Beaver Dredgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Engineering services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Krimpen Shipyard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MTI Holland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Hytop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Fundex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Handling Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Hydrohammer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Metalix	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Lagersmith	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training instituut for Dredging					
Merwede design					
<b>14. Andere partner ships</b>					
<b>Wat zijn (indien aanwezig) de 3 belangrijkste andere partnerships in uw bedrijf (s.v.p in de grijs gemarkeerde velden, de bedrijfsnaam invullen en 1 checkbox per subvraag invullen)</b>					
Bedrijf 1:	<i>Naam bedrijf partnership</i>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk
Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bedrijf 2:	<i>Naam bedrijf partnership</i>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk
Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bedrijf 3:	<i>Naam bedrijf partnership</i>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk



Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Met welke onderzoeksinstellingen heeft u partnerships? (s.v.p wederom een top 3 benoemen, indien contact aanwezig is)</b>					
<b>Instelling 1</b>	<b>Naam instelling</b>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk
Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Instelling 2</b>	<b>Naam instelling</b>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk
Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Instelling 3</b>	<b>Naam instelling</b>				
	Totaal niet belangrijk	Niet belangrijk	Neutraal	Belangrijk	Zeer belangrijk
Wat is hiervan het belang voor de innovatiekracht van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wat is hiervan het belang voor de continuïteit van uw bedrijf?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>15. Succes van de relatie</b>					
	<b>Zeer matig</b>	<b>Matig</b>	<b>Neutraal</b>	<b>Succesvol</b>	<b>Zeer succesvol</b>
Hoe zou u de samenwerking met IHC Merwede beschrijven in verhouding tot andere bedrijven waarmee u samenwerkt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hoe zou u de samenwerking met IHC merwede beschrijven in termen van gewenst resultaat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>16. Stellingen over de samenwerking met IHC Merwede</b>					

	Helemaal oneens	oneens	Neutraal	eens	Helemaal eens
De samenwerking wordt vanuit de overheid erg gestimuleerd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Er is voldoende contact met onderzoeksinstituten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Binnen de samenwerking met IHC Merwede zijn alle afspraken duidelijk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In het samenwerkingsverband voel ik me als partner gelijkwaardig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Merwede maakt voldoende mensen vrij om zo de samenwerking te stimuleren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Er ontstaat regelmatig discussie over gemaakt afspraken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Veel van de innovaties worden ook in samenwerking met een onderzoeksinstituut gedaan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Risico's binnen de samenwerking zijn goed geregeld	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Binnen de samenwerking is er voldoende kapitaal aanwezig om tot resultaten te komen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Er is voldoende vertrouwen aanwezig voor een eerlijke samenwerking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In de samenwerking wordt veel kennis gedeeld	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
De communicatielijnen met IHC Merwede zijn kort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Problemen binnen de samenwerking worden snel opgelost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Helemaal oneens	oneens	Neutraal	eens	Helemaal eens
Binnen de samenwerking zijn er duidelijk afspraken op het gebied van intellectueel eigendom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

De bedrijfsculturen van uw bedrijf en IHC Merwede vertonen veel overeenkomsten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Als er meer financiële middelen beschikbaar zouden zijn, zou de performance van de projecten verbeteren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Er zijn vanuit de overheid voldoende regelingen die het aantrekkelijk maken om samen te werken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vaak wordt contact gezocht met onderzoeksinstellingen als er kennishiaten zijn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In het samenwerkingsverband hebben we elkaar nodig om tot het gewenste resultaat te komen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
De organisatiestructuur van de samenwerking is duidelijk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Merwede geeft voldoende aandacht aan de samenwerking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Binnen de samenwerking zijn alleen de hoofdzaken formeel vastgelegd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
De communicatie binnen de samenwerking verloopt soepel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
De mensen van u bedrijf hebben dezelfde mentaliteit als van IHC Merwede	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>17. Stellingen over uw bedrijf.</b>					
	<b>Helemaal oneens</b>	<b>Oneens</b>	<b>Neutraal</b>	<b>Eens</b>	<b>Helemaal eens</b>
Ons bedrijf heeft een duidelijke strategische koers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Het is duidelijk wie er wat moet doen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Binnen het bedrijf worden product ontwikkelingen gepland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wij hebben voldoende gekwalificeerd personeel om onze opdrachten uit te voeren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Onze bedrijfsprocessen zijn helder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Opdrachten worden uitgevoerd met project management methodiek	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Wij maken gebruik van de nieuwste productietechnieken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Wij investeren veel in R&D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Innovatie is voor ons bedrijf van levensbelang	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	Ons bedrijf is innovatiever dan gemiddeld in onze bedrijfstak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
	We evalueren op structurele basis onze technologische positie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
		<b>Haast niemand</b>	<b>Minder dan de helft</b>	<b>De helft</b>	<b>Meer dan de helft</b>	<b>Bijna iedereen</b>			
	Hoeveel mensen binnen uw bedrijf hebben een HBO of hogere opleiding?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<b>18.</b>	<b>Zou u meer betrokken willen zijn bij de R&amp;D van IHC Merwede en op welke manier?</b>								
	<i>S.v.p hier antwoord invullen</i>								
<b>19.</b>	<b>Zou u het waarderen als IHC Merwede mee zou denken met uw eigen R&amp;D en hoe zou u deze rol dan zien?</b>								
	<i>S.v.p hier antwoord invullen</i>								
<b>20.</b>	<b>Welk percentage van de omzet besteedt u ongeveer aan R&amp;D?</b>	<i>s.v.p. geschat percentage invullen</i>							
<b>21.</b>	<b>Ruimte voor aanvullende opmerkingen</b>								

*Vul hier u aanvullende opmerkingen in*

Vriendelijk dank voor uw medewerking!



## **Appendix 12: English survey**

# Innovation survey

Your opinion is important to us



## Part 1: Please fill out the grey cells

1.	Company name	Fill out name of the company
2.	Country	Fill out the country the company is established
3.	Place	Place of Business
4.	Name respondent	Fill out name here
5.	Function respondent:	Fill out function here
6.	Number of employees in your company?	Fill out total employees of the company
7.	What amount of these people work in R&D?	People with R&D function?
8.	If your company exist of different business units, for which are you working then?	Name of the business unit
9.	What amount employees are working in your business unit?	Only fill out if your company exist of different business units
10.	What was your companies turn over of in 2007?	Turn over
11.	What was the turn over of your business unit in 2007?	Only fill out if your company exist of different business units

## Part 2: Please mark one check box for each question

12.	<b>Intensity of the cooperation</b>					
		Very weak	Weak	Neutral	Strong	Very strong
	How would you describe the relation of your company with IHC Merwede?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	How would you describe the relation of your company with IHC Merwede specific related to innovation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<10%	10-20%	20-30%	30-40%	>50%
	Which amount of your turn over is related to work for IHC Merwede?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	<b>Relation with the different business units of IHC Merwede</b>					
	<b>On which terms do you have contact with the following business units of IHC Merwede?</b>					

	Never	Once a year	Each month	Each week	Every day
Merwede shipyard					
IHC Dredgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Parts&Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Beaver Dredgers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Engineering services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Krimpen Shipyard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MTI Holland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Hytop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Fundex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Handling Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Hydrohammer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Metalix	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Lagersmith	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training institute for Dredging					
Merwede design					
<b>14. Other partnerships</b>					
<b>What are (if they are present) the 3 most important other partnerships in your company (please fill out the name of the company in the gray fields, and mark one check box for each sub question)</b>					
Company 1:	<i>Name of the company of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Company 2:	<i>Name of the company of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>




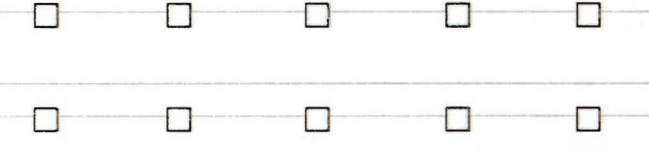

Company 3:	<i>Name of the company of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Are there any research institutes to who you established a partnership with? ( please fill out again the three most important one if they are present)</b>					
Research institute 1:	<i>Name of the research institute of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research institute 2:	<i>Name of the research institute of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research institute 3:	<i>Name of the research institute of the partnership</i>				
	Absolutely not important	Not important	Neutral	Important	Very important
How important is this relation for your innovation program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How important is this relation for the continuity of your company?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>15. Success of the partnership</b>					
	<b>Very poor</b>	<b>Poor</b>	<b>Neutral</b>	<b>Successful</b>	<b>Very successful</b>
How would you describe your partnership with IHC Merwede in relation to other companies where you cooperate with?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How would you describe your relation with IHC Merwede when looking at the desired output?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
<b>16. Statements about the relation with IHC Merwede</b>					
	<b>Totally disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Totally agree</b>
The relation is stimulated very much by the government.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
The amount of contact with research institutes is enough	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
Agreements are very clear within the cooperation with IHC Merwede	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
As a partner I feel myself interdependent in the cooperation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
IHC Merwede makes enough resources available to stimulate the cooperation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
Discussion about agreements occur on a regular base	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
A lot of the innovations are also done in cooperation with research institutes	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
Potential risks are managed very well in the partnership	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
Within the cooperation enough financial capital is present to come to results	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
The level of trust is high enough for a honest and open relation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
a lot of knowledge is shared within the cooperation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
The communication with IHC Merwede is effective	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
Problems are solved fast within the cooperation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				
	<b>Totally disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Totally agree</b>

Within the cooperation clear agreements exist on intellectual property rights	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The culture of IHC Merwede and your company has a lot in common	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The performance of projects will increase, if more financial capital in the cooperation is injected	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are enough governmental regulations to stimulate the cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research institutes are consulted often when knowledge gaps arise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We need each other in the cooperation to get the desired results	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The organizational structure of the cooperation is clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IHC Merwede gives enough attention to the cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Within the cooperation only the important points are on a formal agreement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The communication within the cooperation goes smoothly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The characteristics of your people and form IHC Merwede is much the same	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**17. Statements about your company.**

	Totally disagree	Disagree	Neutral	Agree	Totally agree
The strategy of our company is clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Within our company responsibilities are clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In our company product development is planned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
We have enough qualified people to execute our jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>Our industrial processes are clear</p> <p>Orders are executed with help of project management</p> <p>We use state of the art production technology</p> <p>We invest a lot in R&amp;D</p> <p>Innovation is of major importance within our company</p>	
<p>Our company is more innovative than others in the same branche</p> <p>We evaluate our R&amp;D position on a structural base</p>	
	<p><b>Almost nobody</b>      <b>The minority</b>      <b>Half of the people</b>      <b>The majority</b>      <b>Almost everybody</b></p>
<p>How many employees are higher educated?</p>	
<p>18.</p>	<p><b>Would you like it to be closely associated with the R&amp;D of IHC Merwede and if so in which way?</b></p> <p><i>Please fill out answer here</i></p>
<p>19.</p>	<p><b>Would you appreciate it, if IHC Merwede would be closely associated with your own R&amp;D en how would you see this role?</b></p> <p><i>Please fill out answer here</i></p>
<p>20.</p>	<p><b>Which percentage form the turnover is invested in R&amp;D?</b></p> <p><i>Please fill out the percentage here</i></p>
<p>21.</p>	<p><b>Space for additional comments</b></p>

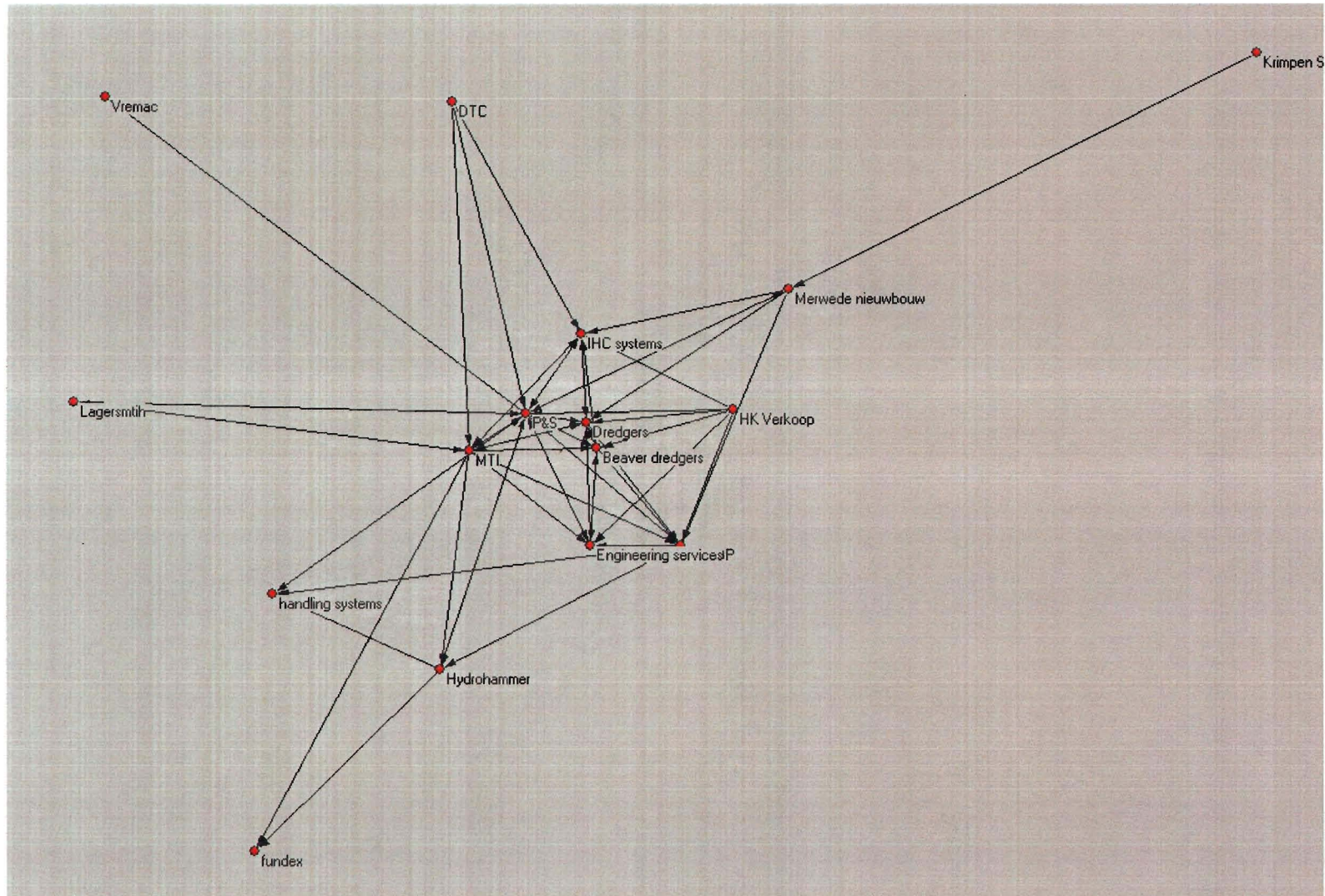
*Please fill out additional comments here*

