

## MASTER

### Finding the future

### an empirical study on Dutch techno start-ups in a sourcing environment

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Eindhoven, January 2012

**Finding the future:**

*An empirical study on Dutch techno start-ups in a  
sourcing environment*

by

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In partial fulfillment of the requirements for the degree of

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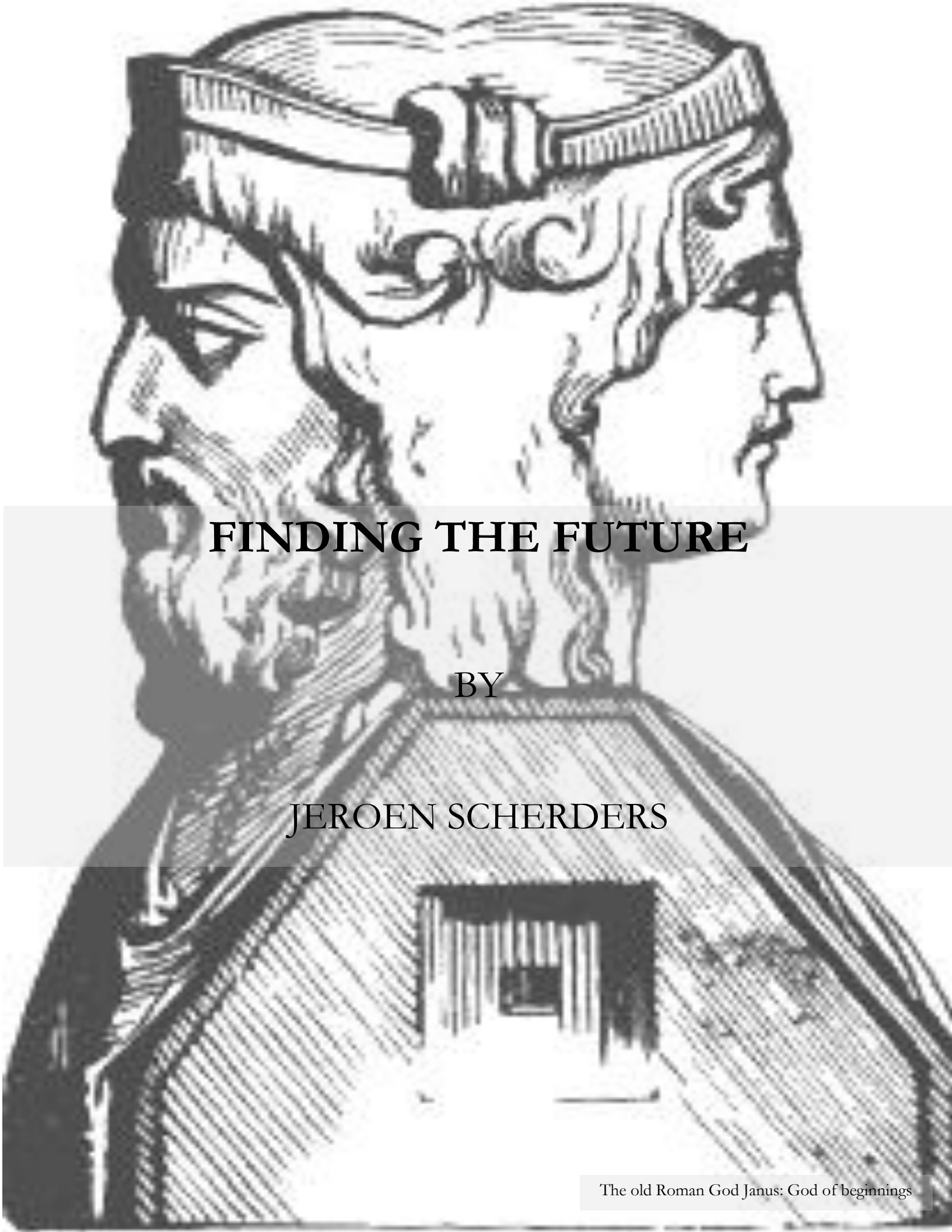
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**FINDING THE FUTURE**

BY

**JEROEN SCHERDERS**

The old Roman God Janus: God of beginnings

## **Abstract**

### **Motivation**

The environment in which techno start-ups are operating is changing rapidly, partly due to globalization, resulting in changing requirements for the future. In order to deal with these trends, techno start-ups are increasingly outsourcing part of their supply chain. This results in higher levels of supplier dependency and growing importance of their selection. Taken the lack of resources and the importance of the supplier selection an intermediary could provide helpful assistance.