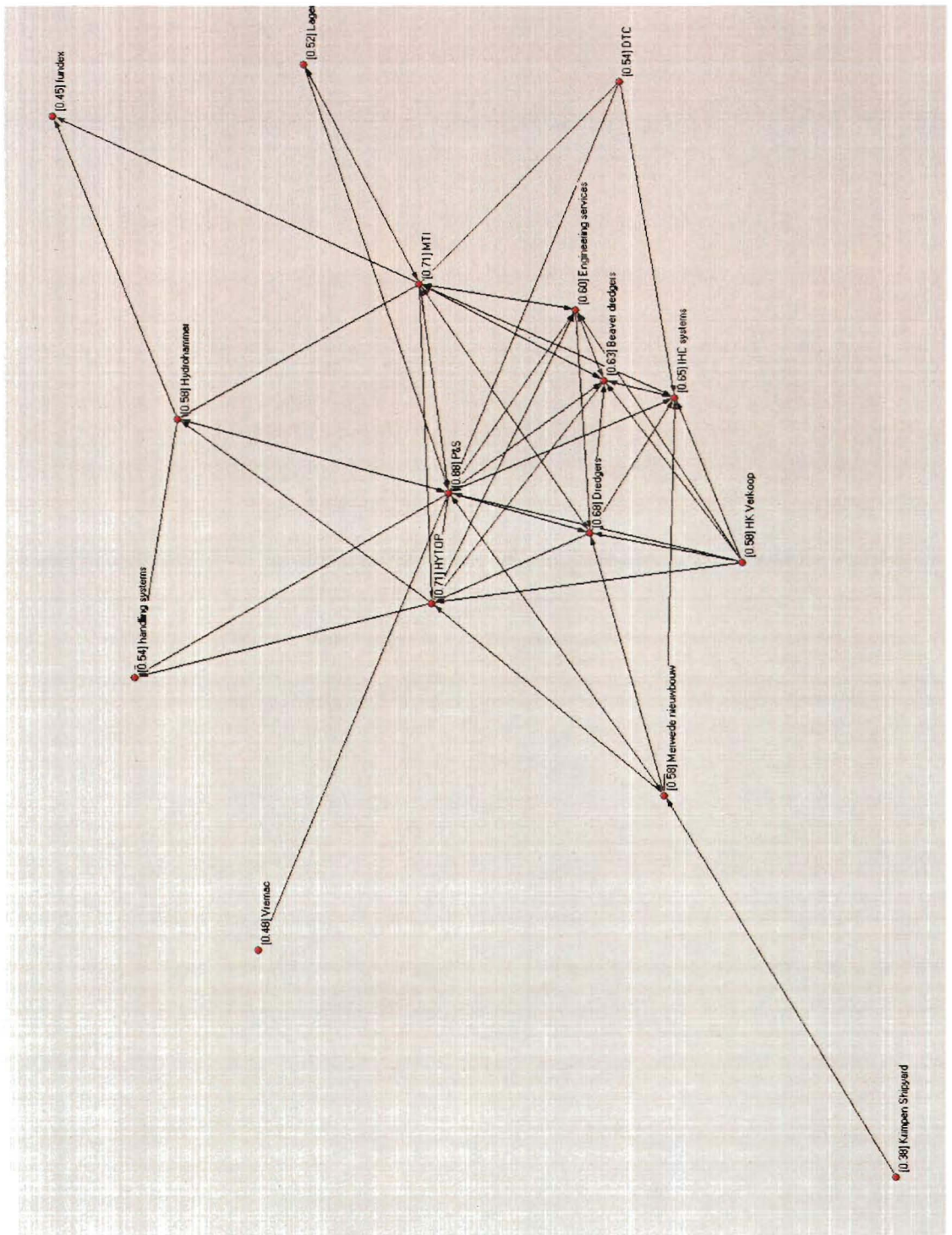
Thanks for your collaboration



## **Appendix 13: Detailed results of the social network analysis**

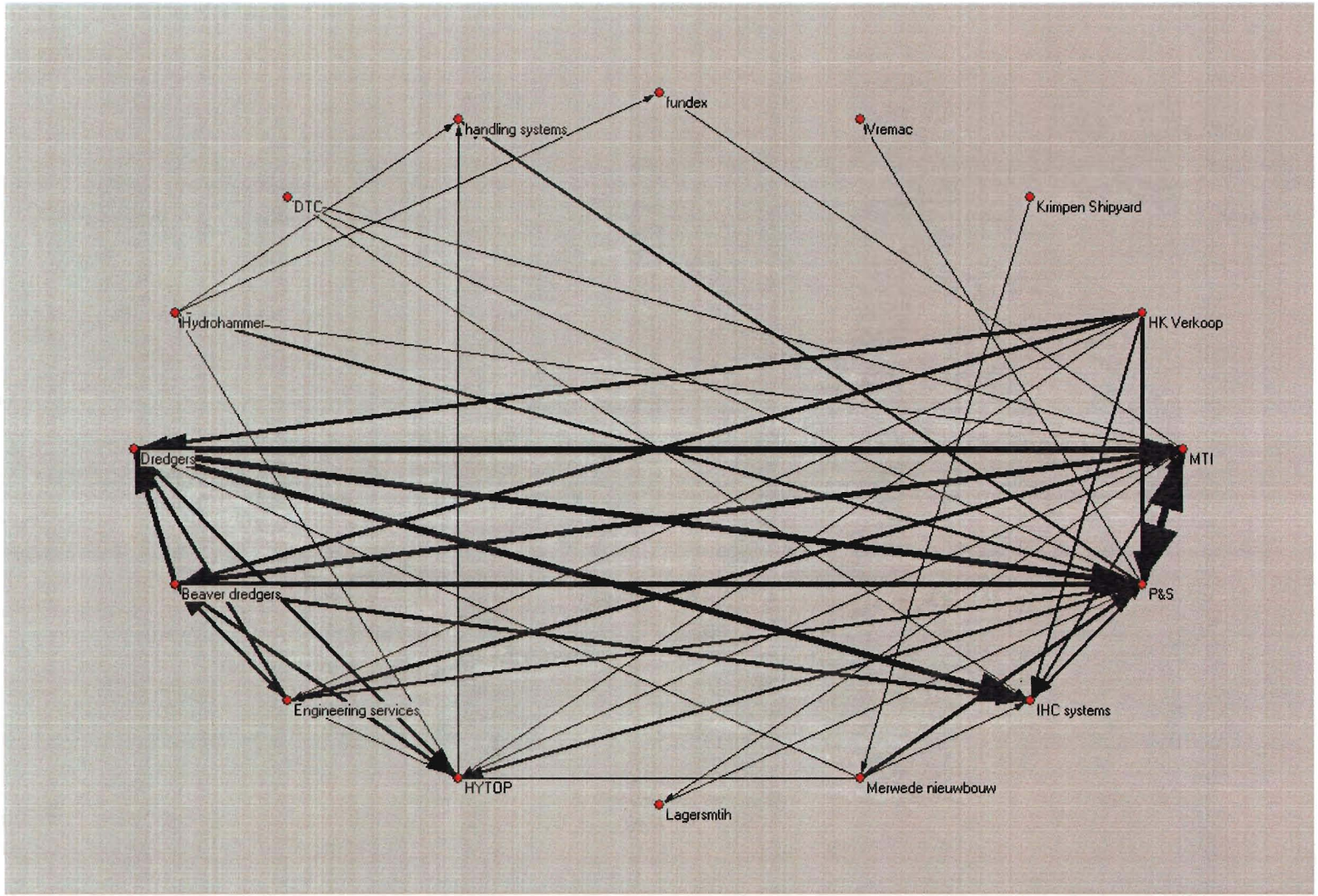
## Internal network of BU



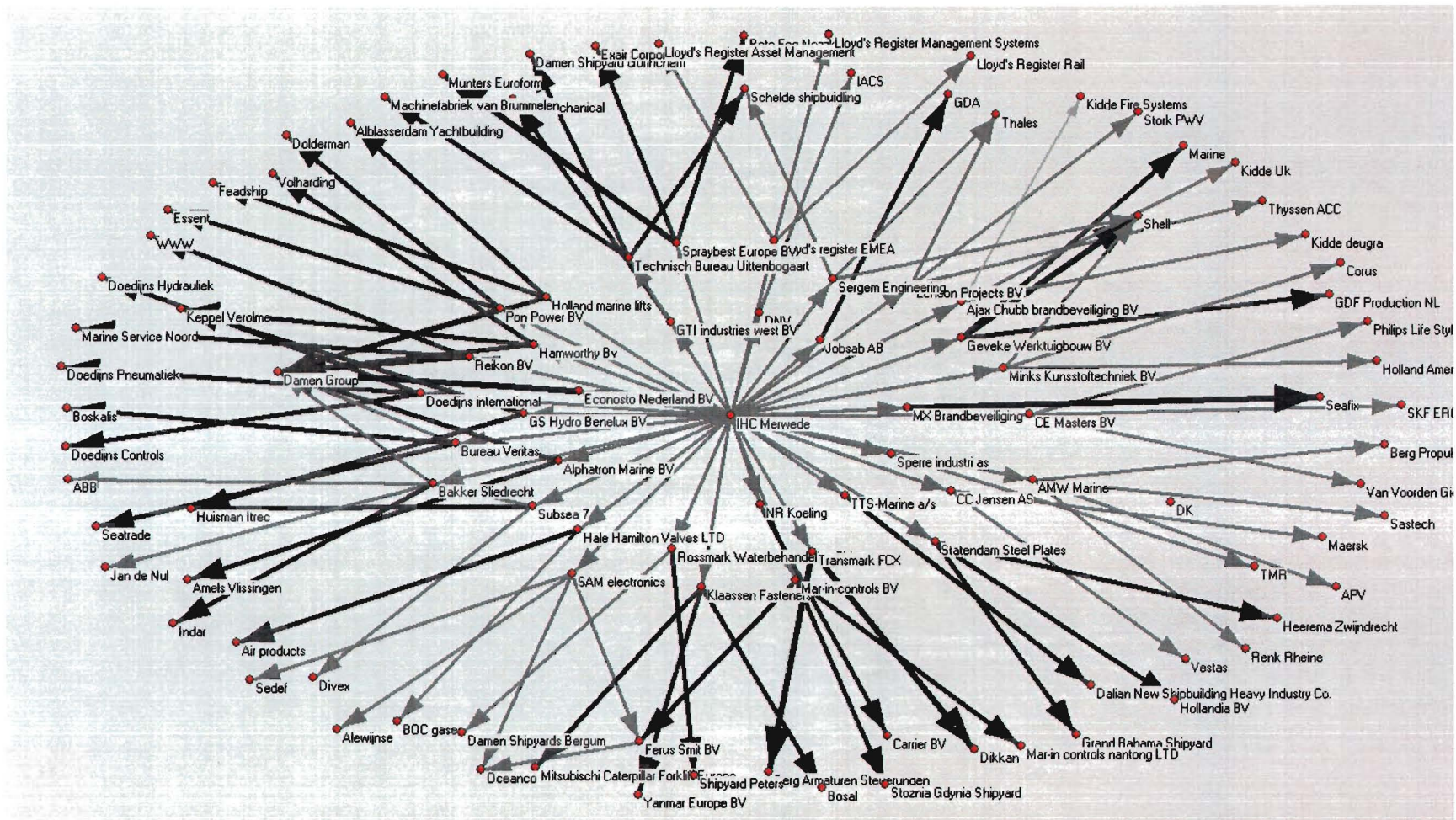


Centrality

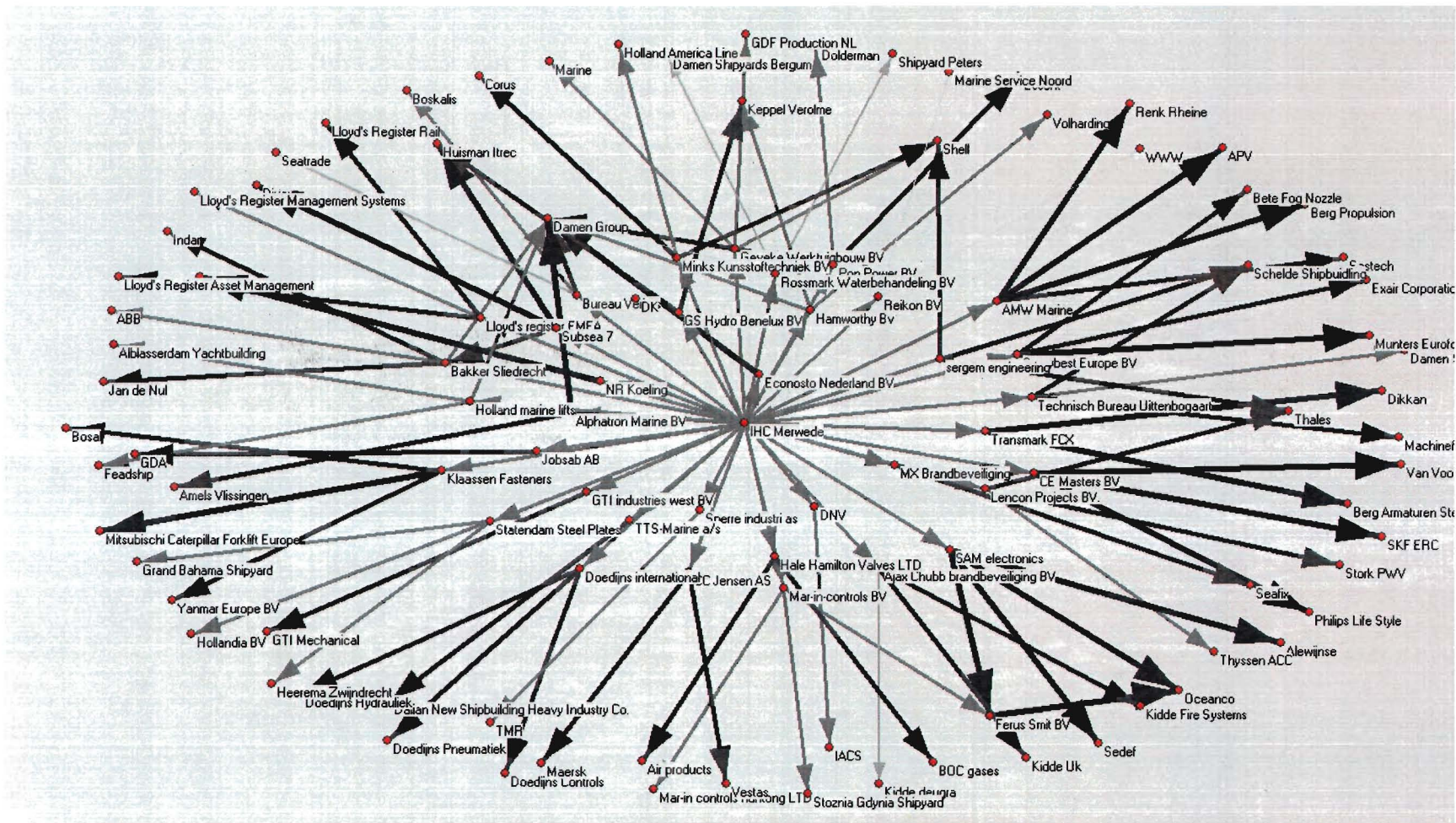






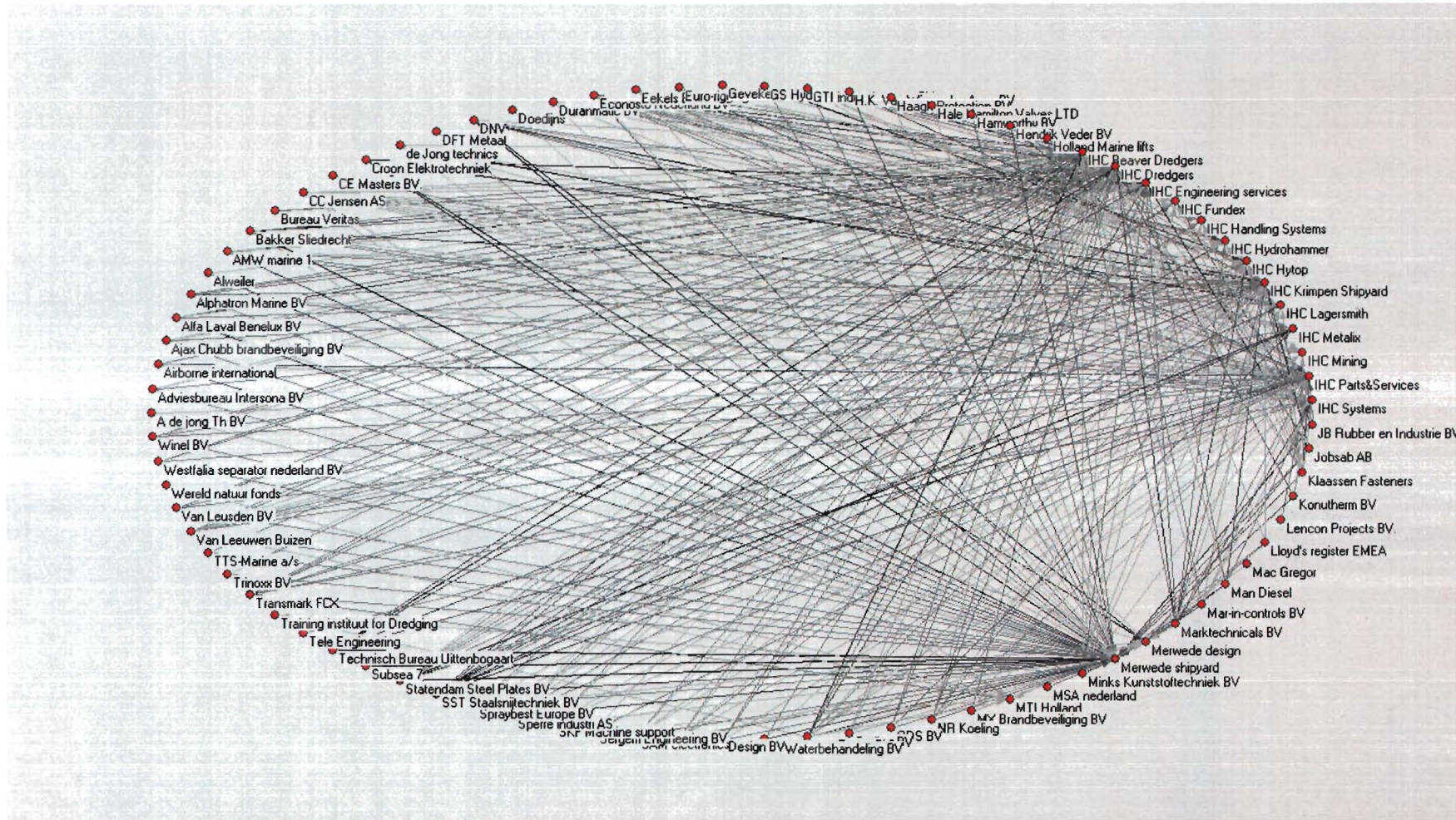


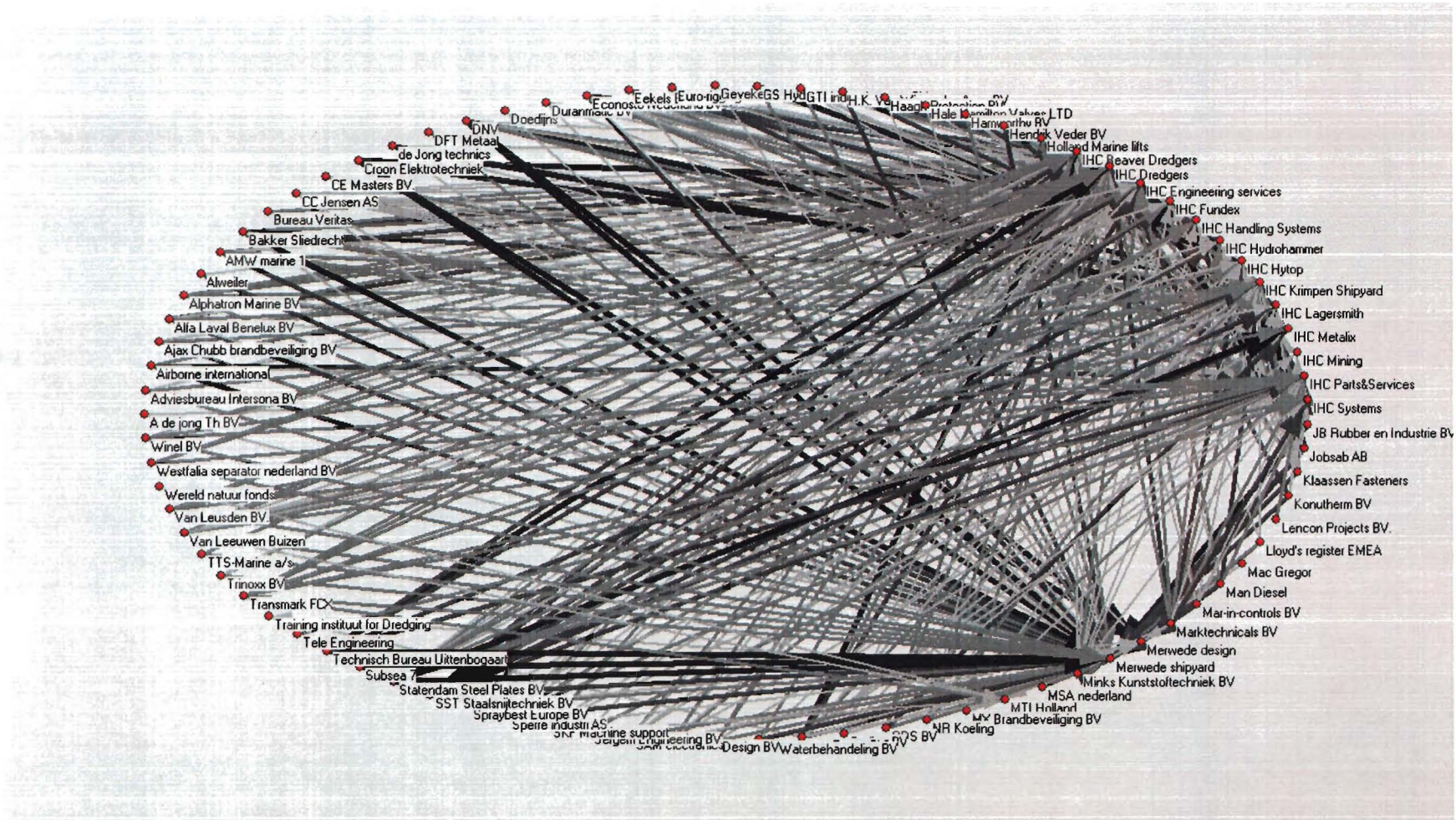




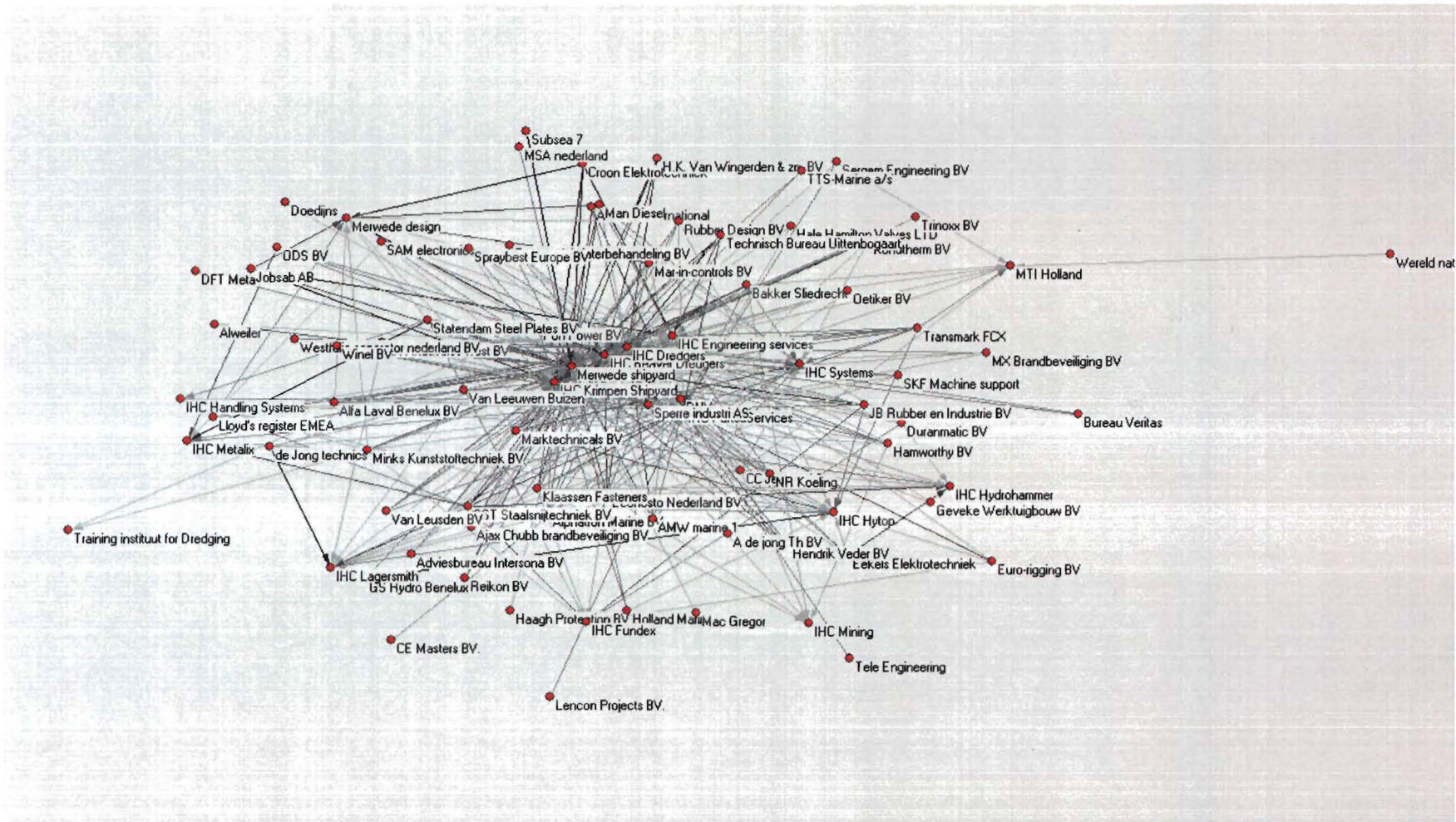


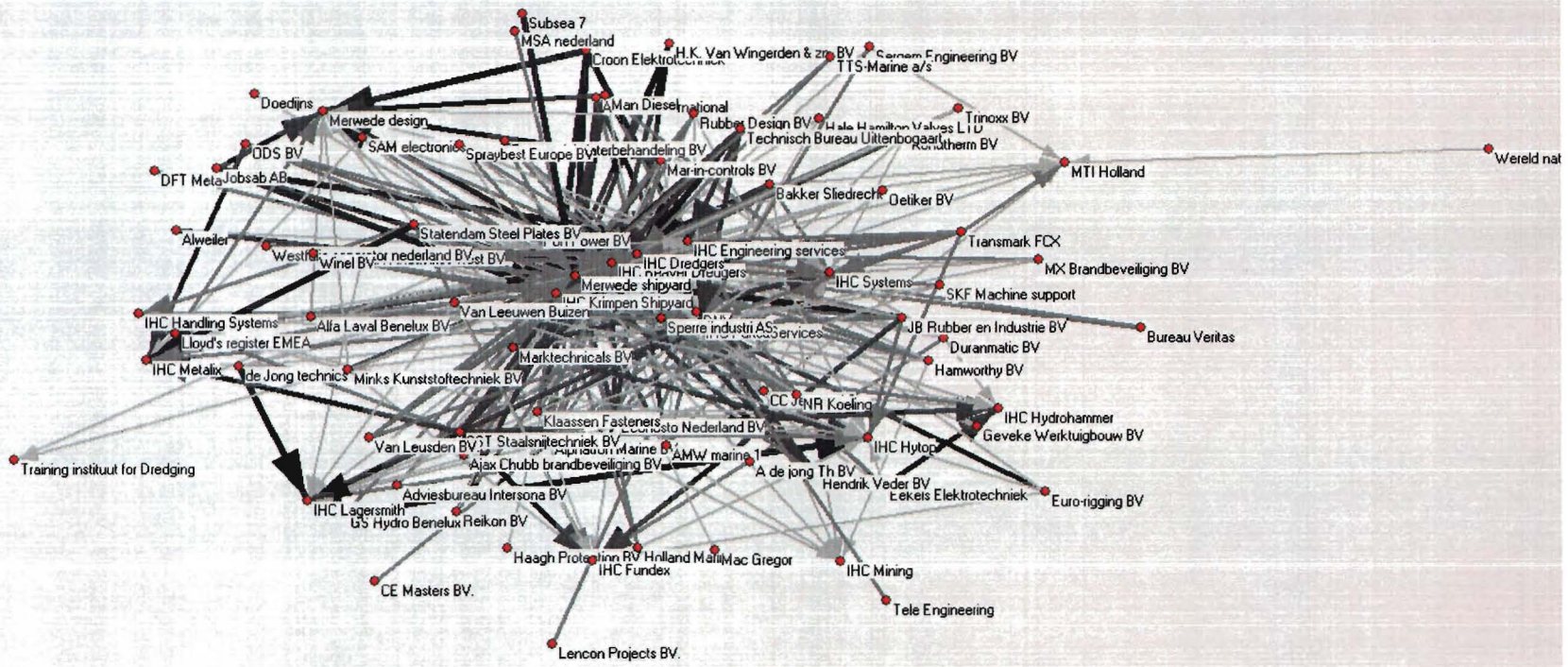
## Relations external companies with BU

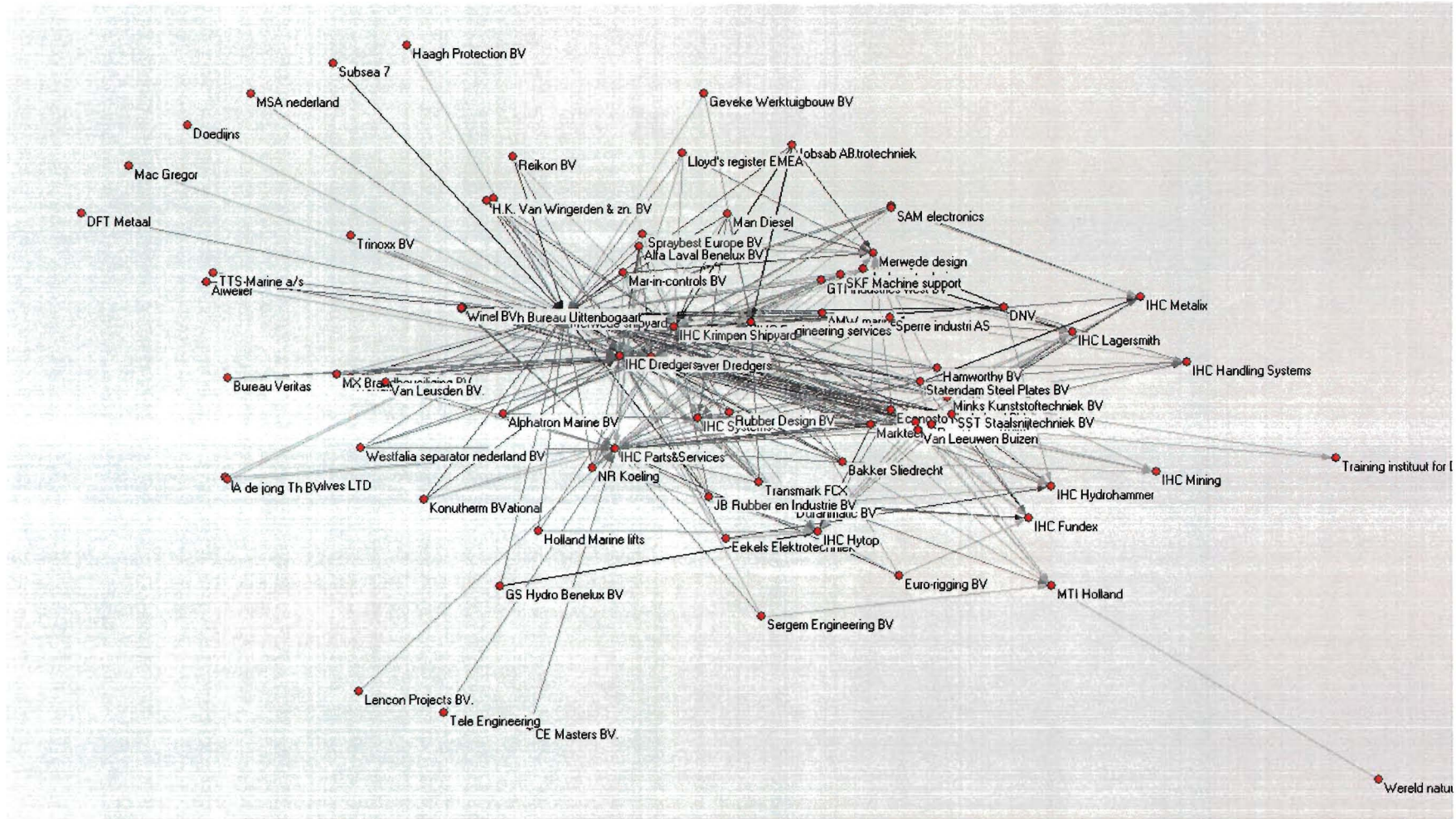


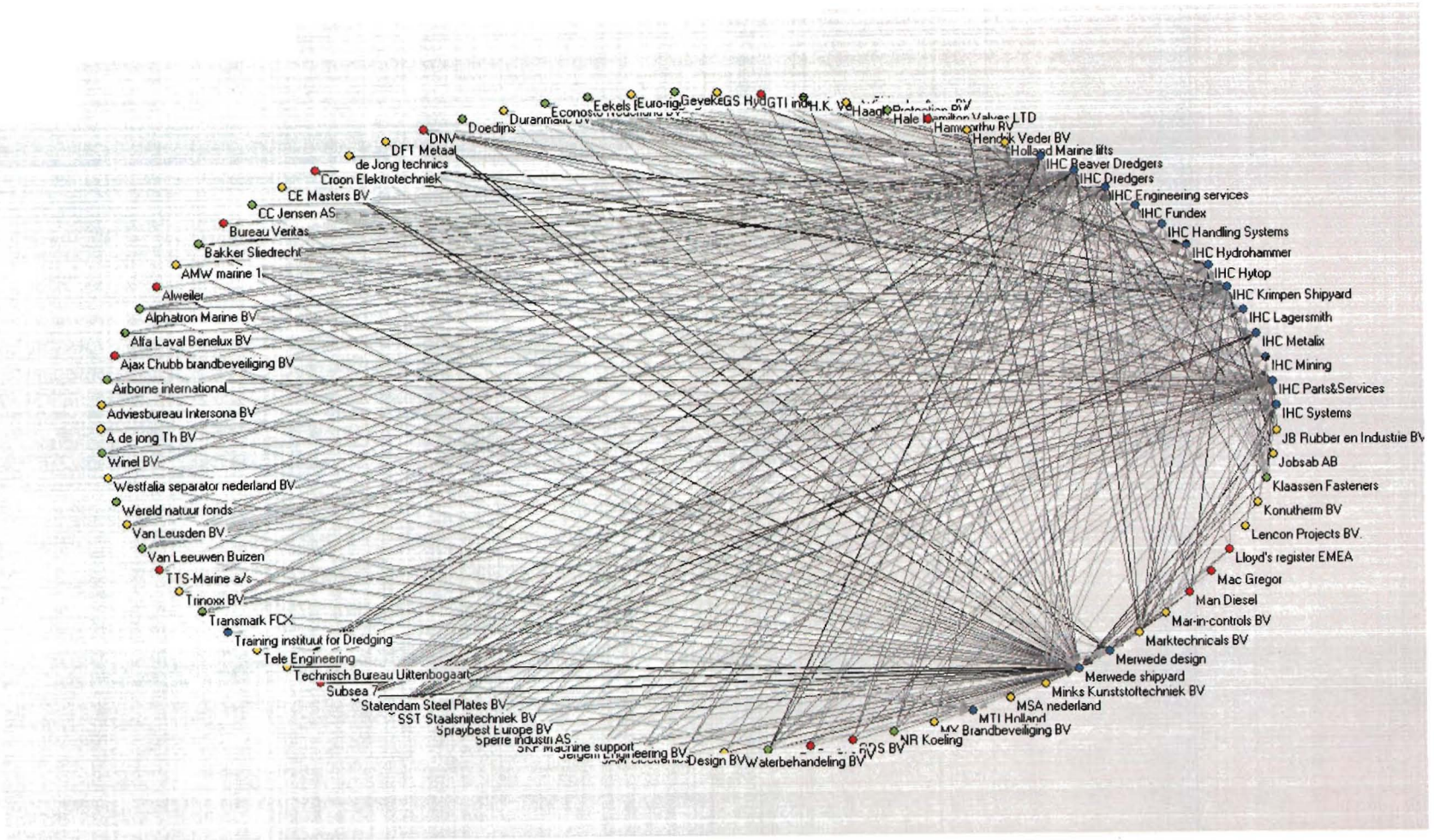


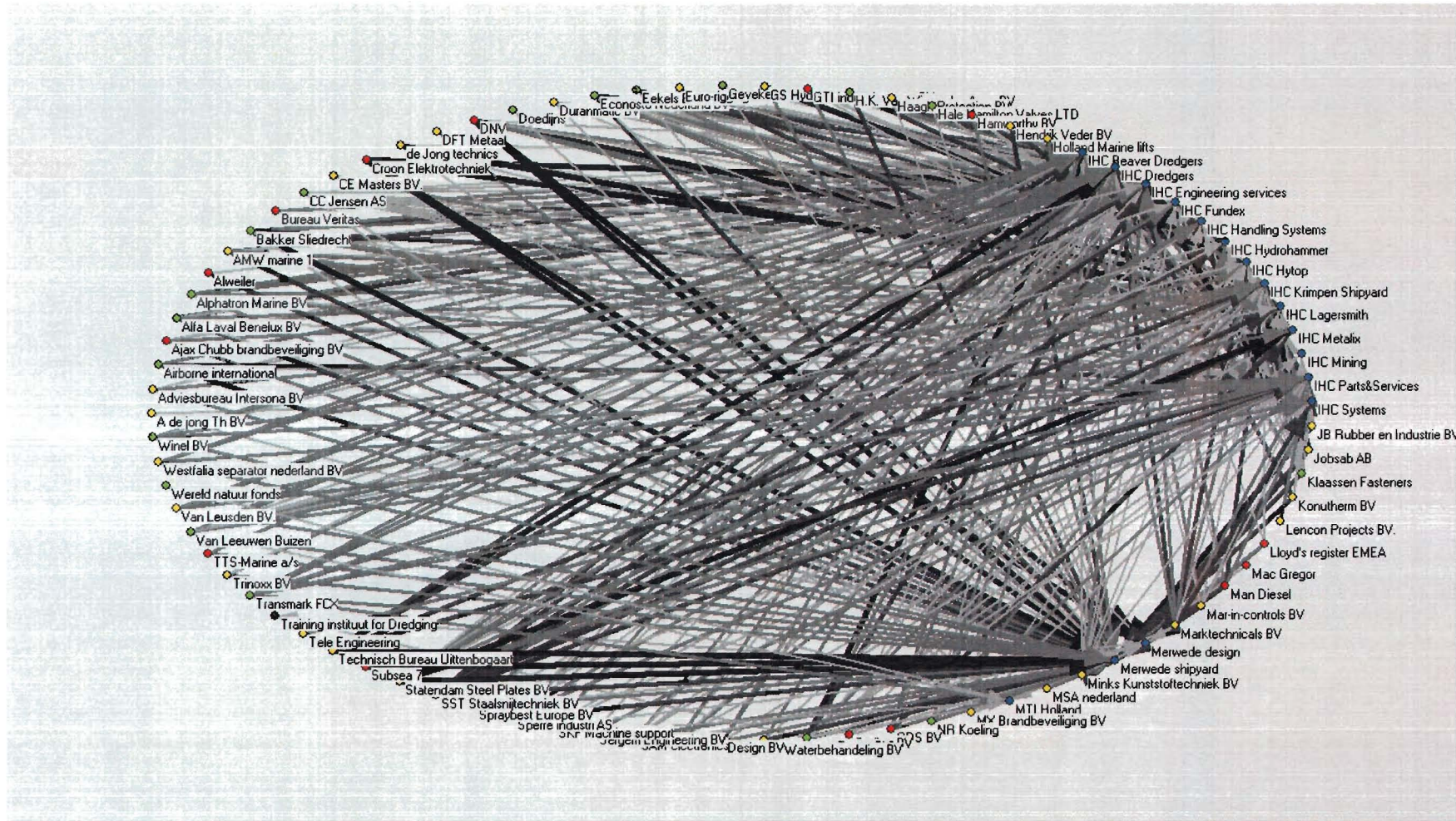


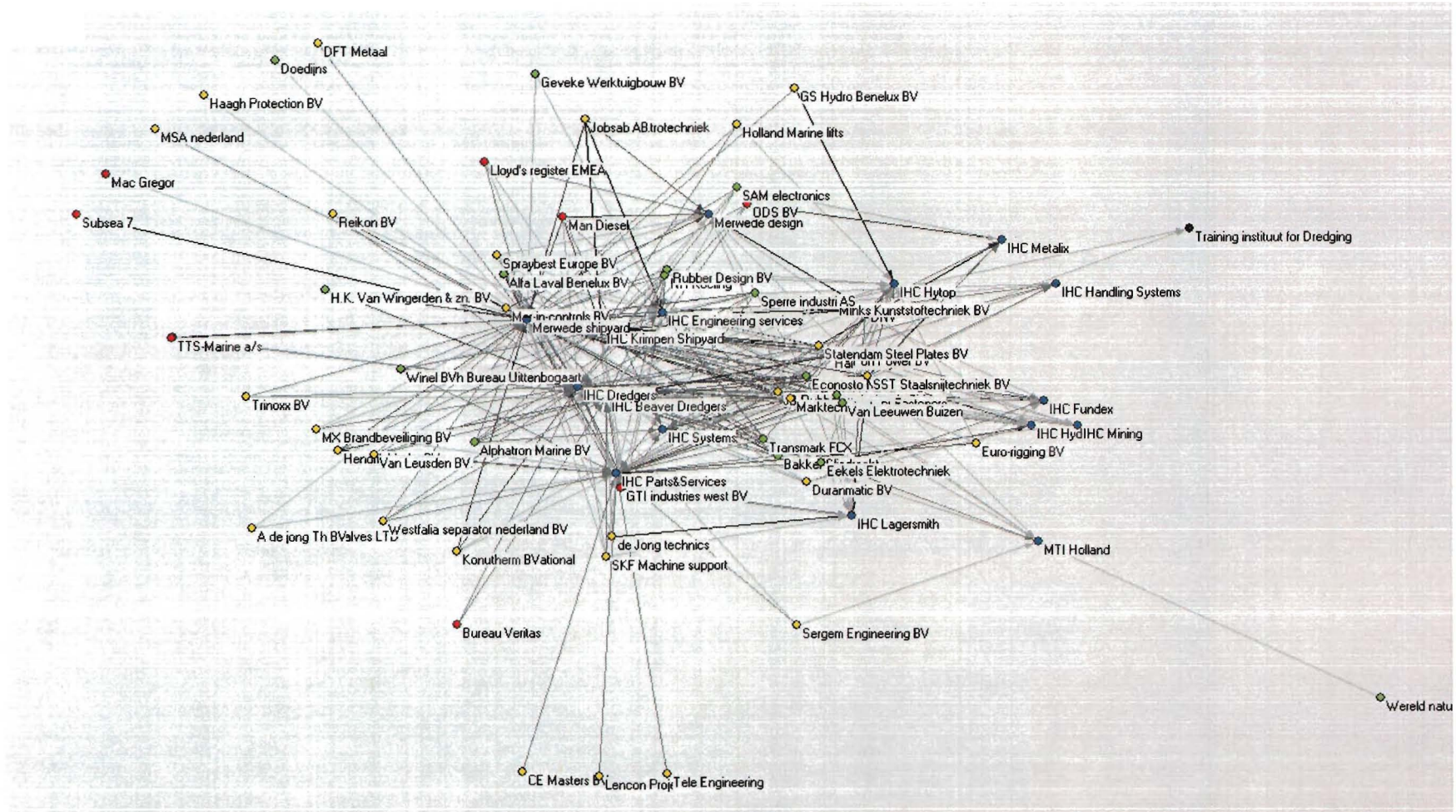