### **Problem statement**

The selection of suppliers will become increasingly important for techno start-ups. Globalization and advancements in information technology increase the possibilities and transparency of the supply base. In addition, suppliers need to be found fast as the lifecycles of products become shorter and supply chains have an increasingly volatile character.

### **Approach**

This report analyzes the supplier selection strategy of Dutch techno start-ups in relation to efficiency (defined as hours spent during supplier selection), effectiveness (defined as evaluation of the selected supplier) and satisfaction (defined as evaluation of the supplier selection process). The preliminary research framework, which is composed using the literature review, was firstly tested by a qualitative study. This study was executed in the form of eight in-depth interviews with intermediaries/third party service providers. Based on this study, a conceptual model with corresponding propositions is described and tested. These relationships are consequentially tested using a quantitative study. This research approach, eight in-depth interviews and a survey, minimizes measurement problems due the reasonable large (nearly 300) sample.

### **Results**

All the interviews had an open character and the preliminary research framework was successfully tested on practical relevance. We found that suppliers delivering high supply risk items are evaluated the worst. On the other hand, in case suppliers deliver high impact on profit items, this significantly improved the evaluation of the supplier. Second, Dutch techno start-ups spent more hours selecting and finding suppliers with a high impact on profit abroad. Third, the satisfaction of the selection procedure decreases when a supplier is located abroad and supplies high-risk items. If the items delivered by the supplier have a high impact on the profit of the Dutch techno start-up, the satisfaction of the selection process increases. To conclude, the individual evaluation metrics do not all have a significant impact on the general evaluation of the supplier. The Dutch techno start-ups rank the metrics as follows (in order of importance): Logistics, Costs, Quality and Technology. The quality and technology metrics are non-significant in relation to the general evaluation of the supplier.

### **Conclusions**

The sample represents the entire population of Dutch techno start-ups due to company and respondent characteristics. We found that third party service providers during supplier selection are barely used by Dutch techno start-ups. The results of the study indicate that the Dutch start-ups focus merely on impact on profit while neglecting supply risk in the sourcing strategy. In addition, the sourcing strategy is rather traditional (focus on cost) than value sourcing (technology and quality were non-significant evaluation metrics).

## A word from the author

Before you lays the result of an exciting graduation period. The inspiration for the thesis subject mainly lays in my fascination for the ever changing and globalization business environment together with entrepreneurship. During the Brabant Centre of Entrepreneurship certificate program, early 2010, these trends and ultimately challenges were analyzed from a practical point of view resulting in a business plan acting in the role of a purchasing office. Immediately I was hooked to the area and therefore a more scientific level of understanding was desired: This master thesis.

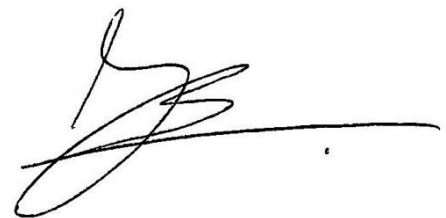
On the cover page the old Roman God Janus is displayed. The legend goes that is was Janus who was the founder of civilized life within society. It was him who set the people free from their barbarian way of life by giving them an ordered and structured life. He was also called the god of beginnings. January, the start of the new year, is derived from his name. This is symbolically shown in the form of the two faces: One looking at the past and one looking at the future.

Janus has been chosen as cover page for this particular thesis since techno start-ups are the multinationals of tomorrow. In addition, this thesis covers traditional and rather new supplier selection strategies of these techno start-ups. These new suppliers will provide the start-ups in the future. The left face of Janus (the past) is symbol for the old start-up which competes on a regional level and suppliers are found using word of mouth nearby. The right face (the future) symbolizes the future techno start-up, which is competing globally and suppliers/partners are found using modern techniques and strategies.

The title, "Finding the future", is derived from the fact that these new suppliers are potentially the future key suppliers but firstly have to be found.

I hope that you will read this thesis with as much interest as I had writing it and you can do your favor with it in the future.

All the best,

A handwritten signature in black ink, appearing to be 'Jeroen Scherders', with a long horizontal line extending to the right.