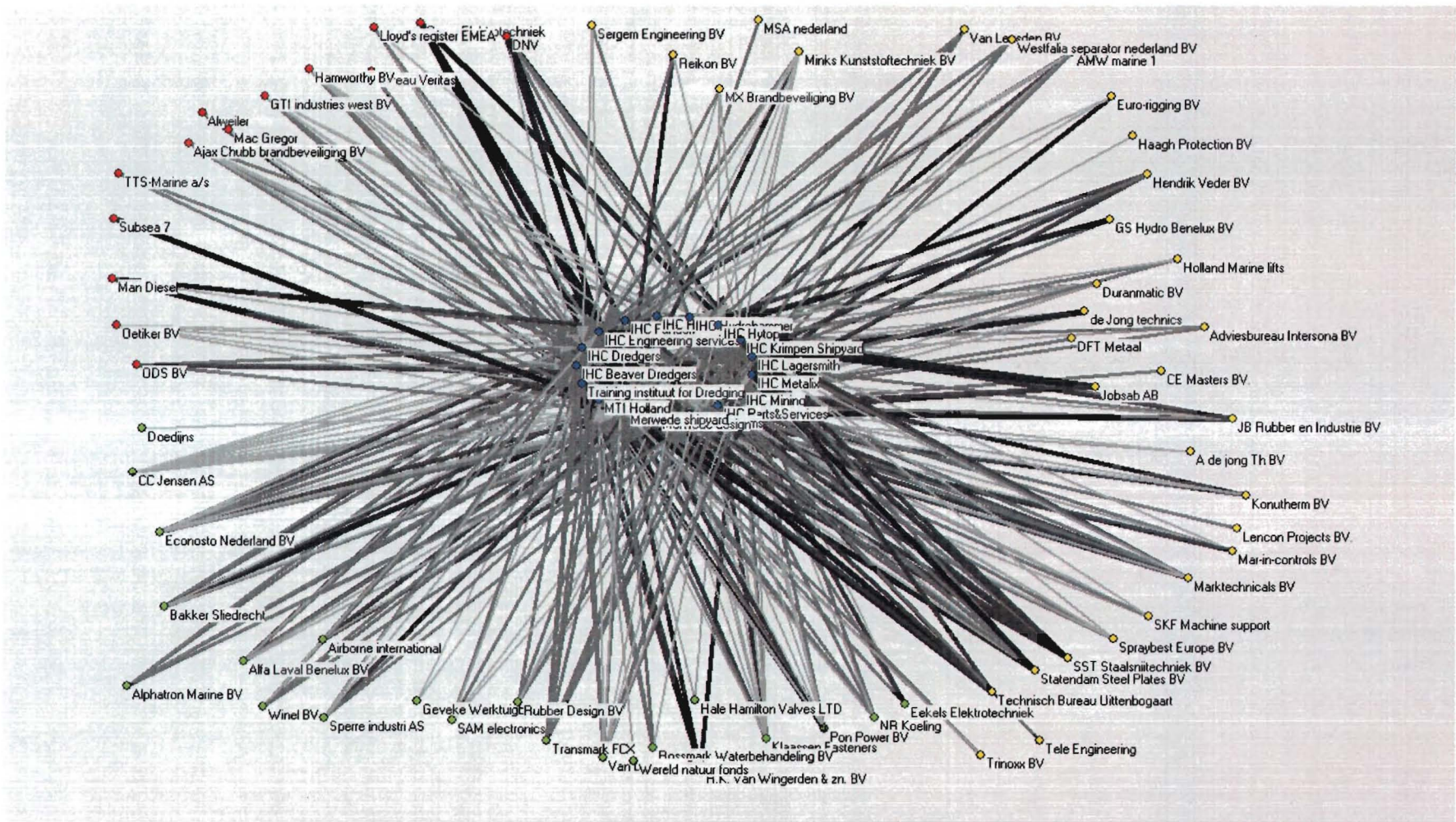


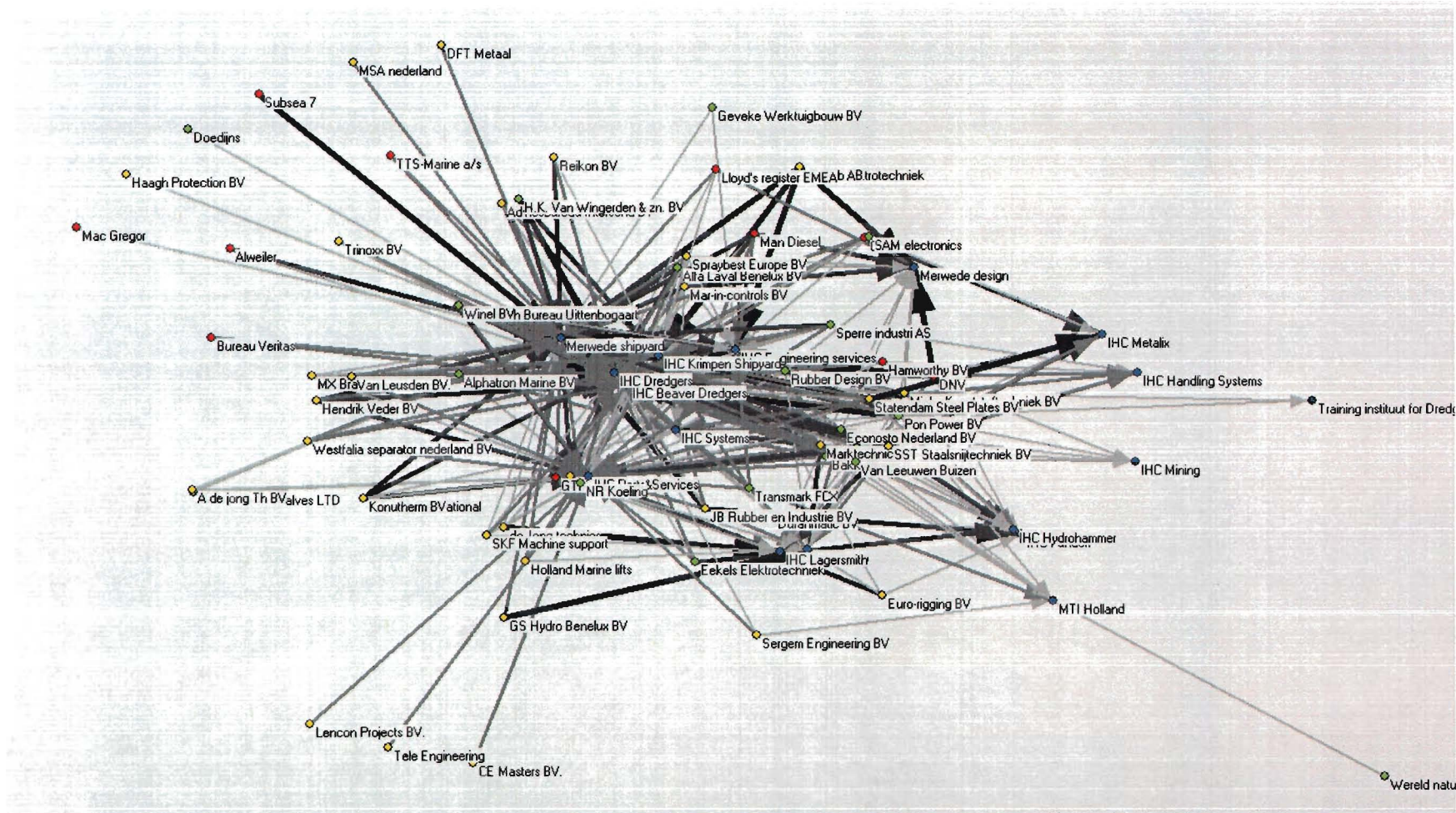






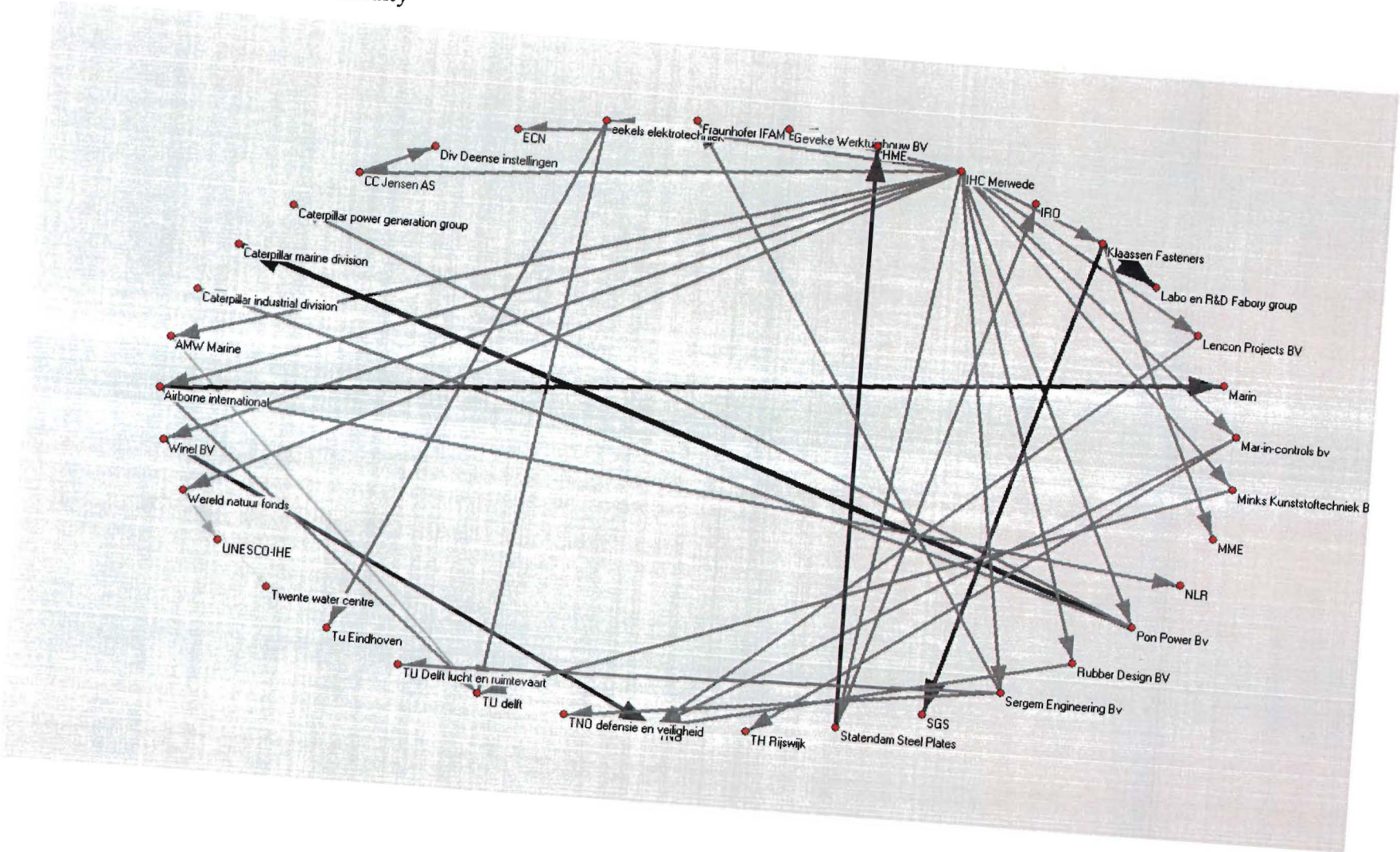


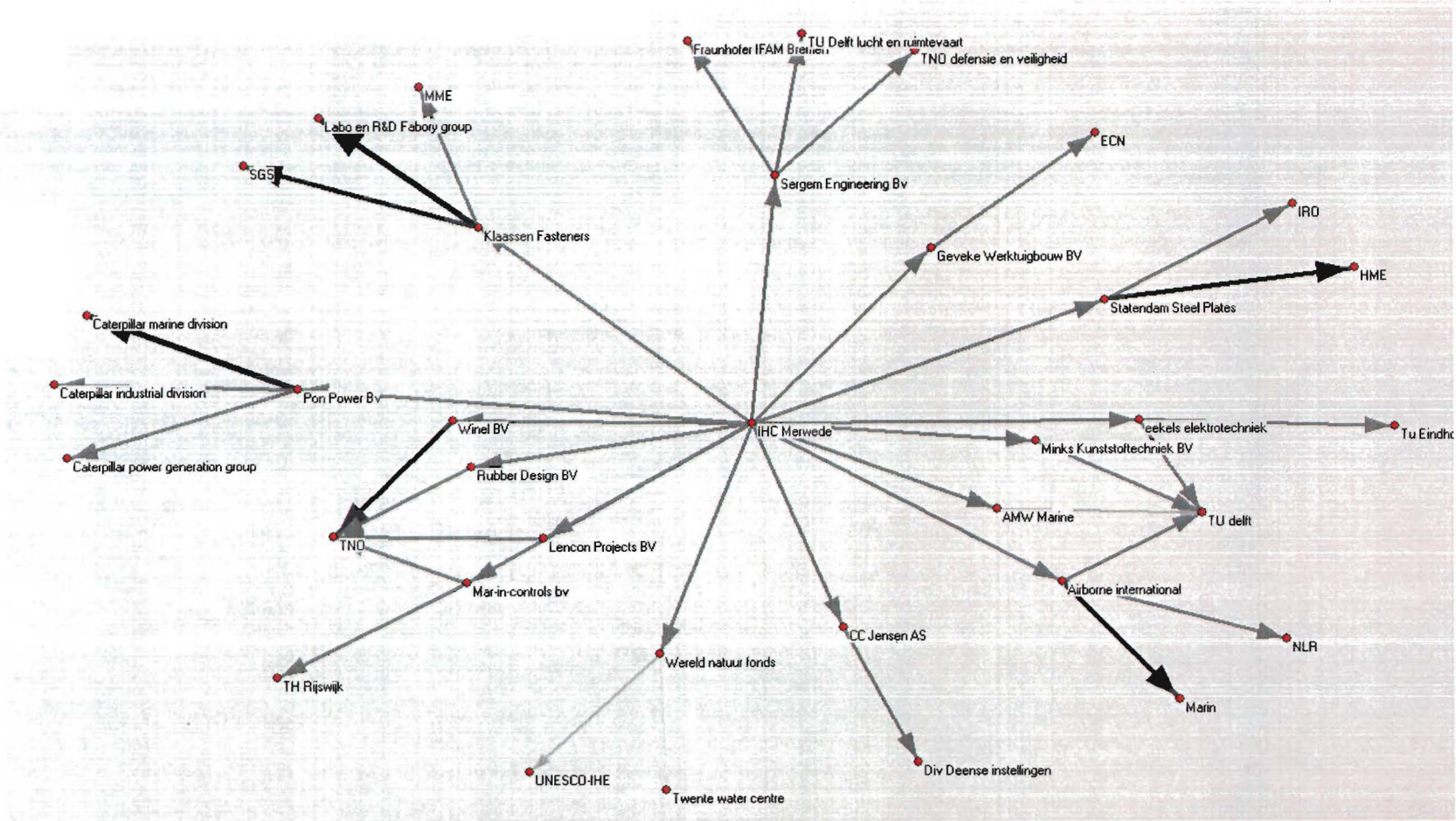




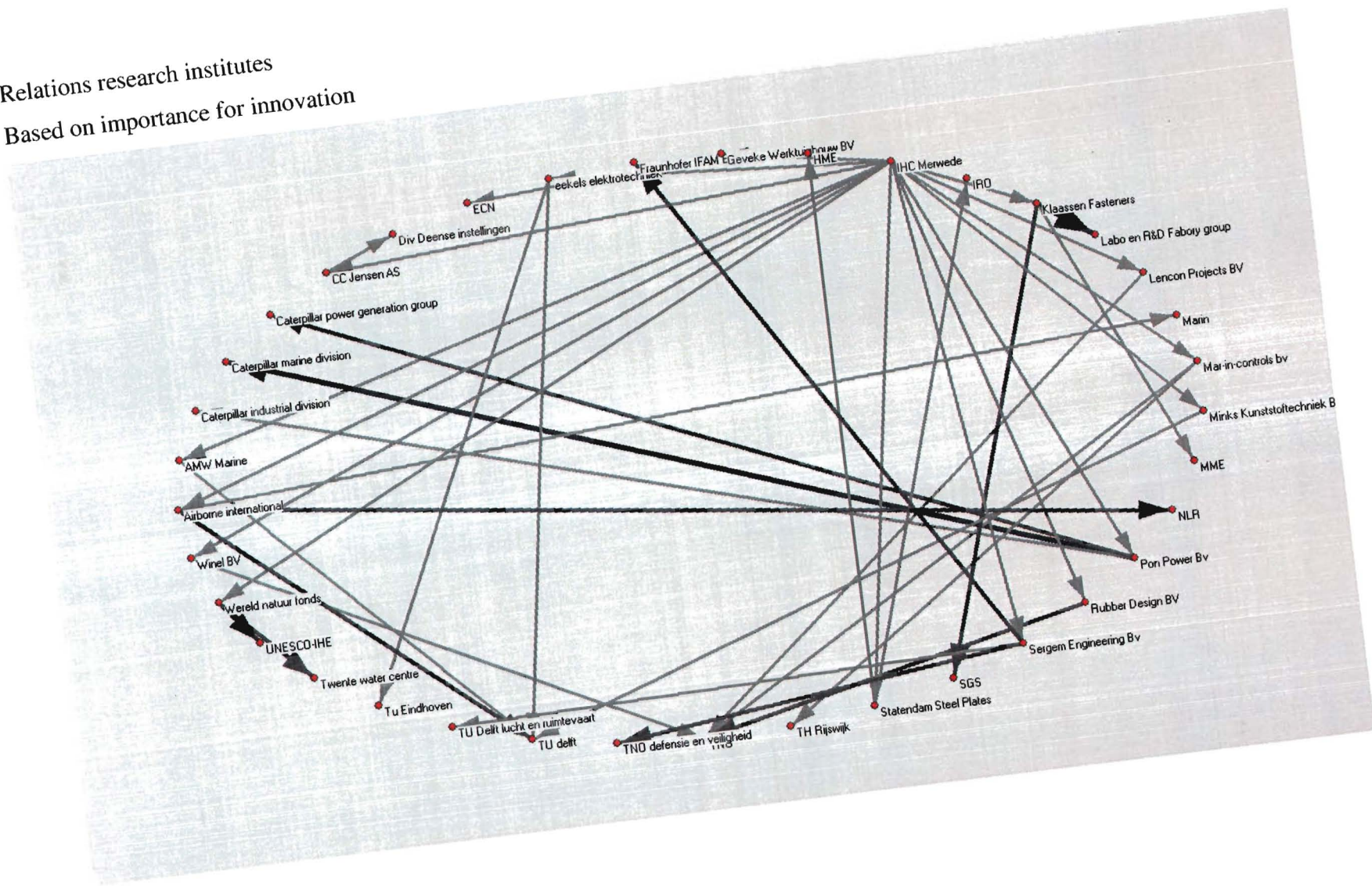


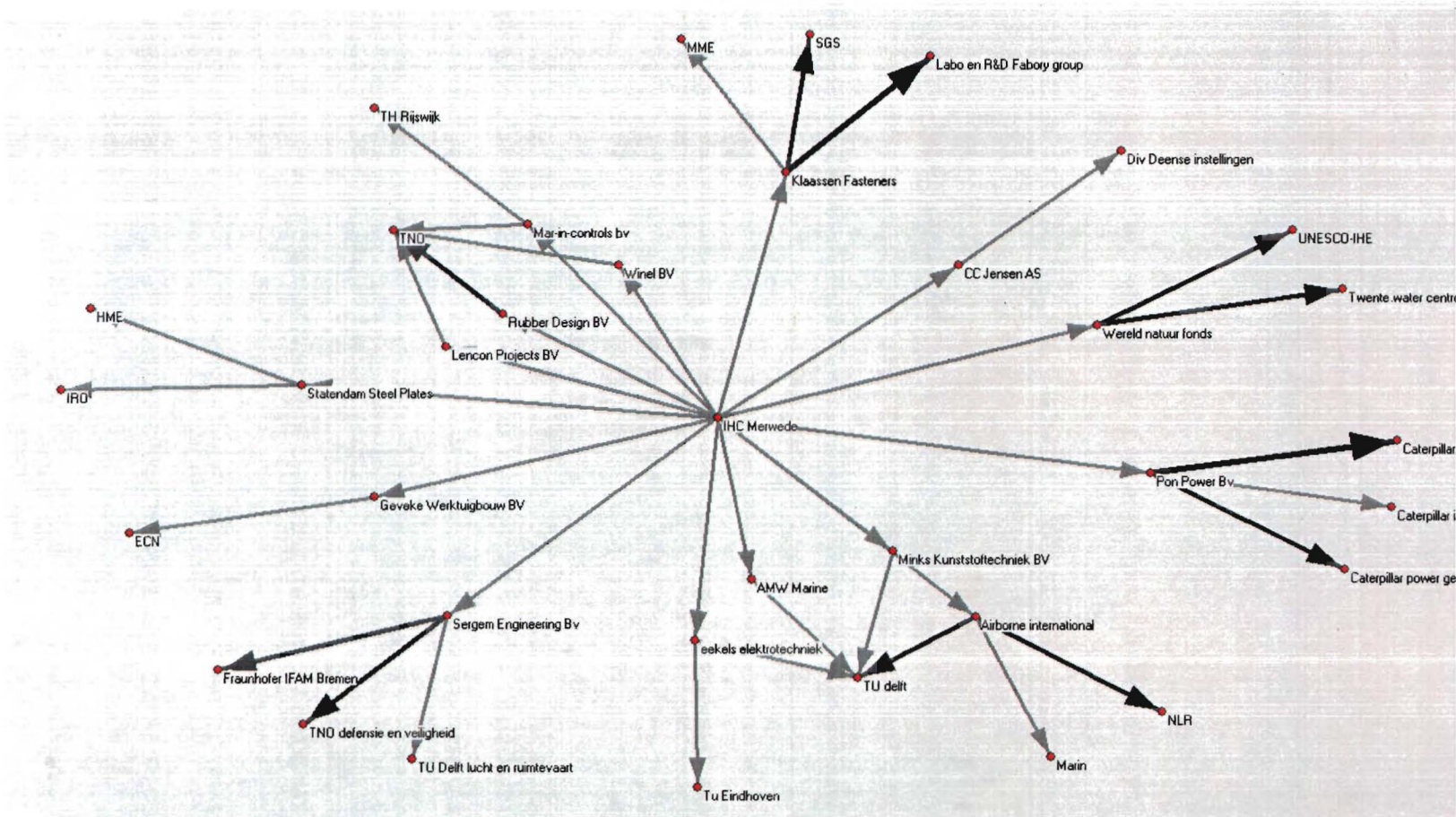
Relations research institutes  
 Based on importance for continuity





Relations research institutes  
Based on importance for innovation







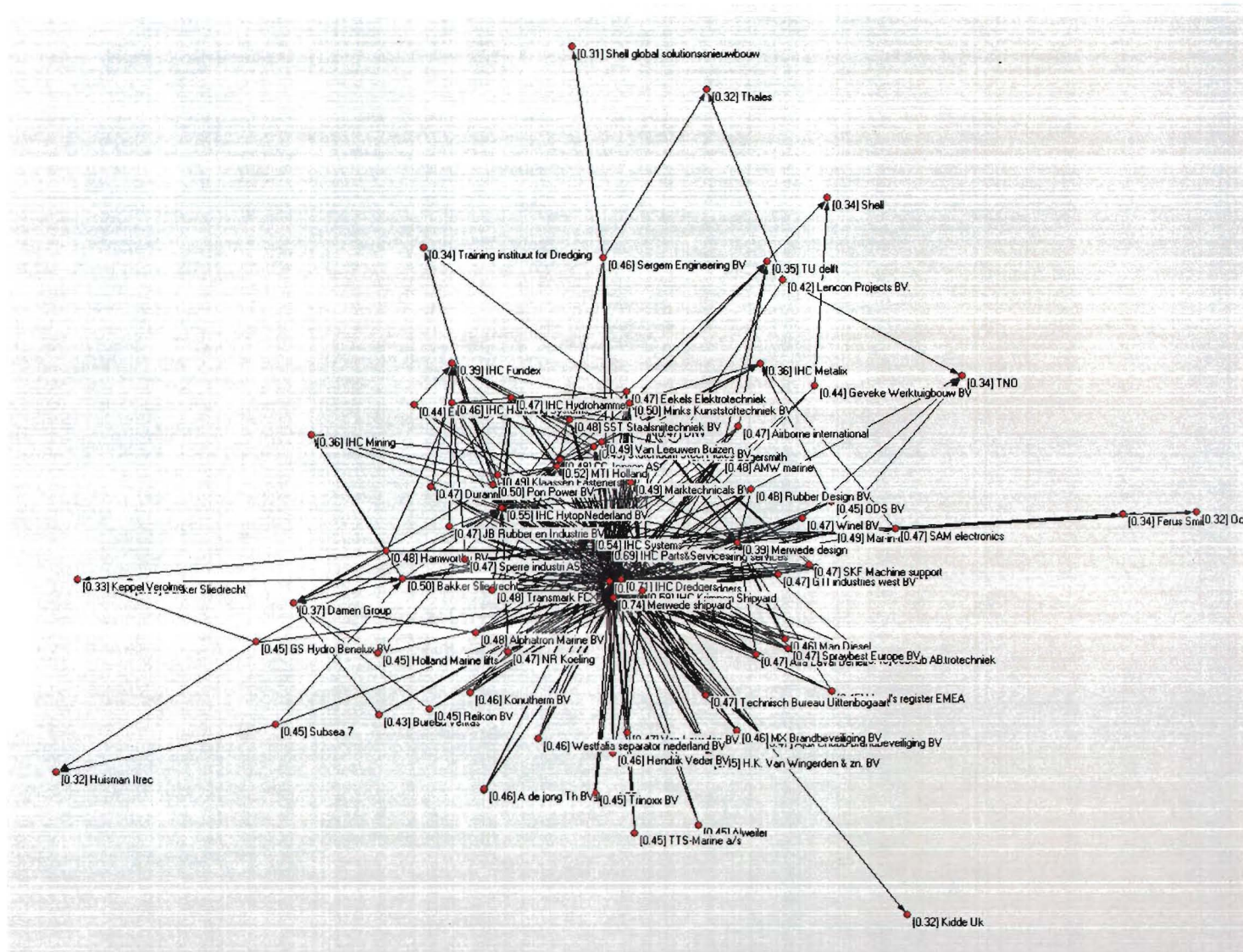




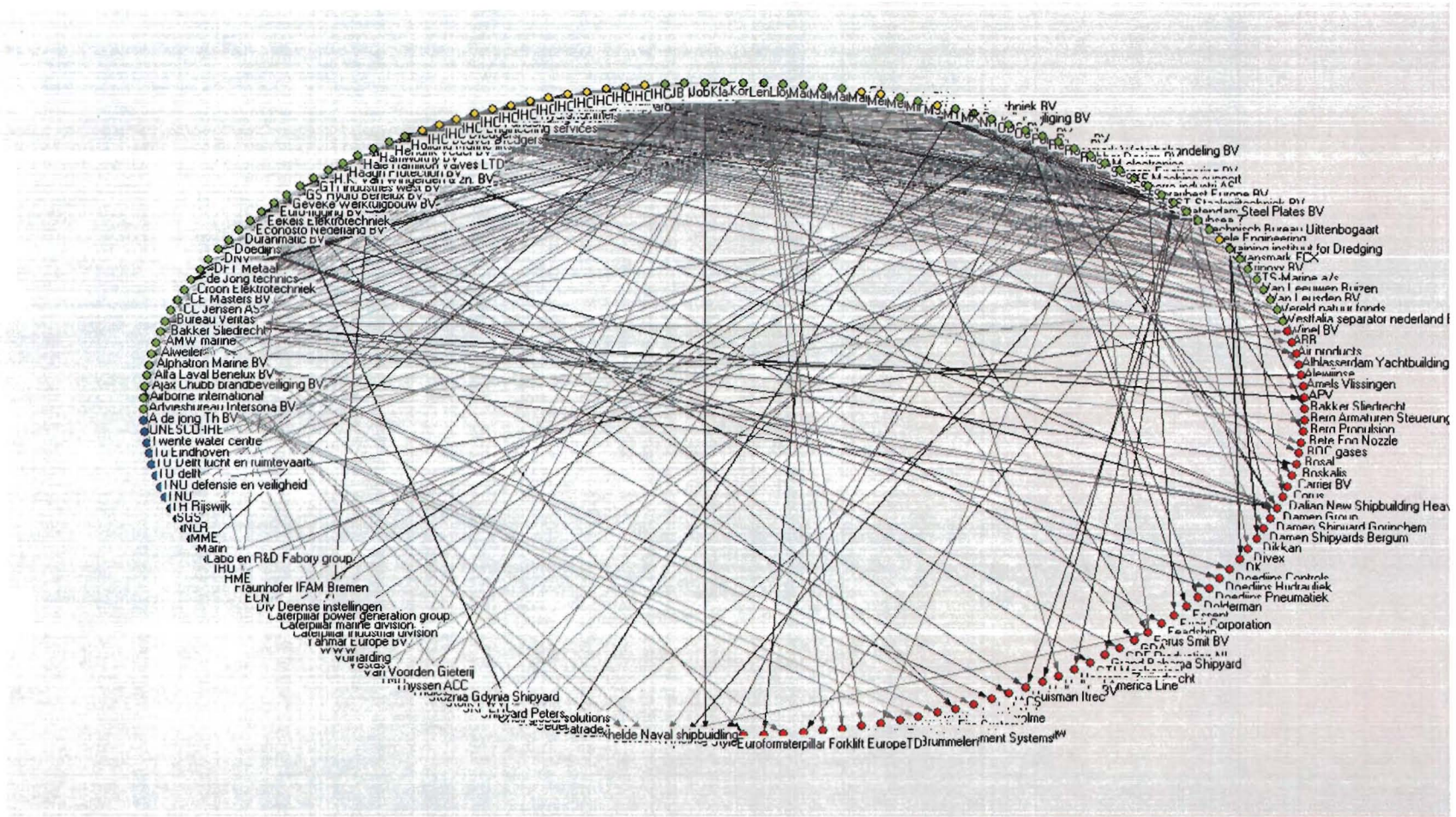


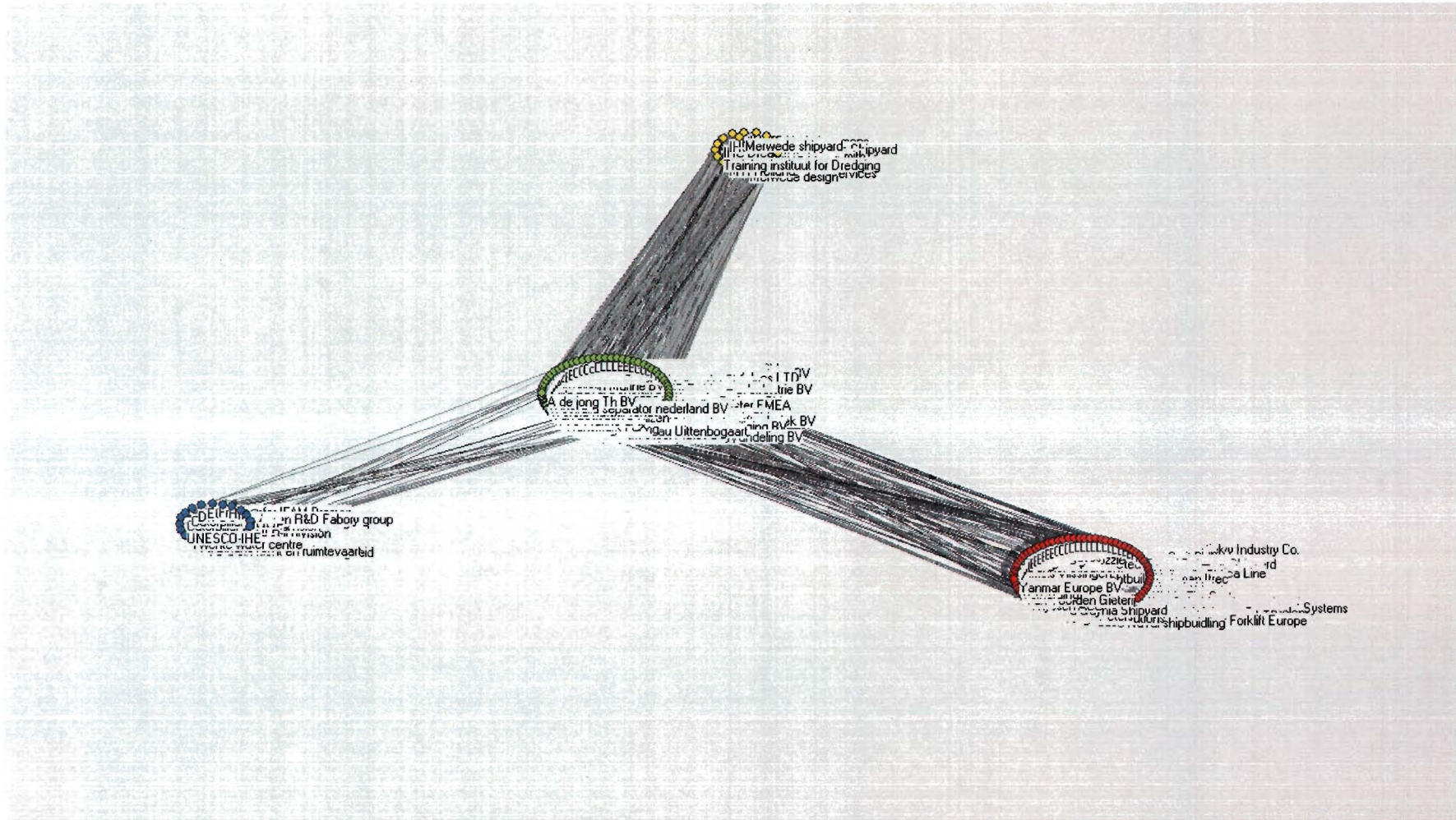




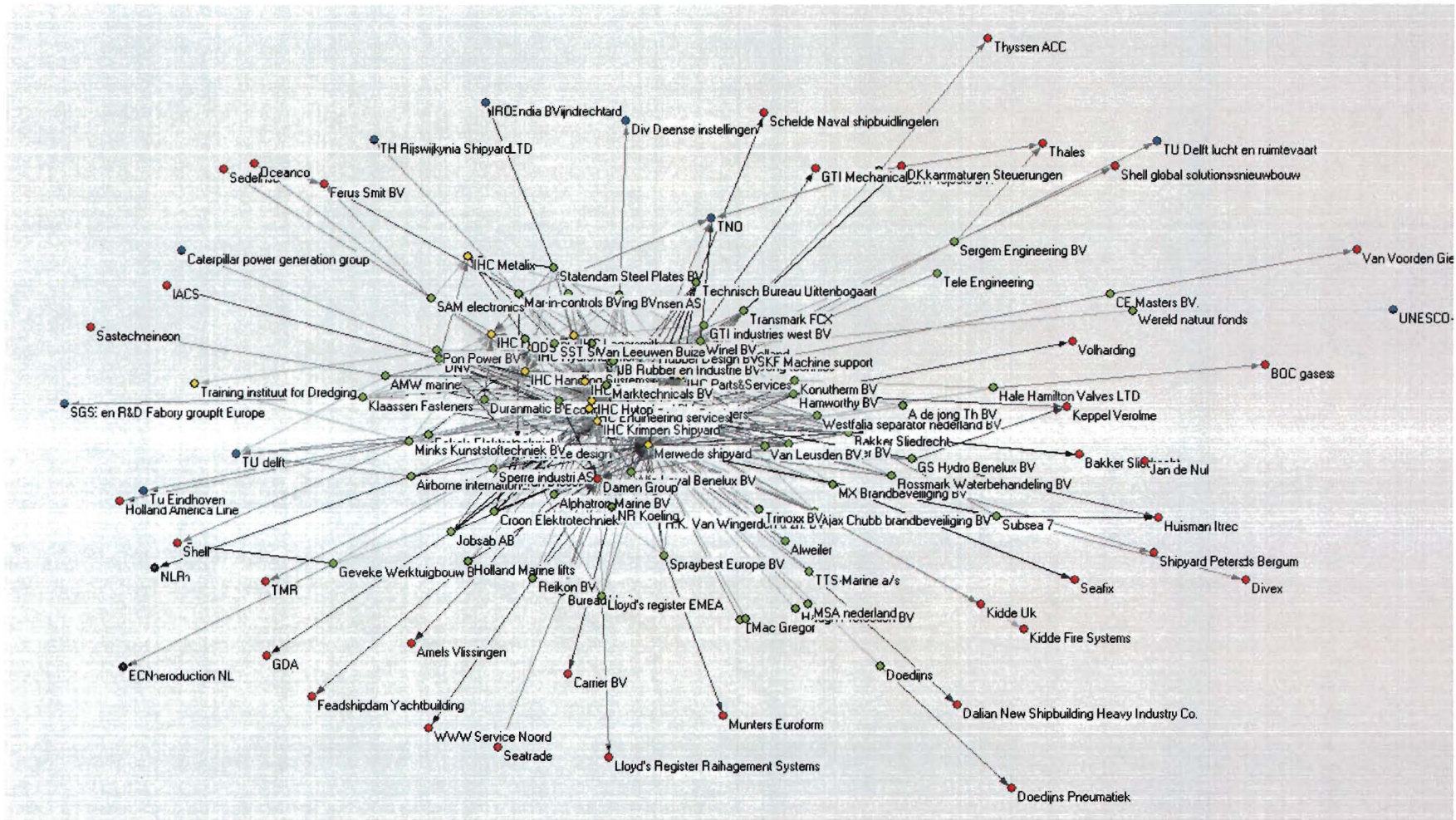








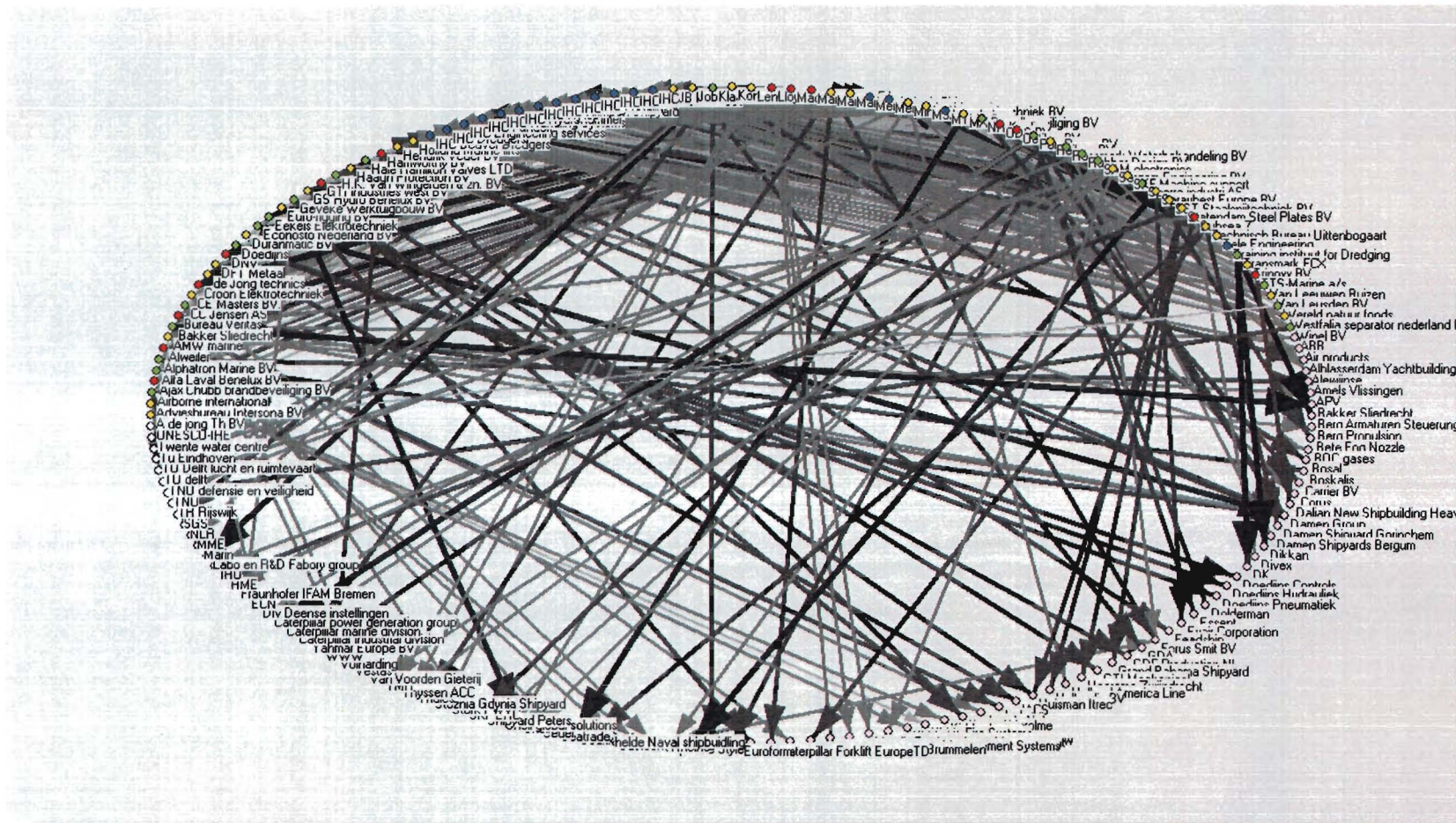




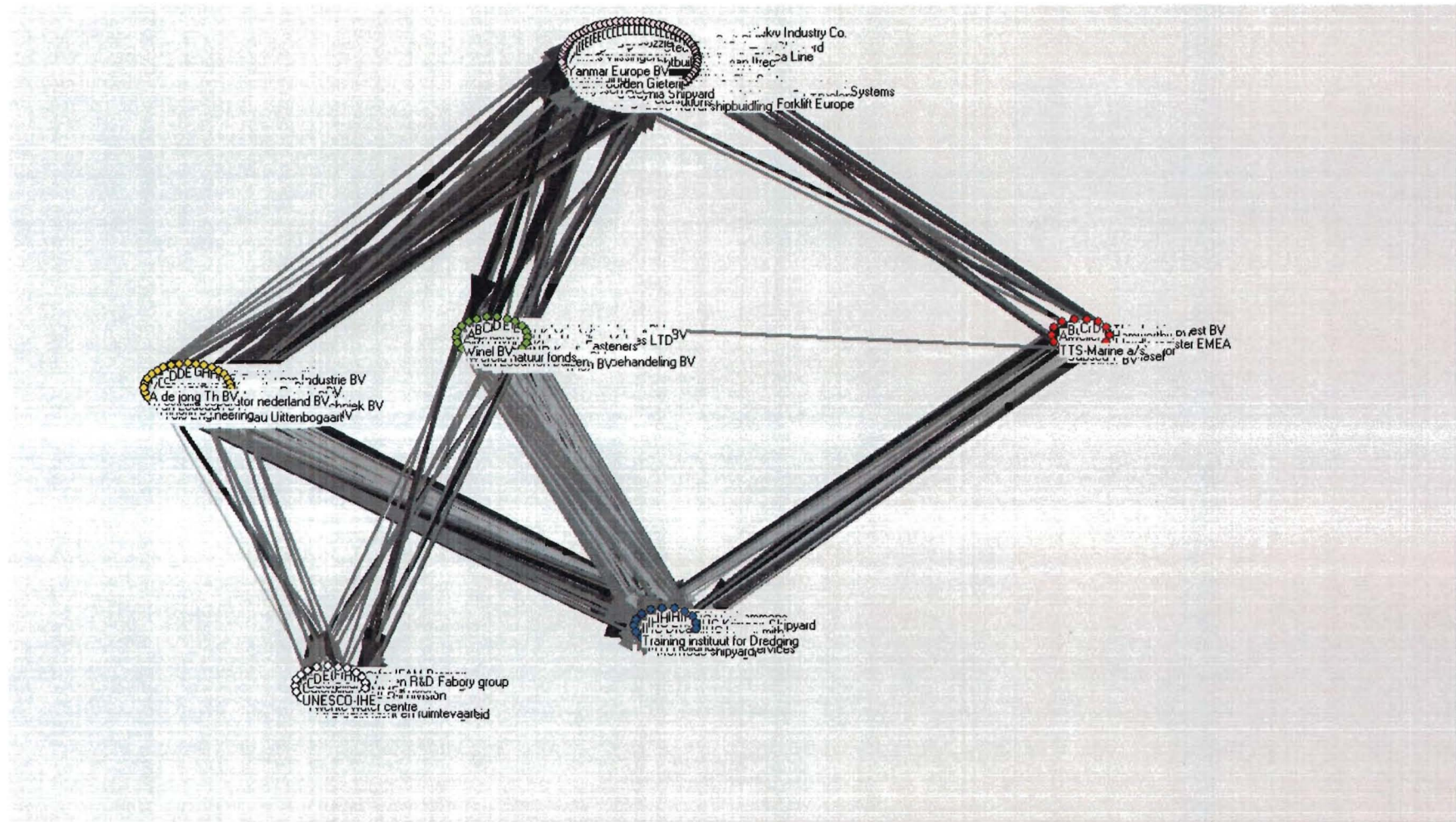


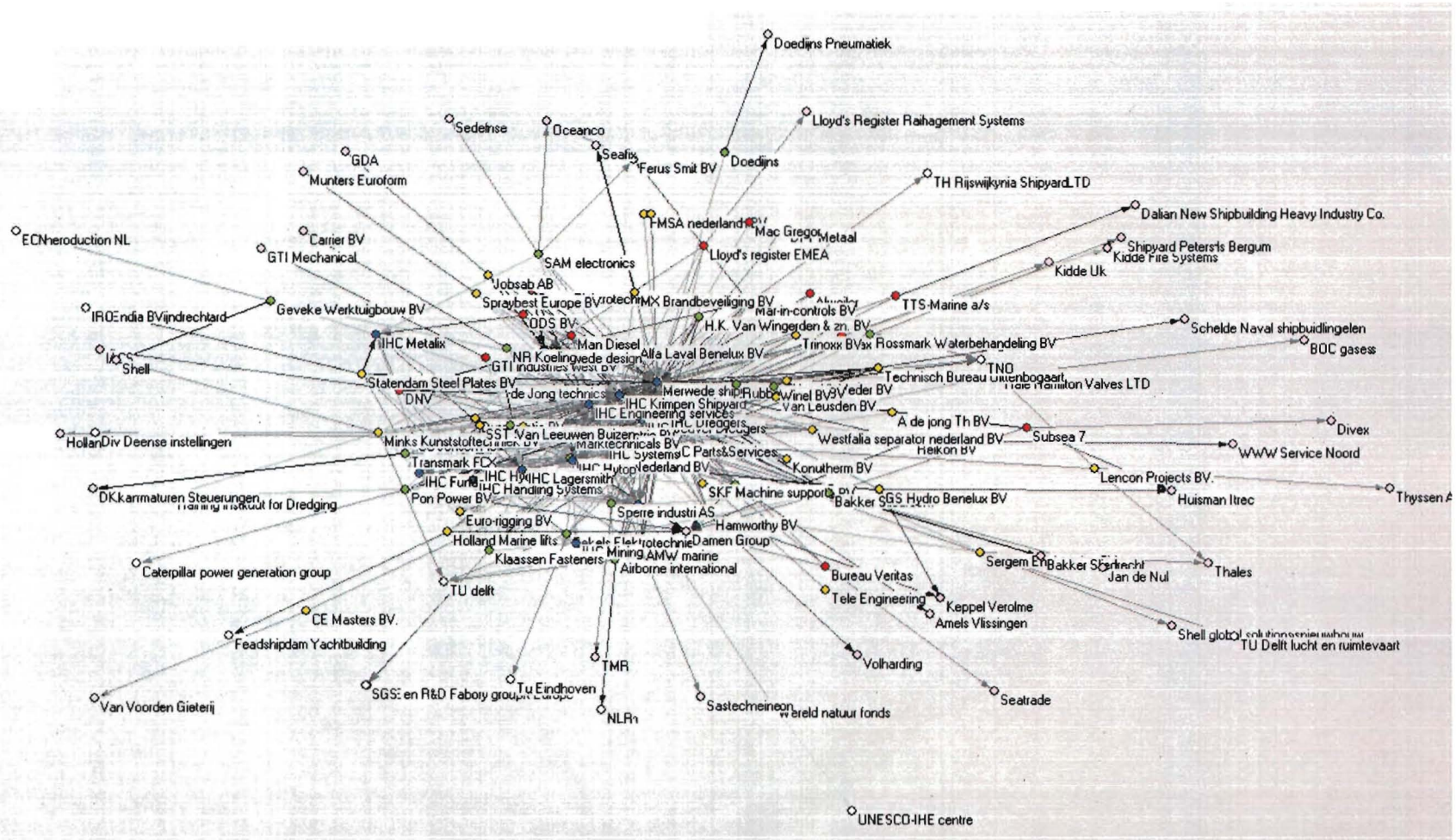


Cluster cross sections on size. Blue=IHC merwede, Red= LE, Yellow=Small, Green= Middle, purple= research, white= unknown









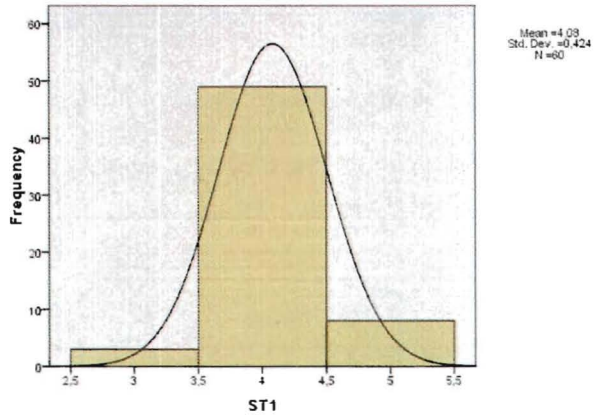
## **Appendix 14: Descriptive statistics in the partner selection model**

**Descriptive Statistics**

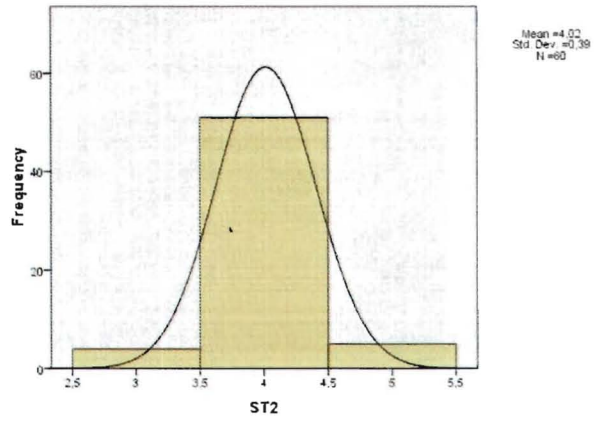
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ST1	60	3	5	4,08	,424	,535	,309	2,546	,608
ST2	60	3	5	4,02	,390	,162	,309	4,084	,608
ST3	59	1	5	3,61	,788	-,706	,311	1,227	,613
ST4	59	1	5	3,63	,828	-,704	,311	,908	,613
ST5	59	1	5	3,66	,843	-,530	,311	,726	,613
STU1	60	3	5	4,07	,362	,900	,309	4,643	,608
STU2	59	1	5	3,49	,817	-,952	,311	1,581	,613
TP1	58	1	5	3,55	,776	-,644	,314	1,158	,618
TP2	59	1	5	3,42	,835	-,579	,311	,208	,613
E1	60	2	5	3,93	,756	-,861	,309	1,171	,608
E2	57	1	5	2,63	1,144	,703	,316	-,427	,623
RD1	58	1	5	3,22	,956	-,222	,314	,214	,618
Valid N (listwise)	55								

# Histogram

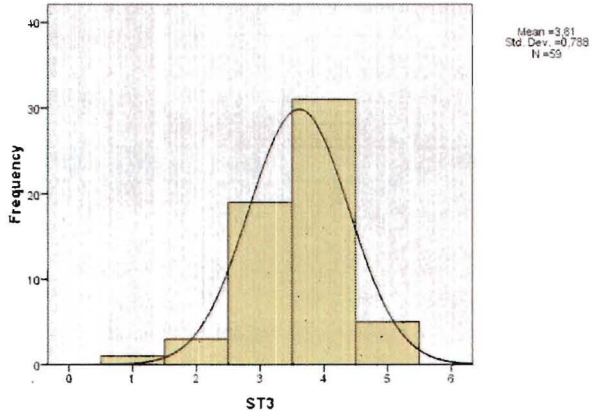
ST1



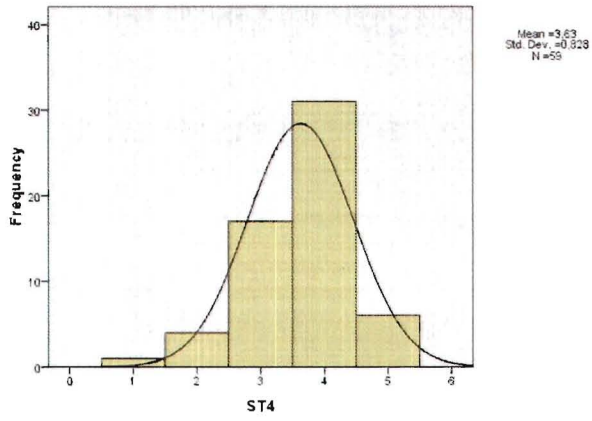
ST2



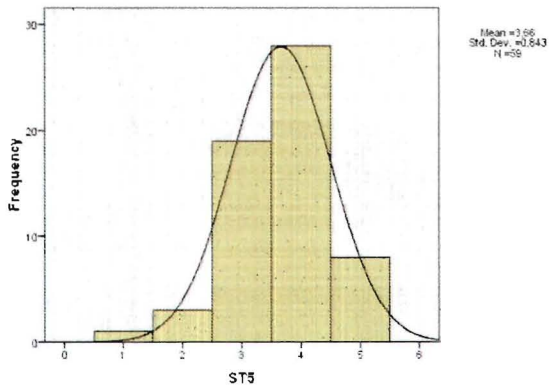
ST3



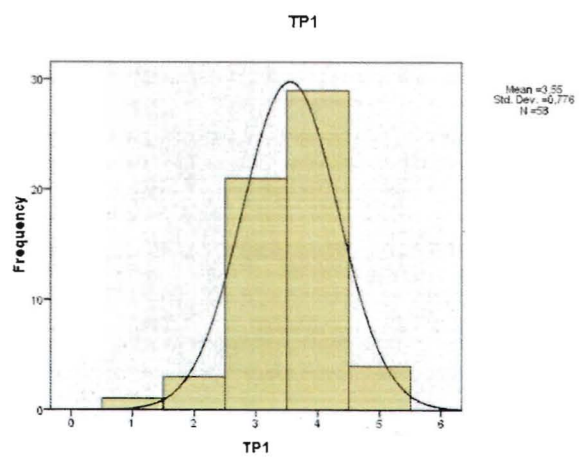
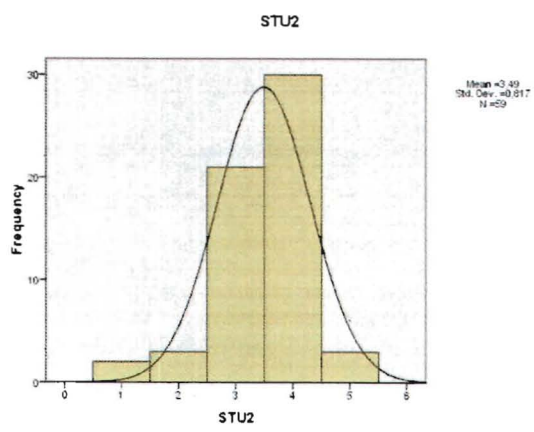
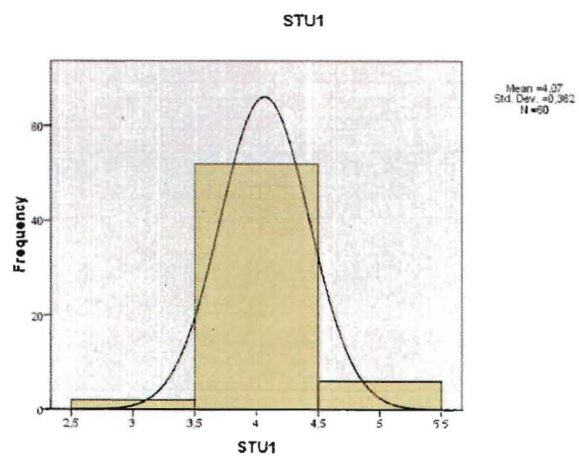
ST4

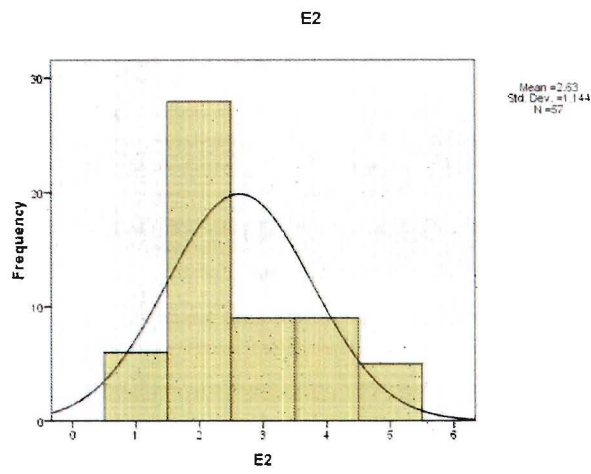
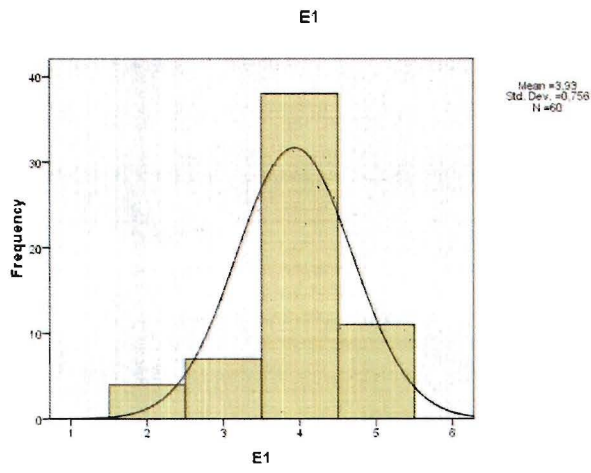
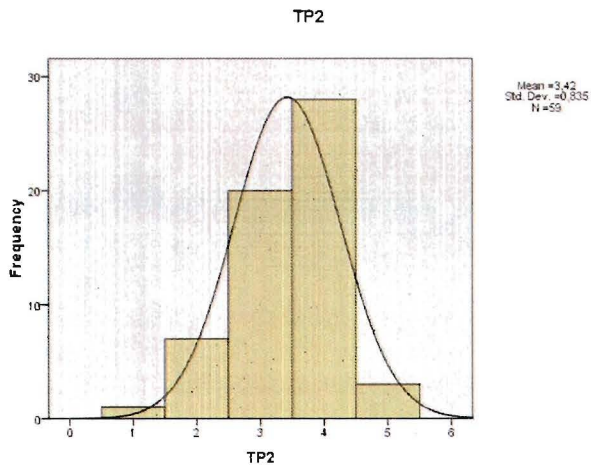


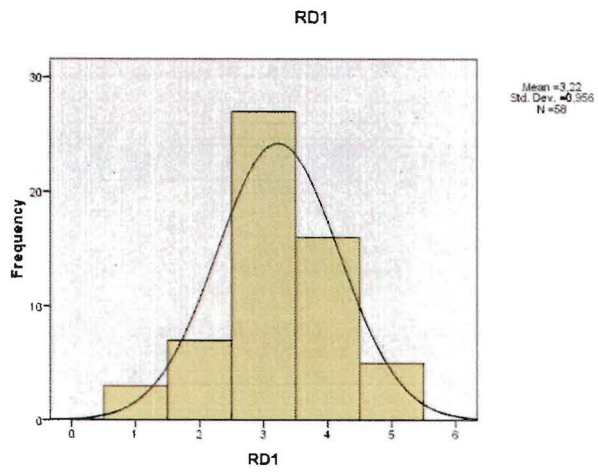
ST5











## **Appendix 15: Reliability statistics company variables**

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	58	95,1
	Excluded <sup>a</sup>	3	4,9
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,493	3

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ST3	7,38	1,678	,183	,603
ST4	7,31	1,446	,364	,304
ST5	7,28	1,361	,403	,230

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	58	95,1
	Excluded <sup>a</sup>	3	4,9
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,503	5

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ST1	15,00	2,912	,334	,437
ST2	15,07	3,153	,197	,493
ST3	15,48	2,359	,246	,477
ST4	15,41	2,247	,337	,402
ST5	15,38	2,240	,325	,412

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	57	93,4
	Excluded <sup>a</sup>	4	6,6
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,609	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	58	95,1
	Excluded <sup>a</sup>	3	4,9
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,582	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	59	96,7
	Excluded <sup>a</sup>	2	3,3
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,003	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	58	95,1
	Excluded <sup>a</sup>	3	4,9
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,503	5



## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	60	98,4
	Excluded <sup>a</sup>	1	1,6
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,784	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	58	95,1
	Excluded <sup>a</sup>	3	4,9
	Total	61	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,718	2

## **Appendix 16: Results factor analysis partner selection**

Correlation Matrix

	I1	I2	S1	S2	ST1	ST2	ST3	ST4	ST5	STU1	STU2	TP1	TP2	E1	E2	RD1
Correlation I1	1,000	,560	,760	,460	-,034	-,037	,038	,121	-,034	-,107	-,076	,085	,185	-,026	,073	,092
I2	,560	1,000	,564	,388	-,160	-,210	,197	,159	,058	-,127	-,101	,076	,228	-,180	,077	-,020
S1	,760	,564	1,000	,645	-,055	-,021	,060	,107	-,094	,010	-,156	-,033	,067	,044	,048	-,096
S2	,460	,388	,645	1,000	-,054	-,233	-,021	,067	-,105	,080	-,174	-,052	,031	-,272	-,031	-,076
ST1	-,034	-,160	-,055	-,054	1,000	,607	,202	,140	,081	,516	,224	,170	,188	,388	,138	,037
ST2	-,037	-,210	-,021	-,233	,607	1,000	,133	,020	-,034	,352	,242	,139	-,022	,521	,170	-,057
ST3	,038	,197	,060	-,021	,202	,133	1,000	,130	,179	,034	,417	,561	,162	,070	-,003	,411
ST4	,121	,159	,107	,067	,140	,020	,130	1,000	,532	-,143	,148	,163	,681	,178	,409	,615
ST5	-,034	,058	-,094	-,105	,081	-,034	,179	,532	1,000	,076	,246	,216	,649	,285	,440	,526
STU1	-,107	-,127	,010	,080	,516	,352	,034	-,143	,076	1,000	,002	,049	,017	,202	-,190	-,194
STU2	-,076	-,101	-,156	-,174	,224	,242	,417	,148	,246	,002	1,000	,275	,271	,110	,091	,329
TP1	,085	,076	-,033	-,052	,170	,139	,561	,163	,216	,049	,275	1,000	,410	,094	,131	,595
TP2	,185	,228	,067	,031	,188	-,022	,162	,681	,649	,017	,271	,410	1,000	,208	,383	,517
E1	-,026	-,180	,044	-,272	,388	,521	,070	,178	,285	,202	,110	,094	,208	1,000	,474	,069
E2	,073	,077	,048	-,031	,138	,170	-,003	,409	,440	-,190	,091	,131	,383	,474	1,000	,218
RD1	,092	-,020	-,096	-,076	,037	-,057	,411	,615	,526	-,194	,329	,595	,517	,069	,218	1,000