Jeroen Scherders

09-11-2011, Eindhoven

## Acknowledgements

After quite some time of analyzing, typing and researching my master Innovation Management has come to an end in the form of this master thesis. During the realization of this thesis, I have been accompanied and supported by many people. It is now a great pleasure to take the opportunity to thank some of them. Starting with the support from the Eindhoven University of Technology. First, my first supervisor Prof van Weele for initially given me this wonderful opportunity and for given me guidance and tempering my enthusiasm in order to focus on the core of the thesis. All the appointments and feedback just were tremendous and hopefully we stay in touch after this. Second, I would like to thank Ksenia Podoyntsyna for the several sessions considering the survey, general advice and given me the opportunity to be part of a larger research together with LiveWire, BCE and Syntens. Third, Prof Duijsters for the strategic and practical input in the role of second supervisor. Fourth, I would like to thank Prof Snijders for the helpful advices considering the data analysis.

In addition, I would like to thank my (former) fellow classmates for the unforgettable period at the TU/e.

I also would like to thank my company supervisor, Daan Kersten, in the role of purchasing and supply chain consultant and founder of an intermediary firm. The practical advice and numerous meetings have been great and I am very happy that after my graduation we continue to work with each other.

This thesis was not possible without the data gathered, therefore I would like to thank the eight interviewees in various roles and the 270 respondents in the survey for their practical insights.

Finally, I would like to thank my family, friends and girlfriend: They have made my who I am. Hopefully they also can appreciate the end result.

## Management summary

### Background

The environment in which technology driven companies are operating is changing rapidly. Trends like globalization and shorter lifecycles force technology driven companies to focus on the development of new products and services. In addition, because of the global competition, customers are increasingly demanding, leading to a higher capital intensity of new product development processes. In order to deal with trends described above, companies are focusing on their core competences and are increasingly engaged in outsourcing non-core parts of their supply chain. As the level of outsourcing increases, so does the dependency on their suppliers and the importance of their selection.

Large multinationals have the capabilities and staff to manage the complex sourcing processes in contrary to techno start-ups. In this paper a techno start-up is defined as a company that is recently founded with a technological invention or new application of a current technology. Techno start-ups don't have the capabilities of larger multinationals and are limited by the connections of the director who is responsible for supplier selection in most cases. As techno start-ups are operating in the same environment as the larger technology driven companies, the selection of suppliers is even more difficult while being equally urgent. In addition, it is widely believed that techno start-ups are facilitators of innovation and have a large impact on the domestic economy. Taken this importance and difficulties of techno start-ups, this research therefore focuses on the supplier selection of techno start-ups.

Having stated the importance of supplier selection of techno start-ups, global trends are also influencing the supplier selection process. The potential supply base has grown exponentially due to revolutions in communication technology and the removal of trade barriers. The globalization of markets and consumers puts the product lifecycle under pressure and forces many companies to organize a flexible supply chain. These trends require the products to be world-class and have to be developed within a short time frame. Finding the best supplier/partner as fast as possible will become increasingly important.

Dedicated intermediaries could provide a solution in order to deal with these trends for the techno start-ups.

### Research methodology

This study is carried out for Boer & Croon Consulting. After the problem/challenge was analyzed from various points of view, relevant literature is reviewed resulting in a literature framework. Derived from this, the following main research question is stated:

**“To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?”**

This research question is fairly new in literature. Therefore, in order to gain a deeper practical and theoretical understanding of the phenomenon, a qualitative study was executed first. This study is executed in the form of semi-structured interviews with practitioners and with third party service providers. Three types of third party service providers can be distinguished: Cybermediary (internet based intermediary providing information), intermediary (traditional match maker) and the purchasing office (responsible for entire purchasing process). This qualitative study resulted in an exhaustive list of possible third party service providers, verification of the literature framework and the addition of a new performance indicator measuring the evaluation of the selection process: Satisfaction.

Based on these interviews an adjusted research model is designed and propositions are described in order to answer the main research question as stated earlier. In order to test this research model and its propositions a



survey is held under 2,552 companies leading to 279 gathered responses (response rate of 10,9%) of which 221 had suppliers. To be able to answer the main research question, the following sub-questions were derived:

✓ *Sub-question 1: How do techno start-ups select their suppliers?*

What influences the supplier selection strategy, which intermediary or use in-house resource for supplier selection, of Dutch techno-start-ups. The type of supplier is added as predictor for the supplier selection strategy. This is defined using the Kraljic matrix: This matrix grades the supplier on impact on profit (e.g. importance for company result) and supply risk (e.g. are there more comparable supplier?). In addition, the geographical location of the supplier is added to predict the supplier selection strategy.