**KMO and Bartlett's Test**

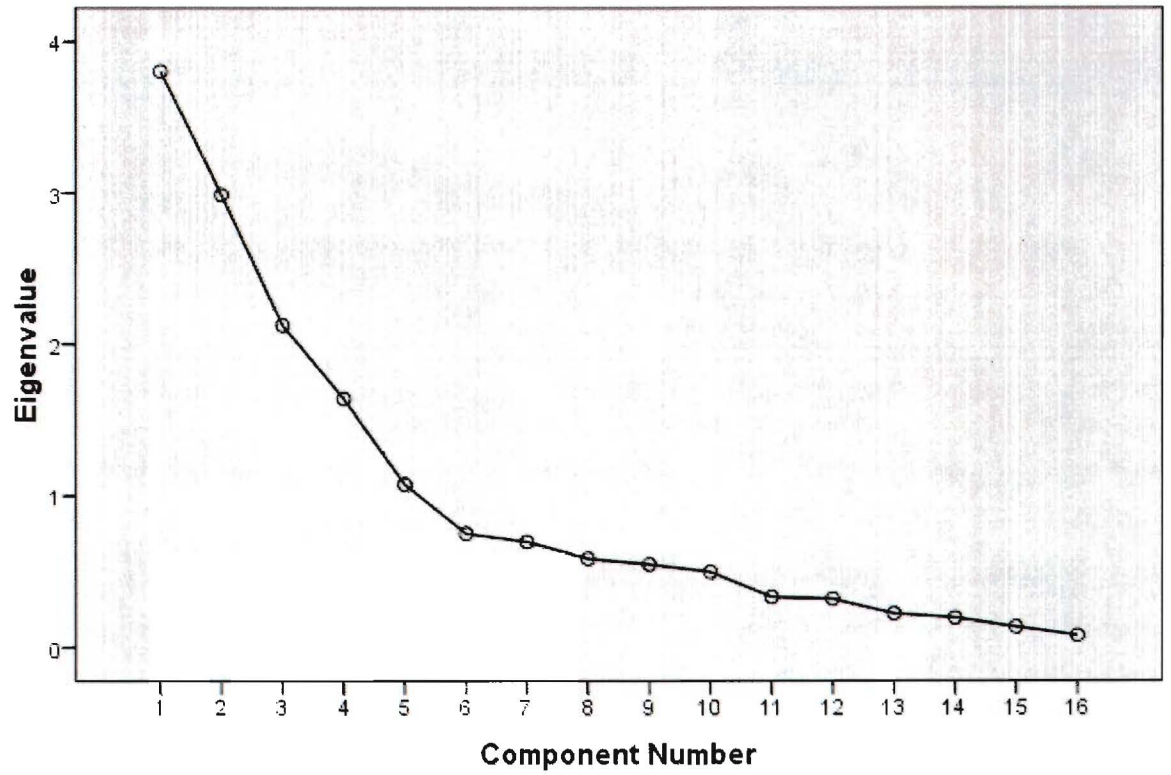
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,570
Bartlett's Test of Sphericity	Approx. Chi-Square	413,776
	df	120,000
	Sig.	,000

**Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,803	23,766	23,766	3,803	23,766	23,766
2	2,988	18,677	42,443	2,988	18,677	42,443
3	2,126	13,287	55,730	2,126	13,287	55,730
4	1,641	10,256	65,987	1,641	10,256	65,987
5	1,076	6,722	72,709	1,076	6,722	72,709
6	,752	4,698	77,407			
7	,697	4,357	81,764			
8	,586	3,660	85,425			
9	,549	3,430	88,855			
10	,498	3,115	91,970			
11	,333	2,083	94,053			
12	,321	2,004	96,058			
13	,223	1,394	97,452			
14	,195	1,218	98,669			
15	,135	,843	99,512			
16	,078	,488	100,000			

Extraction Method: Principal Component Analysis.

Scree Plot



Component Matrix<sup>a</sup>

	Component				
	1	2	3	4	5
I1	,112	,760	,358	,023	-,192
I2	,096	,761	,139	,085	-,080
S1	,003	,775	,499	-,024	-,117
S2	-,113	,701	,294	,062	,288
ST1	,381	-,381	,640	,070	,192
ST2	,275	-,468	,650	,003	-,254
ST3	,489	,030	,044	,678	-,194
ST4	,711	,236	-,171	-,302	,181
ST5	,723	,014	-,218	-,275	,282
STU1	,041	-,301	,616	,130	,605
STU2	,487	-,234	-,043	,381	-,161
TP1	,603	,016	-,047	,535	-,089
TP2	,787	,219	-,108	-,165	,280
E1	,450	-,337	,432	-,403	-,307
E2	,542	,042	,032	-,563	-,332
RD1	,750	,097	-,387	,205	,035

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

## **Appendix 17: Results structural equation model partner selection**



Output first model

DATE: 6/25/2008  
TIME: 23:55

L I S R E L 8.80

BY

Karl G. Jöreskog & Dag Sörbom

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partner.SPJ :

Raw Data from file 'C:\Documents and Settings\bsnoeijs\ben  
reservekopie\afstuderen\data analysis\spss input files\model partner slection\lisrel\v0.2  
partner.psf'

Latent Variables intensity performance strategy technology education research

Relationships

I1 = intensity

I2 = intensity

S1 = performance

S2 = performance

ST3 = strategy

ST4 = strategy

ST5 = strategy

TP1 = technology

TP2 = technology

E1 = education

E2 = education  
 RD1 = research  
 Path Diagram  
 End of Problem

Sample Size = 53

Covariance Matrix

	I1	I2	S1	S2	ST3	ST4
I1	0.80					
I2	0.45	0.78				
S1	0.65	0.50	0.90			
S2	0.34	0.32	0.55	0.72		
ST3	0.01	0.15	0.04	-0.06	0.62	
ST4	0.05	0.13	0.05	0.00	0.13	0.57
ST5	-0.07	0.03	-0.11	-0.19	0.13	0.29
TP1	0.08	0.02	0.00	-0.03	0.38	0.14
TP2	0.12	0.15	0.04	-0.02	0.13	0.39
E1	-0.03	-0.12	0.01	-0.19	0.07	0.11
E2	0.04	0.07	0.01	-0.08	-0.02	0.35
RD1	0.06	-0.05	-0.10	-0.13	0.32	0.43

Covariance Matrix

	ST5	TP1	TP2	E1	E2	RD1
ST5	0.63					
TP1	0.12	0.60				
TP2	0.37	0.23	0.60			
E1	0.20	0.07	0.13	0.60		
E2	0.37	0.10	0.28	0.40	1.24	
RD1	0.34	0.42	0.32	0.07	0.19	0.87

Number of Iterations = 38

LISREL Estimates (Maximum Likelihood)

Standard Errors, T-Values, Modification Indices,  
 and Standardized Residuals cannot be computed.

Measurement Equations

Correlation Matrix of Independent Variables

	intensit	performa	strategy	technolo	educatio	research
intensit	1.00					
performa	0.80	1.00				
strategy	0.04	0.02	1.00			
technolo	0.20	0.06	0.91	1.00		
educatio	0.04	0.03	0.64	0.37	1.00	
research	0.06	-0.09	0.81	0.43	0.21	1.00

### Goodness of Fit Statistics

Degrees of Freedom = 39

Minimum Fit Function Chi-Square = 98.97 (P = 0.00)

Normal Theory Weighted Least Squares Chi-Square = 81.19 (P = 0.00)

Estimated Non-centrality Parameter (NCP) = 42.19

90 Percent Confidence Interval for NCP = (20.15 ; 72.00)

Minimum Fit Function Value = 1.90

Population Discrepancy Function Value (F0) = 0.81

90 Percent Confidence Interval for F0 = (0.39 ; 1.38)

Root Mean Square Error of Approximation (RMSEA) = 0.14

90 Percent Confidence Interval for RMSEA = (0.100 ; 0.19)

P-Value for Test of Close Fit (RMSEA < 0.05) = 0.00097

Expected Cross-Validation Index (ECVI) = 3.06

90 Percent Confidence Interval for ECVI = (2.64 ; 3.63)

ECVI for Saturated Model = 3.00

ECVI for Independence Model = 7.09

Chi-Square for Independence Model with 66 Degrees of Freedom = 344.62

Independence AIC = 368.62

Model AIC = 159.19

Saturated AIC = 156.00

Independence CAIC = 404.26

Model CAIC = 275.03

Saturated CAIC = 387.68

Normed Fit Index (NFI) = 0.76

Non-Normed Fit Index (NNFI) = 0.74

Parsimony Normed Fit Index (PNFI) = 0.45

Comparative Fit Index (CFI) = 0.85

Incremental Fit Index (IFI) = 0.86

Relative Fit Index (RFI) = 0.60

Critical N (CN) = 40.98

Root Mean Square Residual (RMR) = 0.077

Standardized RMR = 0.11

Goodness of Fit Index (GFI) = 0.79

Adjusted Goodness of Fit Index (AGFI) = 0.59

Parsimony Goodness of Fit Index (PGFI) = 0.40

Time used: 0.047 Seconds

Second model missing value  
DATE: 6/ 1/2008  
TIME: 8:55

L I S R E L 8.80

BY

Karl G. Jöreskog & Dag Sörbom

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Settings\Ben\Desktop\TUE\master thesis\data analysis\spss input files\model partner  
slection\lisrel\0.12.SPJ :

Raw Data from file 'C:\Documents and Settings\Ben\Desktop\TUE\master thesis\data  
analysis\spss input files\model partner slection\lisrel\0.1 partner.psf'

-----  
EM Algorithm for missing Data:  
-----

Number of different missing-value patterns= 7  
Convergence of EM-algorithm in 7 iterations  
-2 Ln(L) = 1431.02564  
Percentage missing values= 3.28

Note:

The Covariances and/or Means to be analyzed are estimated  
by the EM procedure and are only used to obtain starting  
values for the FIML procedure

Latent Variables intensity performance strategy education technology research  
Relationships

I1 = intensity  
 I2 = intensity  
 S1 = performance  
 S2 = performance  
 ST3 = strategy  
 ST4 = strategy  
 ST5 = strategy  
 E1 = education  
 E2 = education  
 TP1 = technology research  
 TP2 = technology  
 RD1 = research  
 intensity = strategy  
 performance = intensity strategy  
 strategy = education  
 education = strategy  
 strategy = technology research  
 education = technology  
 Path Diagram  
 End of Problem

Sample Size = 61

Covariance Matrix

	I1	I2	S1	S2	ST3	ST4
I1	0.80					
I2	0.44	0.75				
S1	0.64	0.46	0.85			
S2	0.37	0.29	0.52	0.75		
ST3	0.03	0.14	0.04	-0.01	0.62	
ST4	0.10	0.12	0.09	0.05	0.08	0.69
ST5	-0.02	0.04	-0.07	-0.07	0.11	0.37
E1	-0.02	-0.11	0.03	-0.18	0.04	0.11
E2	0.08	0.11	0.07	-0.05	-0.05	0.41
TP1	0.08	0.05	-0.01	-0.01	0.34	0.12
TP2	0.15	0.18	0.06	0.03	0.10	0.47
RD1	0.09	-0.01	-0.07	-0.05	0.29	0.48

Covariance Matrix

	ST5	E1	E2	TP1	TP2	RD1
ST5	0.71					
E1	0.18	0.57				
E2	0.43	0.42	1.34			
TP1	0.16	0.05	0.12	0.60		
TP2	0.46	0.13	0.38	0.27	0.70	
RD1	0.42	0.05	0.23	0.44	0.41	0.90

Number of Iterations = 50

Correlation Matrix of Independent Variables

	technolo	research
technolo	1.00	
research	0.23 (0.08) 2.89	1.00

Covariance Matrix of Latent Variables

	intensit	performa	strategy	educatio	technolo	research
intensit	0.98					
performa	0.85	0.98				
strategy	0.14	0.00	0.53			
educatio	0.11	0.00	0.43	0.95		
technolo	0.16	0.00	0.59	0.32	1.00	
research	0.08	0.00	0.31	0.10	0.23	1.00

Global Goodness of Fit Statistics, Missing Data Case

-2ln(L) for the saturated model = 1431.026  
-2ln(L) for the fitted model = 1500.842

Degrees of Freedom = 44  
Full Information ML Chi-Square = 69.82 (P = 0.0079)  
Root Mean Square Error of Approximation (RMSEA) = 0.098  
90 Percent Confidence Interval for RMSEA = (0.051 ; 0.14)  
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.048

The Modification Indices Suggest to Add an Error Covariance

	Between	and	Decrease in Chi-Square	New Estimate
E1	S2		9.6	-0.17
TP1	ST3		14.6	0.22

Time used: 0.141 Seconds



Second model without missing values deleted list wise

DATE: 6/26/2008  
TIME: 0:05

L I S R E L 8.80

BY

Karl G. Jöreskog & Dag Sörbom

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slection\lisrel\0.32.SPJ :

Raw Data from file 'C:\Documents and Settings\bsnoeijs\ben  
reservekopie\afstuderen\data analysis\spss input files\model partner slection\lisrel\v0.2  
partner.psf'

Latent Variables intensity performance strategy education technology research  
Relationships  
I1 = intensity  
I2 = intensity  
S1 = performance  
S2 = performance  
ST3 = strategy  
ST4 = strategy  
ST5 = strategy  
E1 = education  
E2 = education  
TP1 = technology research  
TP2 = technology  
RD1 = research  
intensity = strategy

performance = intensity strategy  
 strategy = education  
 education = strategy  
 strategy = technology research  
 education = technology  
 Path Diagram  
 End of Problem

Sample Size = 53

Covariance Matrix

	I1	I2	S1	S2	ST3	ST4
I1	0.80					
I2	0.45	0.78				
S1	0.65	0.50	0.90			
S2	0.34	0.32	0.55	0.72		
ST3	0.01	0.15	0.04	-0.06	0.62	
ST4	0.05	0.13	0.05	0.00	0.13	0.57
ST5	-0.07	0.03	-0.11	-0.19	0.13	0.29
E1	-0.03	-0.12	0.01	-0.19	0.07	0.11
E2	0.04	0.07	0.01	-0.08	-0.02	0.35
TP1	0.08	0.02	0.00	-0.03	0.38	0.14
TP2	0.12	0.15	0.04	-0.02	0.13	0.39
RD1	0.06	-0.05	-0.10	-0.13	0.32	0.43

Covariance Matrix

	ST5	E1	E2	TP1	TP2	RD1
ST5	0.63					
E1	0.20	0.60				
E2	0.37	0.40	1.24			
TP1	0.12	0.07	0.10	0.60		
TP2	0.37	0.13	0.28	0.23	0.60	
RD1	0.34	0.07	0.19	0.42	0.32	0.87

Correlation Matrix of Independent Variables

	technolo	research
technolo	1.00	
research	0.26 (0.08)	1.00

Covariance Matrix of Latent Variables

	intensit	performa	strategy	educatio	technolo	research
intensit	1.00					
performa	0.86	1.00				
strategy	0.16	-0.02	1.00			
educatio	0.10	-0.02	0.63	1.00		
technolo	0.12	-0.02	0.77	0.29	1.00	
research	0.10	-0.02	0.61	0.14	0.26	1.00

## Goodness of Fit Statistics

Degrees of Freedom = 44

Minimum Fit Function Chi-Square = 82.86 (P = 0.00036)

Normal Theory Weighted Least Squares Chi-Square = 63.06 (P = 0.031)

Estimated Non-centrality Parameter (NCP) = 19.06

90 Percent Confidence Interval for NCP = (1.89 ; 44.24)

Minimum Fit Function Value = 1.59

Population Discrepancy Function Value (F0) = 0.37

90 Percent Confidence Interval for F0 = (0.036 ; 0.85)

Root Mean Square Error of Approximation (RMSEA) = 0.091

90 Percent Confidence Interval for RMSEA = (0.029 ; 0.14)

P-Value for Test of Close Fit (RMSEA &lt; 0.05) = 0.11

Expected Cross-Validation Index (ECVI) = 2.52

90 Percent Confidence Interval for ECVI = (2.19 ; 3.00)

ECVI for Saturated Model = 3.00

ECVI for Independence Model = 7.09

Chi-Square for Independence Model with 66 Degrees of Freedom = 344.62

Independence AIC = 368.62

Model AIC = 131.06

Saturated AIC = 156.00

Independence CAIC = 404.26

Model CAIC = 232.05

Saturated CAIC = 387.68

Normed Fit Index (NFI) = 0.82

Non-Normed Fit Index (NNFI) = 0.90

Parsimony Normed Fit Index (PNFI) = 0.54

Comparative Fit Index (CFI) = 0.93

Incremental Fit Index (IFI) = 0.94

Relative Fit Index (RFI) = 0.73

Critical N (CN) = 57.66

Root Mean Square Residual (RMR) = 0.073

Standardized RMR = 0.11

Goodness of Fit Index (GFI) = 0.83

Adjusted Goodness of Fit Index (AGFI) = 0.70

Parsimony Goodness of Fit Index (PGFI) = 0.47

Time used: 0.047 Seconds

## **Appendix 18: Descriptive statistics of variables in the success model**

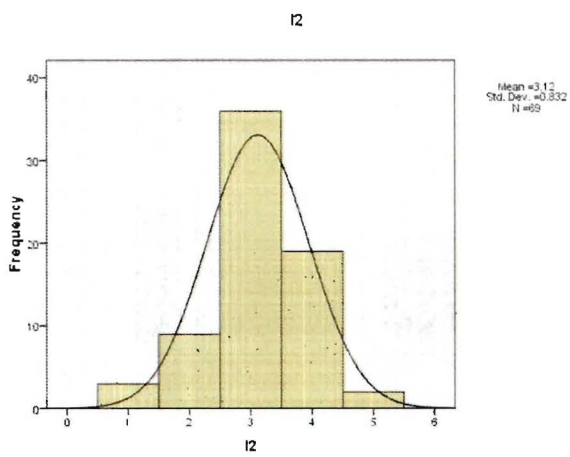
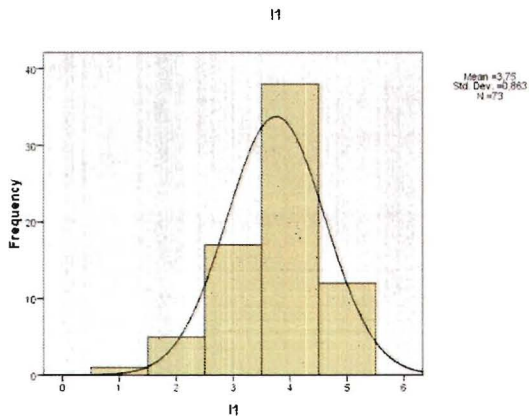
**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
I1	73	1	5	3,75	,863	,744	-,696	,281	,672	,555
I2	69	1	5	3,12	,832	,692	-,381	,289	,581	,570
S1	69	1	5	3,52	,901	,812	-,874	,289	1,122	,570
S2	69	1	5	3,64	,857	,734	-1,093	,289	1,527	,570
G1	68	1	4	2,15	,902	,814	,204	,291	-,892	,574
G2	69	1	4	2,55	,718	,516	-1,041	,289	,120	,570
RI1	68	1	4	2,65	,748	,560	-,414	,291	,033	,574
RI2	67	1	4	2,58	,781	,611	-,281	,293	-,232	,578
RI3	67	1	4	2,57	,701	,492	,026	,293	-,179	,578
GS1	71	2	5	3,52	,673	,453	-,513	,285	-,082	,563
GS2	70	2	5	3,47	,812	,659	-,408	,287	-,493	,566
GS3	69	2	5	3,35	,638	,407	-,103	,289	-,285	,570
GS4	72	1	5	3,40	,867	,751	-,359	,283	,489	,559
GS5	70	1	5	3,19	,873	,762	-,106	,287	,119	,566
GS6	69	1	5	3,59	,773	,598	-,522	,289	1,007	,570
ID1	72	2	5	3,60	,643	,413	-,702	,283	,269	,559
ID2	70	3	5	4,03	,659	,434	-,030	,287	-,623	,566

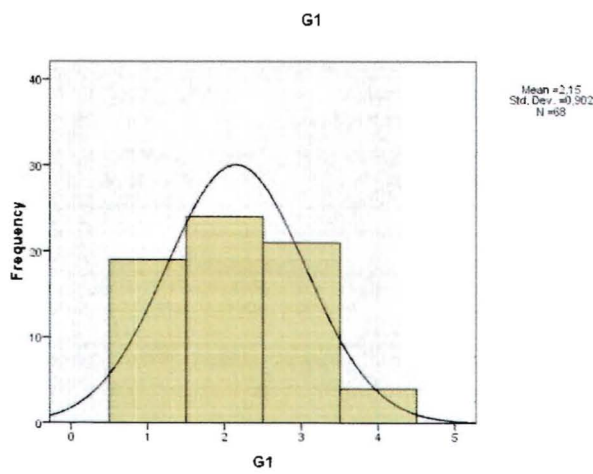
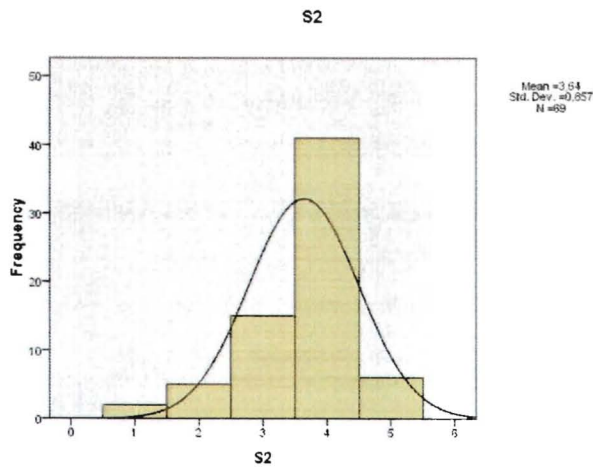
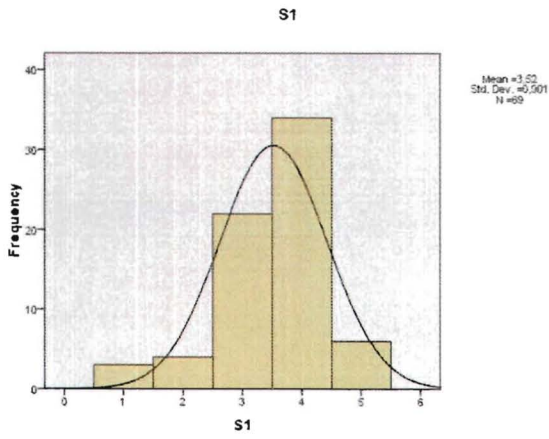
## Ben Snoeijs

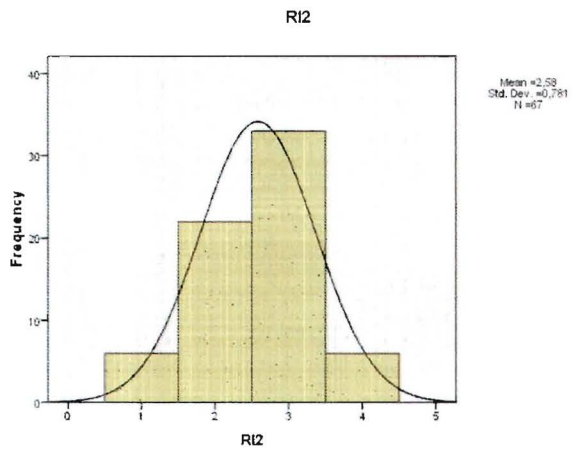
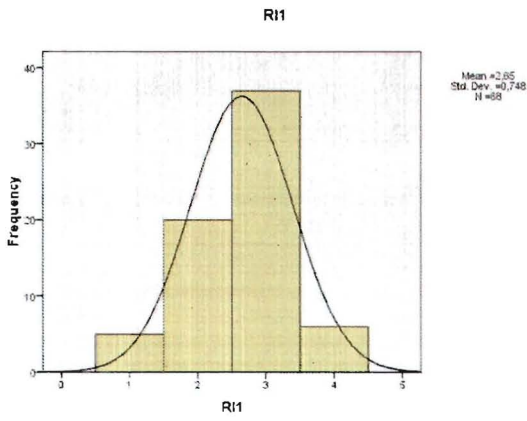
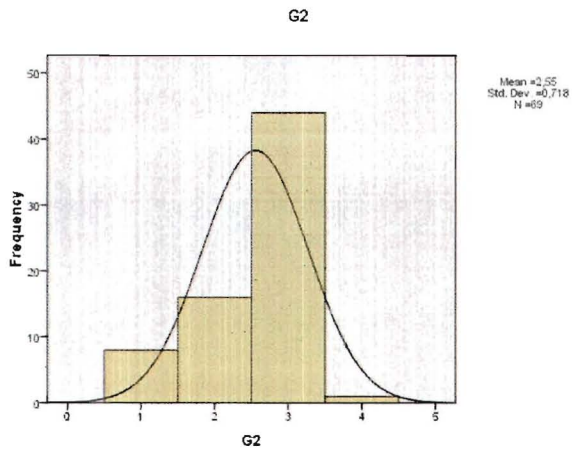
C1	70	1	5	3,41,752	,565	-,437,287	,698	,566
C2	70	1	5	3,46,863	,745	-,770,287	,605	,566
F1	67	1	5	3,30,759	,576	-,994,293	2,075	,578
F2	71	1	5	3,04,836	,698	-,232,285	,380	,563
T1	71	2	5	3,80,786	,618	-,541,285	,200	,563
T2	71	1	5	3,30,684	,468	-,455,285	,910	,563
CC1	72	1	5	3,74,787	,620	-,917,283	1,569	,559
CC2	71	2	5	3,66,608	,370	-,850,285	,707	,563
CC3	71	2	5	3,75,712	,506	-,812,285	,867	,563
CU1	72	2	5	3,24,813	,662	-,141,283	-,891	,559
CU2	71	2	5	3,80,646	,418	-,444,285	,670	,563
Valid N (listwise)	60							

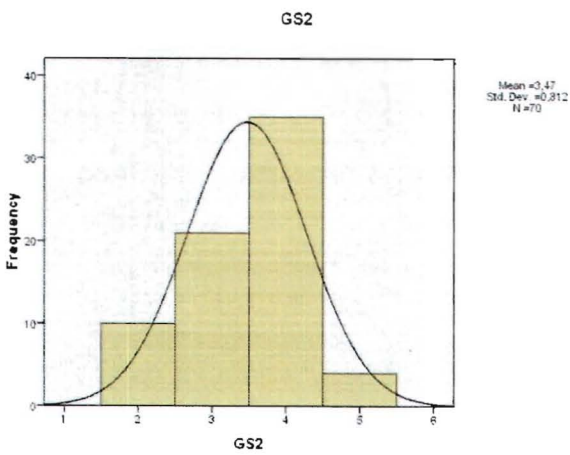
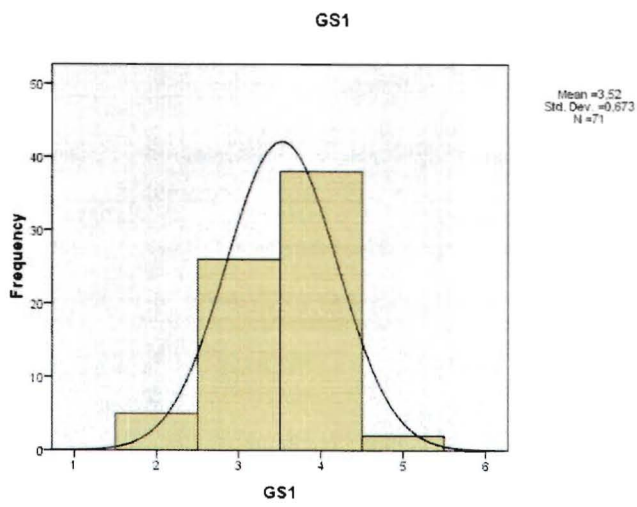
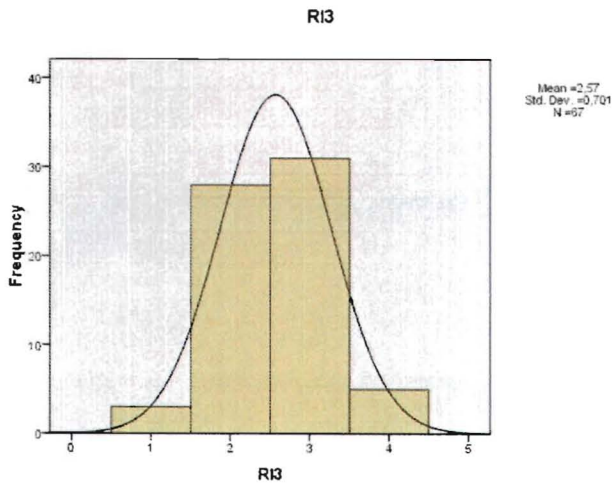
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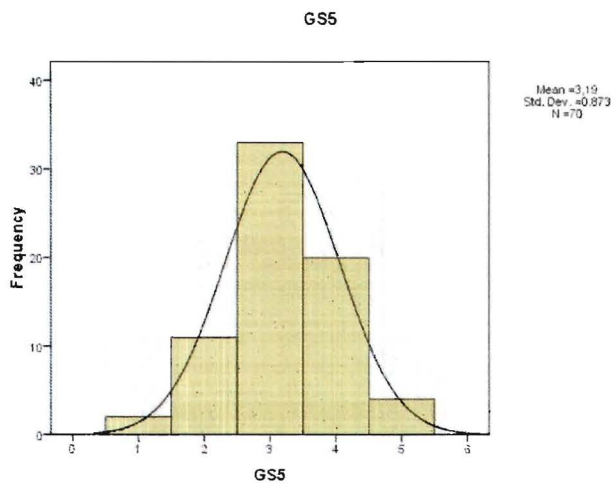
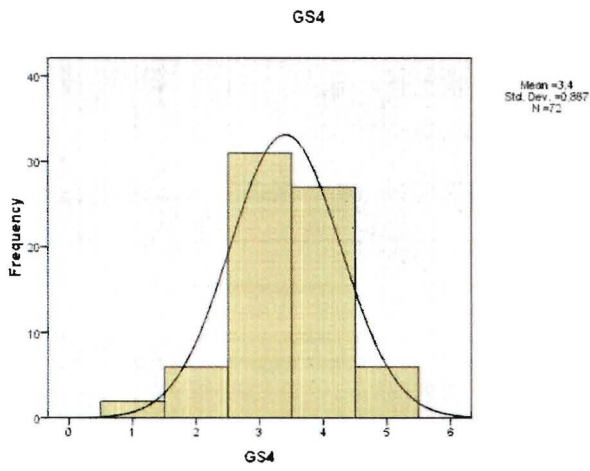
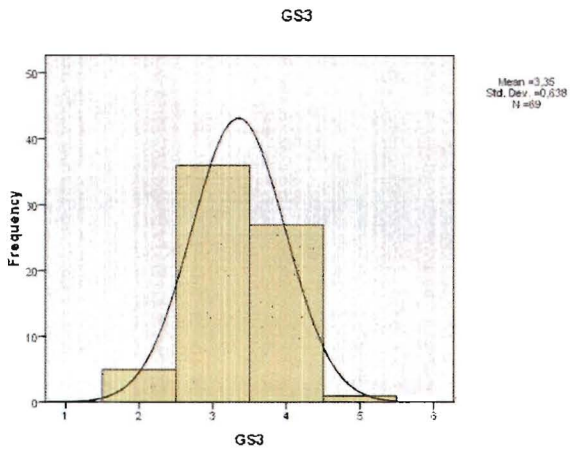


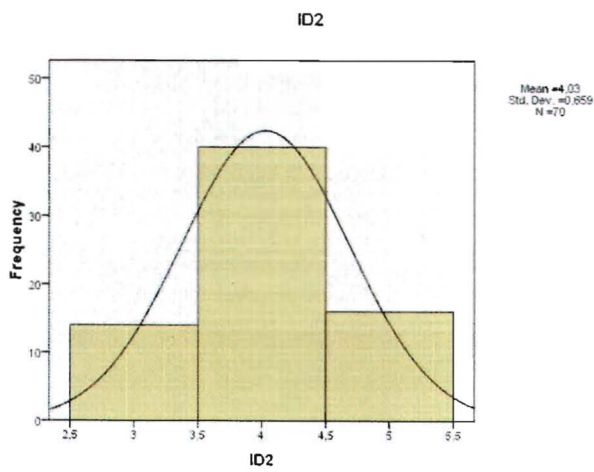
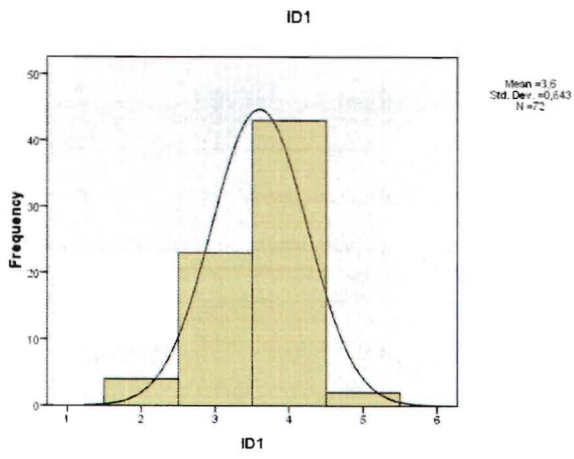
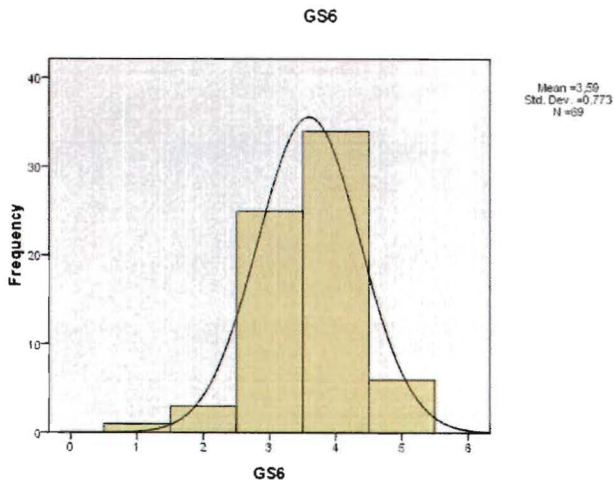


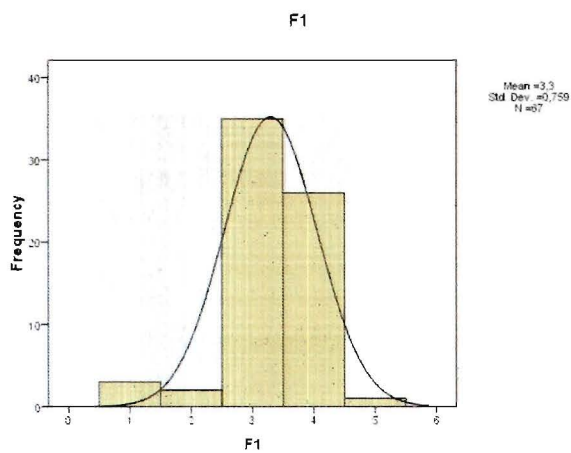
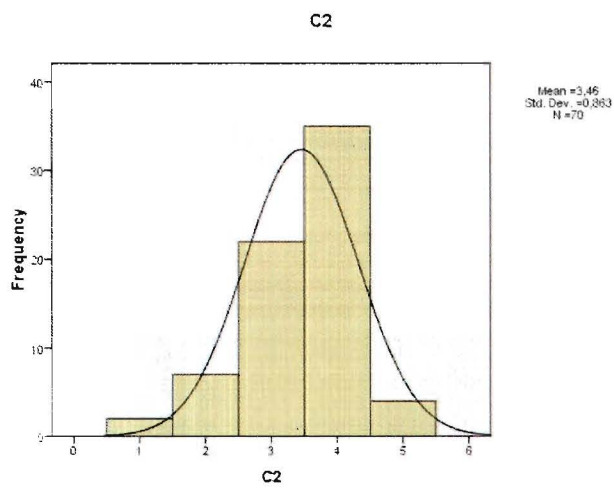
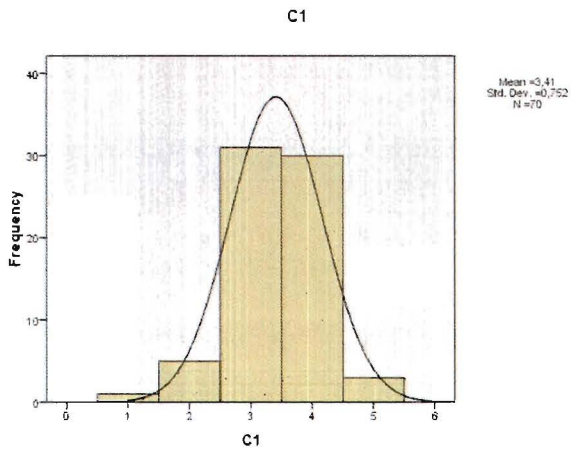


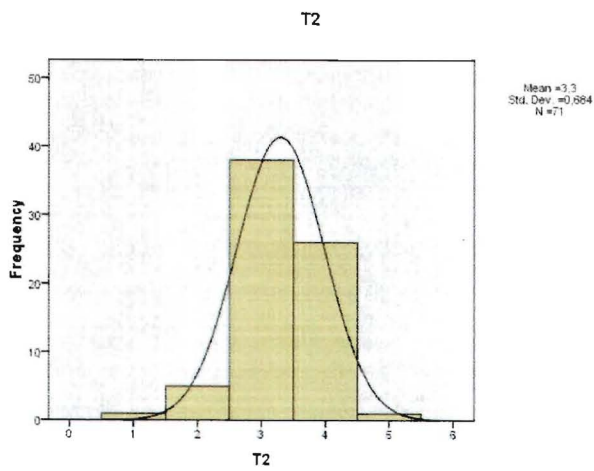
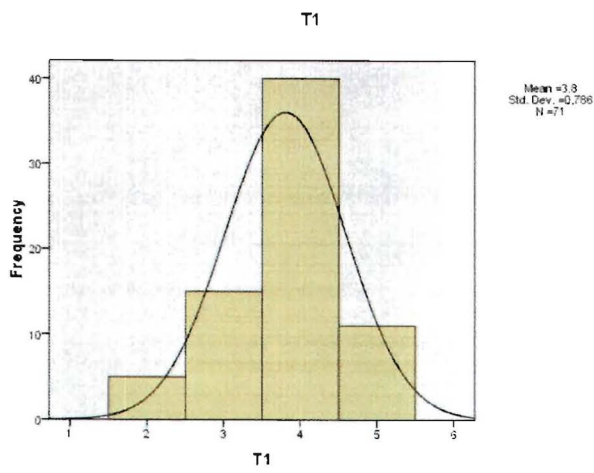
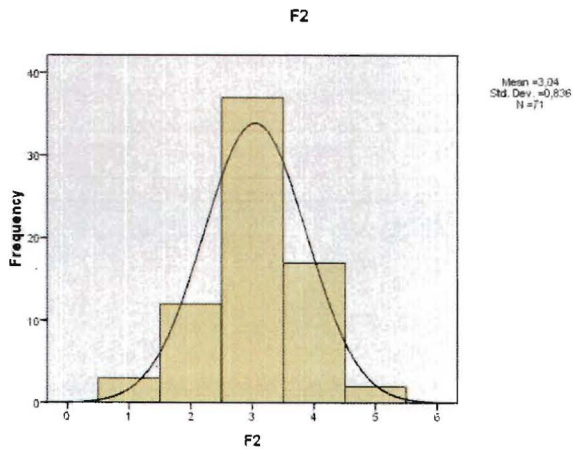


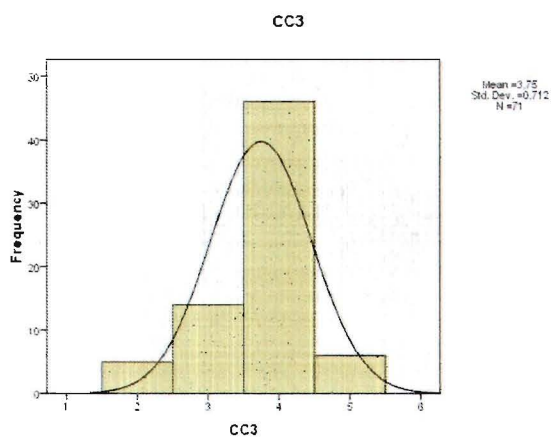
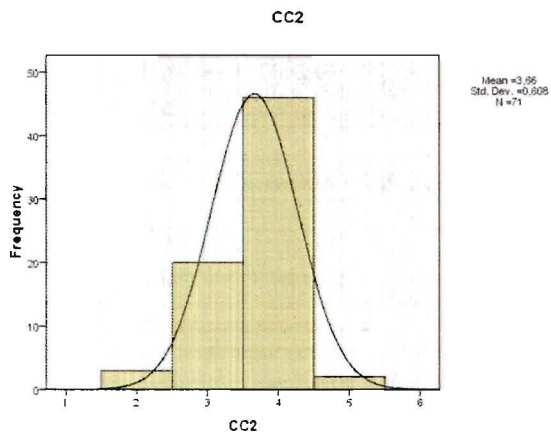
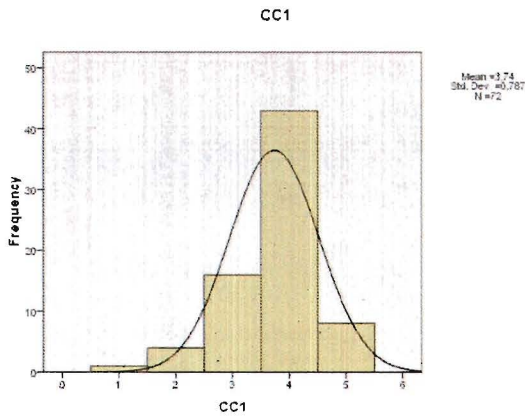






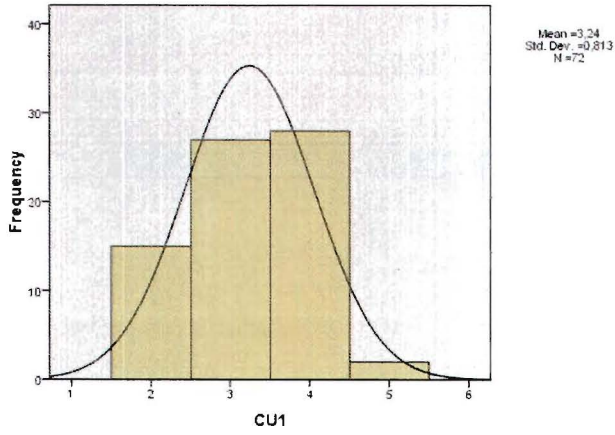




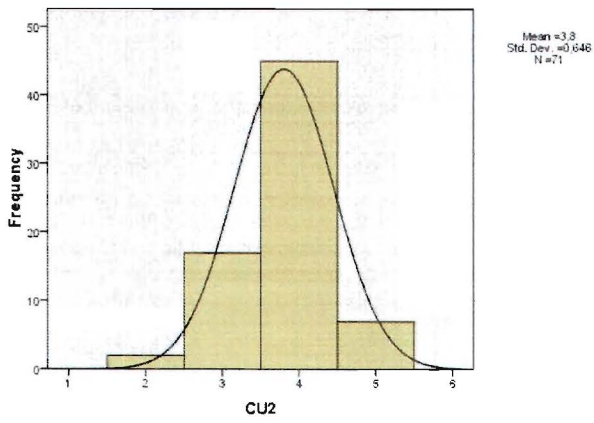




CU1



CU2



## Appendix 19: Reliability statistics variables performance

**Reliability Statistics**

Cronbach's Alpha	N of Items
,870	28

**Case Processing Summary**

		N	%
Cases	Valid	60	76,9
	Excluded <sup>a</sup>	18	23,1
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
I1	89,62	91,190	,697	,857
I2	90,25	95,343	,473	,864
S1	89,88	91,393	,673	,857
S2	89,73	95,555	,455	,864
G1	91,25	102,394	,023	,877
G2	90,93	105,962	-,189	,880
RI1	90,73	99,182	,264	,869
RI2	90,80	102,231	,052	,875
RI3	90,83	103,090	,004	,875
GS1	89,95	95,675	,595	,861
GS2	89,97	100,609	,142	,873
GS3	90,13	96,897	,530	,863
GS4	89,95	92,048	,684	,858
GS5	90,27	96,945	,364	,867
GS6	89,83	91,734	,728	,856
ID1	89,77	98,690	,383	,866
ID2	89,35	98,062	,395	,866
C1	89,98	94,254	,593	,861
C2	89,93	92,741	,621	,859
F1	90,17	98,887	,283	,869
F2	90,38	103,427	-,030	,878
T1	89,62	91,664	,744	,856
T2	90,07	98,673	,365	,867
CC1	89,65	92,469	,719	,857
CC2	89,78	96,240	,562	,862
CC3	89,67	93,006	,749	,857
CU1	90,17	97,226	,338	,868
CU2	89,58	96,586	,506	,863

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	71	91,0
	Excluded <sup>a</sup>	7	9,0
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,503	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	70	89,7
	Excluded <sup>a</sup>	8	10,3
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,816	3

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	70	89,7
	Excluded <sup>a</sup>	8	10,3
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,526	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	67	85,9
	Excluded <sup>a</sup>	11	14,1
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,133	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	68	87,2
	Excluded <sup>a</sup>	10	12,8
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,765	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	70	89,7
	Excluded <sup>a</sup>	8	10,3
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,053	2

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	65	83,3
	Excluded <sup>a</sup>	13	16,7
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,718	6

## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	66	84,6
	Excluded <sup>a</sup>	12	15,4
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,616	3



## Reliability

**Case Processing Summary**

		N	%
Cases	Valid	67	85,9
	Excluded <sup>a</sup>	11	14,1
	Total	78	100,0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
,560	2