✓ *Sub-question 2: What is the effect of the supplier selection strategy on the efficiency of the selection process?*

The impact of the supplier selection strategy (in-house, cybermediary, intermediary and purchasing office) on the hours spend during the selection process (defined as efficiency) is investigated, in this question. In addition the two variables forming the Kraljic matrix [as in sub-question 1] and geographical location is added.

✓ *Sub-question 3: What is the effect of the supplier selection strategy on the effectiveness of the selection process?*

This question investigates the consequences of the supplier selection strategy on the evaluation of the selected supplier (defined as effectiveness). In addition, the two variables of Kraljic and the geographical location are added to predict this evaluation of the supplier.

✓ *Sub-question 4: What is the effect of the supplier selection strategy on the satisfaction of the selection process?*

The impact of the supplier selection strategy on the evaluation of the selection process (defined as satisfaction) is investigated in this question. As for sub-question 2 and 3, the Kraljic matrix variables and geographical location of the supplier are added to predict this evaluation of the selection process.

✓ *Sub-question 5: What are the most important evaluation criteria of suppliers for Dutch techno start-ups?*

Specific metrics are used in order to evaluate the supplier. This question ranks these metrics on level of importance/significance.

✓ *Sub-question 6: What is the effect of the place in the portfolio on the geographical region of the supplier?*

This question investigates the relation between type of supplier, using the described Kraljic matrix, and the geographical location of this selected supplier.

## Results

Before the data analysis can be performed a general data examination has to be executed. From the personal and company characteristics it can be concluded that the sample represents the techno start-ups well. Considering the observed raw data it can be concluded that the usage of the third party service providers is rather limited and supplier selection is in most cases executed in-house. The following answers to the sub-questions can be given:

✓ *Sub-question 1: How do techno start-ups select their suppliers?*

The majority of the Dutch techno start-ups select their suppliers without the help of third party service providers. As this usage is limited in the sample no significant relations are found between type and geographical location of the selected supplier.

✓ *Sub-question 2: What is the effect of the supplier selection strategy on the efficiency of the process?*

Most supplier selection processes take less than 20 hours, as observed in the data. There was no significant relation to supplier selection. Whether the supplier is located abroad or not, increases the hours spent during the supplier selection (decreases the efficiency), as expected. Dutch techno start-ups spent more hours finding suppliers with a high impact on profit, as expected. Moreover, the second variable, the supply risk, of the Kraljic matrix has a non-significant relationship with the efficiency of the supplier selection process.

Two propositions are confirmed: Geographical location and impact on profit of the supplier increases the hours spent during supplier selection. Two propositions were not supported: Supplier selection strategy and supply risk of the supplier as these two predictors does not have a significant effect on efficiency.

✓ *Sub-question 3: What is the effect of the supplier selection strategy on the effectiveness of the process?*

The effectiveness, measured using four specific supplier evaluation metrics, has one underlying factor. The proposition that the geographical location of the supplier does not have an effect on the supplier evaluation is confirmed: Evaluation is based on expected and realized performance and is therefore not location specific. Based on this line of reasoning, the place on the Kraljic matrix also should not affect the supplier evaluation. However, this proposition is rejected as there is a significant relationship between impact on profit and supply risk (forming the Kraljic matrix) on the evaluation of the supplier. Impact on profit has a significant positive effect on the factor measuring the effectiveness of the process. On the other hand, supply risk has a negative significant relation on the evaluation of the supplier.

This indicates that suppliers delivering high supply risk items are evaluated worse by the techno start-ups while impact on profit significantly improves the supplier evaluation. Suppliers delivering leverage items, high impact on profit with low supply risk, are evaluated the best by the Dutch techno start-ups in the sample. This is in contradiction with the earlier described proposition.

✓ *Sub-question 4: What is the effect of the supplier selection strategy on the satisfaction of the process?*

The usage of third party service providers is, as described earlier, very low. The proposition that the usage of a third party service provider positively influences the supplier selection process is, therefore, not supported. If the supplier is located abroad, this negatively influences the satisfaction of the process, as expected. The Dutch techno start-up clearly has a different prediction in case of selecting a strategic supplier in comparison to a non-critical supplier. The proposition that the place on the Kraljic matrix does not affect the satisfaction of the selection process is rejected. Impact on profit has a positive influence on the satisfaction of the supplier selection process while supply risk has a negative influence. Dutch techno start-ups evaluate the supplier selection process for suppliers delivering leverage items, high impact on profit and low supply risk, the best.

✓ *Sub-question 5: What are the most important evaluation criteria of suppliers for Dutch techno start-ups?*

Taken the metrics derived from theory and practice used for general supplier evaluation, the proposition was that all individual metrics had a positive significant impact on the general supplier evaluation. Analyzing the linear regression with “the supplier exceeded the expectations” the following results were found:

1. Logistics (significant, 0.002; beta, 0.227)
2. Costs (significant, 0.016; beta, 0,160)
3. Quality (non-significant, 0.055; beta, 0,152)
4. Technology (non-significant, 0.563; beta, 0,042)

The overall experienced most important parameter of suppliers by Dutch techno start-ups is logistics. This indicates that on-time delivery is crucial for Dutch techno start-ups. This could teach us that the product

development phase is under pressure since on time delivery is even more important than costs and quality. The second significant predictor of general supplier evaluation is costs.

The other two evaluation metrics, quality and technology are non-significant. This rejects the propositions that all metrics have a positive significant relation to general supplier evaluation. As this analysis shows the techno start-ups require a certain type of supplier: One that delivers on time at the lowest cost.

✓ *Sub-question 6: What is the effect of the place in the portfolio on geographical region of the supplier?*

The proposed proposition that strategic suppliers, due to high impact, and non-critical suppliers, due to non strategic character, are found in the Netherlands by Dutch techno start-ups is rejected.

Analysis shows that suppliers located in Western/Northern Europe have an overall significant higher impact on profit and supply risk indicating that more strategic supplier are selected in this region. Quite remarkable is that the suppliers found in Asia, which demand in general a lower supply risk, also have a more significant strategic nature compared to the average supplier in the Netherlands. Other conclusions based on geographical locations cannot be drawn from these diagrams due the lack of variation.

### **Conclusion**

The dynamic business environment in which western technology driven companies are operating, result in continuous changing requirements for the future in order to survive. Currently, traditional technological driven companies see outsourcing part of their supply chain as a solution to retain or achieve a flexible organization structure, in order to deal with this dynamic environment. On the other hand, techno start-ups are established in the global business environment. The technological driven company and the techno start-ups have one thing in common: They are dependent on suppliers. This report focuses on the supplier selection process of Dutch techno start-ups. In addition, taken the difficulty of the supplier selection process, the role of the third party service provider is analyzed.

The above described problem statement is analyzed using the combination of qualitative and quantitative research. Nine qualitative in-depth interviews were taken and 279 quantitative observations were collected using a survey. It was found that the techno start-up does not use third party service provider for the role of e.g. matchmaker or purchasing office. In addition, the techno start-ups evaluate the bottleneck suppliers, high risk and low impact on profit, lower compared to the leverage suppliers, low risk and high impact on profit. This suggests that the focus of Dutch techno start-ups is merely on profit while neglecting the supply risk. Subsequently, the techno start-ups also spend more hours on the selection of these leverage supplier compared to the bottleneck suppliers.

Having stated that there is a clear distinction in evaluation and selection between type of suppliers, the techno start-ups also have specific evaluation criteria. Getting the products on time is the most important followed by the costs while the impact of quality and technology in general evaluation is not supported by the data.

Finally, it was expected that strategic suppliers are found in the Netherlands or in western Europe while suppliers delivering low supply risk items are selected in Low Cost Countries. This was, however, not found in the data. In Asia, which is typically seen as a LCC, significantly more strategic suppliers, defined as high impact on profit and supply risk, are selected by Dutch techno start-ups. This suggest that the techno start-ups initially searches in his domestic sourcing country and widens his view for strategic suppliers.

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## Chapter **BACKGROUND STUDY**

# 1

O'Leary (2005) defines a problem as “a situation where there is a gap between what is real and what is ideal or desired”. Taking this definition as starting point, this chapter will analyze the problem which forms the background of the study.

### 1.1 Introduction

In this chapter, the problem is identified and described from both a practical and literature point of view. The combination results in the problem statement of the study. Subsequently, the research questions as a result of this problem analysis are described. Next, now that is described what is focus of the research the research methodology together with the deliverables are summarized. Final, the outline of the thesis is described.