## **Appendix 20: Results factor analysis success factors**

Correlation Matrix

	I1	I2	S1	S2	G1	G2	RI1	RI2	RI3	GS1	GS2	ID1	ID2	C2	T1	GS3	GS4	GS5	GS6	C1	F1	T2	CC1	CC3	CC2	CU1	CU2	F2	
Correlabon	I1	1,000	,551	,754	,443	-,016	-,281	,159	,075	-,074	,297	,224	,248	,218	,498	,575	,430	,375	,194	,498	,353	,120	,190	,568	,638	,416	,386	,361	,054
	I2	,551	1,000	,586	,403	-,075	-,373	-,054	,105	-,185	,348	,000	,186	,323	,431	,380	,379	,438	,279	,435	,300	,081	,246	,414	,434	,242	,362	,325	-,095
	S1	,754	,586	1,000	,648	,011	-,144	,171	-,011	-,100	,334	,012	,255	,438	,606	,537	,396	,463	,216	,591	,420	,199	,160	,527	,597	,395	,230	,447	,086
	S2	,443	,403	,648	1,000	,131	-,099	,261	,153	-,056	,161	,132	,218	,187	,306	,368	,195	,406	-,041	,254	,298	,278	,034	,452	,415	,230	,141	,377	,022
	G1	-,016	-,075	,011	,131	1,000	,398	,410	,401	,282	-,024	-,319	,000	-,038	-,024	-,109	-,087	,074	,018	-,022	,217	,131	,046	-,105	-,086	-,227	-,124	-,057	-,260
	G2	-,281	-,373	-,144	-,099	,398	1,000	,340	,055	,465	-,076	-,232	-,176	-,178	-,127	-,185	-,187	-,160	-,059	-,106	,037	,109	-,058	-,269	-,234	-,132	-,392	-,251	-,076
	RI1	,159	-,054	,171	,261	,410	,340	1,000	,254	,545	-,088	-,139	,111	,062	,022	,096	-,021	,149	,067	,089	,298	,364	-,113	,118	,015	-,048	-,065	,090	,017
	RI2	,075	,105	-,011	,153	,401	,055	,254	1,000	,273	,022	-,206	-,058	-,051	-,085	-,199	,153	,178	-,026	,035	,181	,175	-,076	,034	-,102	-,157	,097	-,090	-,504
	RI3	-,074	-,185	-,100	-,056	,282	,465	,545	,273	1,000	,041	-,080	-,181	-,056	-,109	-,031	,046	,000	-,050	-,041	,231	,261	-,107	,031	-,183	-,083	-,174	-,206	-,181
	GS1	,297	,349	,334	,161	-,024	-,076	-,088	,022	,041	1,000	,314	,311	,032	,525	,541	,368	,408	,217	,594	,452	,121	,443	,451	,383	,332	,107	,223	-,065
	GS2	,224	,000	,012	,132	-,319	-,232	-,139	-,206	-,060	,314	1,000	,268	-,205	-,011	,412	,209	,138	-,040	,048	,169	,066	,085	,259	,299	,231	,173	-,012	,056
	ID1	,248	,186	,255	,218	,000	-,176	,111	-,058	-,181	,311	,268	1,000	,027	,333	,402	,113	,422	,189	,382	,227	,152	,310	,427	,362	,299	,131	,284	,191
	ID2	,218	,323	,438	,187	-,038	-,178	,062	-,051	-,056	,032	-,205	,027	1,000	,308	,204	,104	,312	,245	,478	,211	,042	,175	,291	,292	,242	,149	,453	-,107
	C2	,498	,431	,606	,306	-,024	-,127	,022	-,085	-,109	,525	-,011	,333	,308	1,000	,564	,227	,503	,497	,723	,626	-,110	,438	,583	,639	,435	,120	,294	,053
	T1	,575	,380	,537	,368	-,109	-,165	,096	-,199	-,031	,541	,412	,402	,204	,564	1,000	,457	,550	,352	,533	,388	,193	,366	,749	,790	,589	,294	,456	,097
	GS3	,430	,379	,396	,195	-,087	-,187	-,021	,153	,046	,368	,209	,113	,104	,227	,457	1,000	,223	,220	,393	,175	,407	,056	,452	,480	,351	,388	,150	,027
	GS4	,375	,438	,463	,406	,074	-,160	,149	,178	,000	,408	,138	,422	,312	,503	,550	,223	1,000	,321	,520	,393	,227	,369	,550	,530	,499	,363	,437	-,043
	GS5	,194	,279	,216	-,041	,018	-,059	,067	-,026	-,050	,217	-,040	,189	,245	,497	,352	,220	,321	1,000	,454	,449	,027	,153	,386	,425	,235	,203	,245	-,129
	GS6	,498	,435	,591	,254	-,022	-,106	,089	,035	-,041	,594	,048	,382	,478	,723	,533	,393	,520	,454	1,000	,527	,149	,360	,493	,548	,389	,279	,387	-,004
	C1	,353	,300	,420	,298	,217	,037	,298	,181	,231	,452	,169	,227	,211	,626	,388	,175	,393	,449	,527	1,000	,114	,280	,456	,414	,274	,032	,318	-,143
	F1	,120	,081	,199	,278	,131	,109	,364	,175	,261	,121	,086	,152	,042	-,110	,193	,407	,227	,027	,149	,114	1,000	-,192	,075	,108	,070	,201	,148	,072
	T2	,190	,246	,160	,034	,046	-,058	-,113	-,076	-,107	,443	,085	,310	,175	,438	,366	,056	,369	,153	,360	,280	-,192	1,000	,412	,332	,179	-,086	,186	,029
	CC1	,568	,414	,527	,452	-,105	-,269	,118	,034	,031	,451	,259	,427	,291	,583	,749	,452	,550	,386	,493	,456	,075	,412	1,000	,689	,573	,275	,454	,082
	CC3	,638	,434	,597	,415	-,086	-,234	,015	-,102	-,183	,383	,299	,362	,292	,639	,790	,480	,530	,425	,548	,414	,108	,332	,689	1,000	,572	,288	,418	,091
	CC2	,416	,242	,395	,230	-,227	-,132	-,048	-,157	-,083	,332	,231	,299	,242	,435	,589	,351	,499	,235	,389	,274	,070	,179	,573	,572	1,000	,251	,352	,114
	CU1	,386	,362	,230	,141	-,124	-,392	-,065	,097	-,174	,107	,173	,131	,149	,120	,294	,388	,363	,203	,279	,032	,201	-,086	,275	,288	,251	1,000	,344	-,056
	CU2	,361	,325	,447	,377	-,057	-,251	,090	-,090	-,206	,223	-,012	,284	,453	,294	,456	,150	,437	,245	,387	,318	,148	,166	,454	,418	,352	,344	1,000	,122
	F2	,054	-,095	,086	,022	-,260	-,076	,017	-,504	-,181	-,065	,056	,191	-,187	,053	,097	,027	-,043	-,129	-,004	-,143	,072	,029	,082	,091	,114	-,056	,122	1,000

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,696
Bartlett's Test of Sphericity	Approx. Chi-Square	972,920
	df	378,000
	Sig.	,000

**Communalities**

	Initial	Extraction
I1	1,000	,727
I2	1,000	,650
S1	1,000	,874
S2	1,000	,762
G1	1,000	,618
G2	1,000	,664
RI1	1,000	,731
RI2	1,000	,773
RI3	1,000	,696
GS1	1,000	,643
GS2	1,000	,686
ID1	1,000	,684
ID2	1,000	,627
C2	1,000	,813
T1	1,000	,791
GS3	1,000	,695
GS4	1,000	,686
GS5	1,000	,645
GS6	1,000	,698
C1	1,000	,623
F1	1,000	,656
T2	1,000	,620
CC1	1,000	,693
CC3	1,000	,727
CC2	1,000	,514
CU1	1,000	,683
CU2	1,000	,641
F2	1,000	,657

Extraction Method: Principal  
Component Analysis.

**Total Variance Explained**

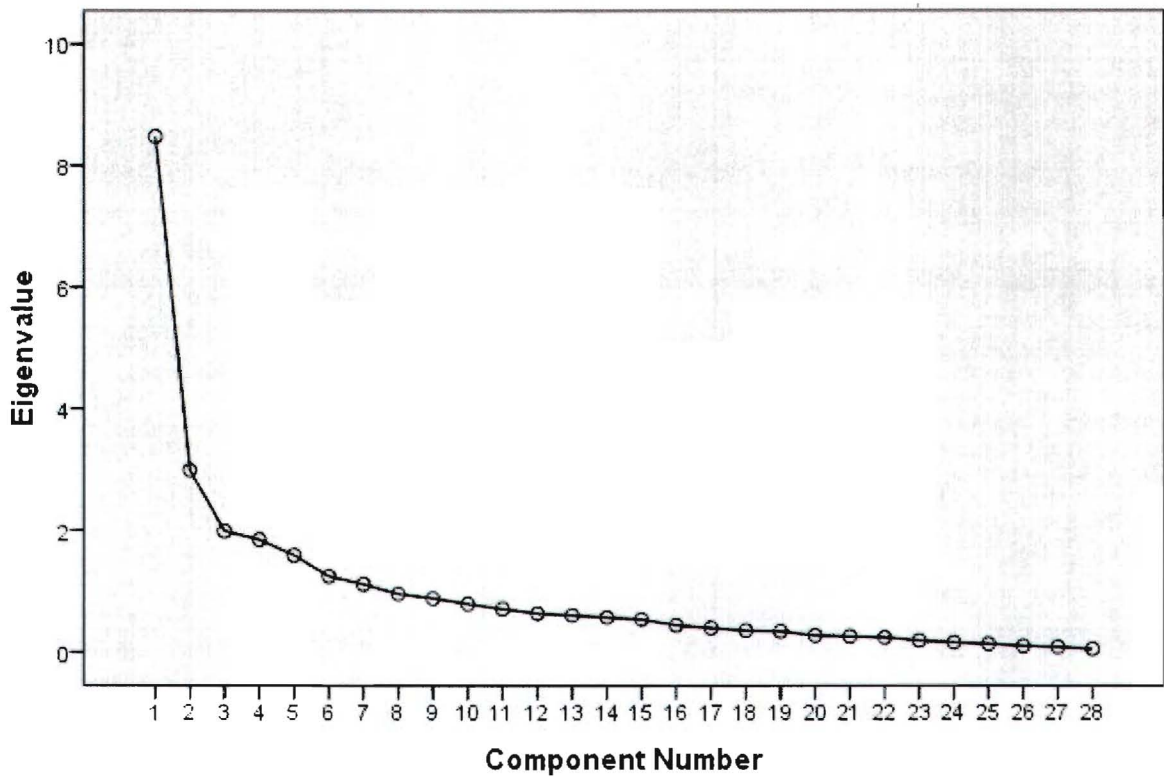
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8,482	30,294	30,294	8,482	30,294	30,294
2	2,993	10,690	40,984	2,993	10,690	40,984
3	1,992	7,113	48,097	1,992	7,113	48,097
4	1,851	6,610	54,707	1,851	6,610	54,707
5	1,594	5,693	60,400	1,594	5,693	60,400
6	1,247	4,453	64,853	1,247	4,453	64,853
7	1,119	3,996	68,849	1,119	3,996	68,849
8	,957	3,419	72,267			
9	,884	3,156	75,423			
10	,792	2,829	78,252			
11	,715	2,552	80,804			
12	,637	2,277	83,081			
13	,607	2,167	85,248			
14	,572	2,042	87,290			
15	,538	1,921	89,211			
16	,441	1,575	90,786			
17	,397	1,418	92,204			
18	,356	1,273	93,477			
19	,340	1,214	94,690			
20	,274	,977	95,668			
21	,258	,922	96,589			
22	,239	,854	97,444			
23	,192	,686	98,129			
24	,159	,566	98,696			
25	,134	,479	99,175			

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26	,098	,352	99,526		
27	,083	,295	99,821		
28	,050	,179	100,000		

Extraction Method: Principal Component Analysis.

Scree Plot



**Component Matrix<sup>a</sup>**

	Component						
	1	2	3	4	5	6	7
I1	,734	,019	,256	-,022	,031	-,145	-,316
I2	,634	-,038	,199	-,373	-,127	-,153	-,169
S1	,768	,118	,184	-,155	,289	-,120	-,338
S2	,526	,222	,352	,012	,284	-,461	-,136
G1	-,073	,716	-,100	-,105	,024	-,250	,127
G2	-,303	,567	-,311	,273	,189	,152	-,143
RI1	,099	,725	,117	,229	,342	,038	,104
RI2	-,005	,608	,244	-,249	-,460	-,243	,110
RI3	-,116	,694	-,045	,338	-,082	,244	-,134
GS1	,599	,025	-,302	,219	-,368	-,079	-,062
GS2	,260	-,336	,087	,602	-,333	-,157	,006
ID1	,489	-,089	-,124	,273	,088	-,276	,513
ID2	,424	,054	-,003	-,522	,300	,282	,052
C2	,762	,024	-,419	-,146	,057	,019	-,175
T1	,822	-,088	-,046	,317	-,004	,064	-,020
GS3	,529	,019	,376	,180	-,332	,279	-,232
GS4	,715	,150	-,008	-,028	-,037	-,102	,375
GS5	,474	,086	-,286	-,204	-,134	,492	,171
GS6	,770	,111	-,203	-,138	-,028	,181	-,007
C1	,592	,405	-,313	,020	-,085	,015	-,044
F1	,203	,386	,511	,348	,051	,210	,192
T2	,422	-,086	-,576	-,020	-,088	-,292	,094
CC1	,818	-,010	-,044	,141	-,019	-,028	,017
CC3	,831	-,114	-,016	,096	,025	,040	-,105
CC2	,632	-,182	-,016	,195	,050	,201	,012
CU1	,413	-,162	,526	-,153	-,262	,196	,281
CU2	,584	-,062	,143	-,196	,341	,051	,343
F2	,052	-,381	,024	,385	,598	,045	-,009

Extraction Method: Principal Component Analysis.



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**Component Matrix<sup>a</sup>**

	Component						
	1	2	3	4	5	6	7
I1	,734	,019	,256	-,022	,031	-,145	-,316
I2	,634	-,038	,199	-,373	-,127	-,153	-,169
S1	,768	,118	,184	-,155	,289	-,120	-,338
S2	,526	,222	,352	,012	,284	-,461	-,136
G1	-,073	,716	-,100	-,105	,024	-,250	,127
G2	-,303	,567	-,311	,273	,189	,152	-,143
RI1	,099	,725	,117	,229	,342	,038	,104
RI2	-,005	,608	,244	-,249	-,460	-,243	,110
RI3	-,116	,694	-,045	,338	-,082	,244	-,134
GS1	,599	,025	-,302	,219	-,368	-,079	-,062
GS2	,260	-,336	,087	,602	-,333	-,157	,006
ID1	,489	-,089	-,124	,273	,088	-,276	,513
ID2	,424	,054	-,003	-,522	,300	,282	,052
C2	,762	,024	-,419	-,146	,057	,019	-,175
T1	,822	-,088	-,046	,317	-,004	,064	-,020
GS3	,529	,019	,376	,180	-,332	,279	-,232
GS4	,715	,150	-,008	-,028	-,037	-,102	,375
GS5	,474	,086	-,286	-,204	-,134	,492	,171
GS6	,770	,111	-,203	-,138	-,028	,181	-,007
C1	,592	,405	-,313	,020	-,085	,015	-,044
F1	,203	,386	,511	,348	,051	,210	,192
T2	,422	-,086	-,576	-,020	-,088	-,292	,094
CC1	,818	-,010	-,044	,141	-,019	-,028	,017
CC3	,831	-,114	-,016	,096	,025	,040	-,105
CC2	,632	-,182	-,016	,195	,050	,201	,012
CU1	,413	-,162	,526	-,153	-,262	,196	,281
CU2	,584	-,062	,143	-,196	,341	,051	,343
F2	,052	-,381	,024	,385	,598	,045	-,009

a. 7 components extracted.

## **Appendix 21: Result structural equation modelling success factors**

DATE: 6/ 7/2008  
TIME: 13:13

L I S R E L 8.80

BY

Karl G. J'reskog & Dag S'rbom

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-----  
EM Algorithm for missing Data:  
-----

Number of different missing-value patterns= 12  
Convergence of EM-algorithm in 9 iterations  
-2 Ln(L) = 1970.66964  
Percentage missing values= 3.60

Note:

The Covariances and/or Means to be analyzed are estimated  
by the EM procedure and are only used to obtain starting  
values for the FIML procedure

Sample Size = 73

Latent Variables intensit performa governan commitme trust communic

Relationships

I1 = 0.73\*intensit

I2 = intensit

S1 = 0.95\*performa

S2 = performa

GS1 = governan

GS2 = governan

GS3 = governan

GS4 = governan

GS5 = governan

GS6 = governan

C1 = commitme

C2 = commitme

T1 = trust

T2 = trust

CC1 = communic

CC2 = communic

performa = performa

intensit = governan commitme trust communic

performa = governan commitme trust communic

Set the Variance of governan to 1.00

Set the Variance of commitme to 1.00

Set the Variance of trust to 1.00

Set the Variance of communic to 1.00

Path Diagram

End of Problem

Sample Size = 73

## Covariance Matrix

	I1	I2	S1	S2	GS1	GS2
I1	0.74					
I2	0.39	0.68				
S1	0.60	0.44	0.83			
S2	0.33	0.27	0.51	0.73		
GS1	0.18	0.20	0.18	0.10	0.46	
GS2	0.13	-0.01	-0.03	0.06	0.20	0.70
GS3	0.24	0.22	0.20	0.12	0.16	0.14
GS4	0.29	0.32	0.37	0.30	0.25	0.07
GS5	0.15	0.20	0.17	-0.03	0.14	-0.04
GS6	0.33	0.28	0.41	0.17	0.31	0.02
C1	0.23	0.19	0.29	0.19	0.23	0.08
C2	0.38	0.31	0.48	0.23	0.31	-0.02
T1	0.39	0.26	0.35	0.24	0.30	0.27
T2	0.11	0.13	0.10	0.02	0.20	0.04
CC1	0.40	0.27	0.38	0.30	0.25	0.14
CC2	0.24	0.19	0.29	0.19	0.15	0.09

## Covariance Matrix

	GS3	GS4	GS5	GS6	C1	C2
GS3	0.41					
GS4	0.13	0.76				
GS5	0.14	0.24	0.76			
GS6	0.19	0.34	0.28	0.59		
C1	0.10	0.26	0.29	0.30	0.56	
C2	0.15	0.36	0.37	0.48	0.40	0.74
T1	0.23	0.39	0.22	0.33	0.24	0.39
T2	0.03	0.22	0.09	0.19	0.14	0.26
CC1	0.24	0.38	0.27	0.31	0.27	0.40
CC2	0.16	0.32	0.18	0.20	0.16	0.29

## Covariance Matrix

	T1	T2	CC1	CC2
T1	0.63			
T2	0.20	0.47		
CC1	0.47	0.22	0.63	
CC2	0.32	0.08	0.33	0.43

NOTE: R<sup>2</sup> for Structural Equations are Hayduk's (2006) Blocked-Error R<sup>2</sup>

Correlation Matrix of Independent Variables

	governan	commitme	trust	communic
governan	1.00			
commitme	0.95	1.00		
trust	0.88	0.74	1.00	
communic	0.84	0.76	0.96	1.00

Covariance Matrix of Latent Variables

	intensit	performa	governan	commitme	trust	communic
intensit	1.21					
performa	1.01	1.02				
governan	0.89	0.69	1.00			
commitme	0.83	0.73	0.95	1.00		
trust	0.88	0.61	0.88	0.74	1.00	
communic	0.90	0.66	0.84	0.76	0.96	1.00

Global Goodness of Fit Statistics, Missing Data Case

-2ln(L) for the saturated model = 2013.912  
 -2ln(L) for the fitted model = 2157.928

Degrees of Freedom = 90  
 Full Information ML Chi-Square = 144.02 (P = 0.00026)  
 Root Mean Square Error of Approximation (RMSEA) = 0.091  
 90 Percent Confidence Interval for RMSEA = (0.062 ; 0.12)  
 P-Value for Test of Close Fit (RMSEA < 0.05) = 0.013

The Modification Indices Suggest to Add the

Path to	from	Decrease in Chi-Square	New Estimate
I2	performa	9.8	-2.41
GS1	commitme	64.3	-3.06
GS1	communic	10.2	-0.50
GS2	commitme	308.8	-13.35
GS3	commitme	755.5	-34.61
GS6	commitme	612.0	50.79
C1	governan	18.8	-2.54

The Modification Indices Suggest to Add an Error Covariance

Between	and	Decrease in Chi-Square	New Estimate
GS2	GS1	8.2	0.14
T1	GS2	7.9	0.12

Time used: 1.734 Seconds

Model without missing values (deleted listwise)

DATE: 6/25/2008

TIME: 22:58

L I S R E L 8.80

BY

Karl G. Jöreskog & Dag Sörbom

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The following lines were read from file C:\Documents and Settings\bsnoeijs\ben  
reservekopie\afstuderen\data analysis\spss input files\model succes factors\lisrel  
files\0.16.SPJ :

Raw Data from file 'C:\Documents and Settings\bsnoeijs\ben  
reservekopie\afstuderen\data analysis\spss input files\model succes factors\lisrel  
files\total all companies v0.4.psf'

Latent Variables intensity performance governance commitment trust communicatio



Relationships

I1 = intensity

I2 = intensity

S1 = performance

S2 = performance

GS1 = governance

GS2 = governance

GS3 = governance

GS4 = governance

GS5 = governance

GS6 = governance

C1 = commitment

C2 = commitment

T1 = trust

T2 = trust

CC1 = communicatio

CC2 = communicatio

CC3 = communicatio

intensity = governance commitment trust communicatio

performance = governance commitment trust communicatio

Path Diagram

End of Problem

Sample Size = 60

Covariance Matrix

	I1	I2	S1	S2	GS1	GS2
I1	0.77					
I2	0.39	0.68				
S1	0.60	0.40	0.80			
S2	0.34	0.22	0.48	0.69		
GS1	0.23	0.21	0.22	0.07	0.42	
GS2	0.16	-0.01	0.01	0.08	0.16	0.69
GS3	0.26	0.22	0.20	0.13	0.15	0.11
GS4	0.30	0.26	0.32	0.25	0.25	0.13
GS5	0.13	0.14	0.07	-0.10	0.18	0.00
GS6	0.36	0.29	0.43	0.17	0.35	0.04
C1	0.22	0.16	0.26	0.14	0.25	0.09
C2	0.37	0.26	0.42	0.16	0.33	0.00
T1	0.43	0.22	0.35	0.21	0.28	0.29
T2	0.14	0.13	0.12	-0.01	0.19	0.03
CC1	0.41	0.21	0.31	0.23	0.23	0.17
CC2	0.23	0.13	0.22	0.14	0.17	0.13
CC3	0.41	0.23	0.34	0.24	0.24	0.22

Covariance Matrix

	GS3	GS4	GS5	GS6	C1	C2
GS3	0.38					
GS4	0.15	0.69				
GS5	0.11	0.20	0.71			
GS6	0.22	0.35	0.30	0.65		
C1	0.10	0.25	0.31	0.32	0.59	
C2	0.13	0.30	0.33	0.51	0.40	0.73
T1	0.21	0.37	0.20	0.37	0.24	0.37
T2	0.07	0.16	0.15	0.20	0.15	0.27
CC1	0.24	0.31	0.22	0.31	0.24	0.34
CC2	0.16	0.29	0.11	0.20	0.14	0.23
CC3	0.21	0.32	0.19	0.32	0.23	0.38

Covariance Matrix

	T1	T2	CC1	CC2	CC3
T1	0.64				
T2	0.21	0.40			
CC1	0.46	0.22	0.59		
CC2	0.32	0.10	0.30	0.41	
CC3	0.44	0.22	0.38	0.26	0.50

Correlation Matrix of Independent Variables

	governan	commitme	trust	communic
governan	1.00			
commitme	1.00	1.00		
	(0.01)	182.51		
trust	0.92	0.84	1.00	
	(0.08)	(0.08)		
	11.19	10.67		
communic	0.82	0.78	1.11	1.00
	(0.05)	(0.07)	(0.07)	
	15.26	12.01	17.03	

Covariance Matrix of Latent Variables

	intensit	performa	governan	commitme	trust	communic
intensit	1.00					
performa	0.78	1.00				
governan	0.67	0.58	1.00			
commitme	0.67	0.61	1.00	1.00		
trust	0.78	0.52	0.92	0.84	1.00	
communic	0.80	0.53	0.82	0.78	1.11	1.00

## Goodness of Fit Statistics

Degrees of Freedom = 105

Minimum Fit Function Chi-Square = 142.52 (P = 0.0087)

Normal Theory Weighted Least Squares Chi-Square = 126.75 (P = 0.073)

Estimated Non-centrality Parameter (NCP) = 21.75

90 Percent Confidence Interval for NCP = (0.0 ; 54.26)

Minimum Fit Function Value = 2.42

Population Discrepancy Function Value (F0) = 0.37

90 Percent Confidence Interval for F0 = (0.0 ; 0.92)

Root Mean Square Error of Approximation (RMSEA) = 0.059

90 Percent Confidence Interval for RMSEA = (0.0 ; 0.094)

P-Value for Test of Close Fit (RMSEA &lt; 0.05) = 0.34

Expected Cross-Validation Index (ECVI) = 3.78

90 Percent Confidence Interval for ECVI = (3.41 ; 4.33)

ECVI for Saturated Model = 5.19

ECVI for Independence Model = 25.16

Chi-Square for Independence Model with 136 Degrees of Freedom = 1450.65

Independence AIC = 1484.65

Model AIC = 222.75

Saturated AIC = 306.00

Independence CAIC = 1537.25

Model CAIC = 371.28

Saturated CAIC = 779.43

Normed Fit Index (NFI) = 0.91

Non-Normed Fit Index (NNFI) = 0.98

Parsimony Normed Fit Index (PNFI) = 0.70

Comparative Fit Index (CFI) = 0.98

Incremental Fit Index (IFI) = 0.98

Relative Fit Index (RFI) = 0.89

Critical N (CN) = 66.92

Root Mean Square Residual (RMR) = 0.052

Standardized RMR = 0.087

Goodness of Fit Index (GFI) = 0.80

Adjusted Goodness of Fit Index (AGFI) = 0.70

Parsimony Goodness of Fit Index (PGFI) = 0.55

Time used: 0.078 Seconds

## Appendix 21: Suggestion for collaboration from the partners

**Confidential**