### 1.2 Background problem statement

Since the beginning of time the world has never stop changing. Consequently, the environment in which companies are operating in is changing. What we currently see is that this environment is becoming more dynamic and there is competition between large and small firms all over the world. More specifically, the western civilization is changing into a post-industrial, service-providing knowledge-economy and adequate blue color workers for manufacturing companies will become harder and harder to find. Question arises which trends are causing this changing environment. The next paragraph will describe three important underlying trends from a practical point of view resulting in a challenge/requirement for the future.

#### 1.2.1 Practical gap

As the introduction states the world is changing and is becoming more dynamic. This study specifically focuses on western companies due to the significant impact of the trends on this type of organization. In addition, this study takes the perspective of technology driven companies due to the high impact on the economy and the influence of these trends on this type of company.

This paragraph will analyze “the gap” from a practical point of view. The changing environment will be analyzed by three distinctive underlying major trends; globalization, volatility and shorter lifecycles for westerns technology driven companies in general. In addition, these trends will be described more thoroughly by indicating sub-trends from four perspectives; the market, the supply chain, organization and information. This global trend analysis ultimately results in requirements for the future of technology driven companies in general. Second, the techno start-up is introduced and the general trends for the technology driven companies are being projected on this specific organization type. Finally, the requirement for the future is analyzed more thoroughly for the techno start-up. A more detailed summary of the practical gap can be found in appendix I.

##### 1.2.1.1 Globalization

The first underlying trend explaining the dynamic environment is the globalizing of markets and supply chains. One driver behind this trend is the ever-changing specific expertise of countries/regions. The Dutch Central Planning-agency (CPB) recently published a report on the future of the Netherlands up to year 2040 using four scenarios (Ter Weel, 2010). All these scenarios have the same underlying fundamental development; the western world has become a post-industrial, service-providing knowledge-civilization. Western inhabitants are all higher and higher educated and produce mostly virtual: Knowledge. In addition, the Dutch Social and Cultural Planning-agency (SCP) published an article considering the job-market for the lower educated (Josten, 2010). These positions do not produce virtually but rather intangible assets. Therefore, these positions are slowly moving to Low Cost Countries (LCC), and blue color work becomes more expensive. Putting it more



strongly; the sixth annual study on corporations' off shoring trends by Duke University's Fuqua School of Business and The Conference Board (Manning, 2008), an independent research association, found that this is even the main driver behind global sourcing. In this survey, held under US companies, stated that the movement of their job functions overseas was due this shortage of skilled domestic talent, not cost cutting, as it is widely believed. This argument for off shoring is growing. Manning (2008) states that in 2004 42% of the respondents indicated that the shortage of skilled employees is the driver behind off shoring. This percentage increased to 54% in 2005 and even 68% in 2006. As a direct result of this trend, markets and supply chains are becoming more global.

From an organization perspective, the competition is also globalizing. Initially, only the multinationals were engaged in global sourcing and global marketing but due to this increased competition, SME's (and even start-ups) are also competing worldwide instead of regional and are forced to focus on their core competences.

In addition, another main driver behind globalization, the internet, leads to more market transparency, as information is globally available. These developments will continue in the future as the implementation of the information technology advances [see Appendix I for a schematic overview of these globalization sub-trends].

#### *1.2.1.2 Volatility*

As a direct result of the previously sketched globalizing environment and information availability, events in other parts of the world can influence the market demand and supply chains more easily. Consequentially, supply chains are becoming more complex (Geissbauer, 2010). Having said that supply chains are becoming more volatile and complex, the new product supply chain of start-ups, with an even more uncertain demand forecast, has an even higher level of volatility [see appendix I].

In an annual survey under nearly 350 manufacturing and service companies (Geissbauer, 2010), PRTM management consultants investigated what the effect from an organization and information perspective are of these developments. Of the participants, 74% state that in order to deal with this supply chain flexibility, in response to the supply chain volatility, demand forecasting is crucial while there is a lack of visibility of current market demand (33%). In the same survey of PRTM, 79% of the participants state that a driver behind this increasing complexity is the increase in customer locations and number of customers. It is increasingly important to predict customer markets and to be able to shift quickly in manufacturing capacity.

Shorter product lifecycles, which will be described in the next paragraph, even increases the high tech market volatility.

#### *1.2.1.3 Shorter lifecycles*

Because of globalizing markets and competition, product lifecycles are decreasing and customers are increasingly demanding (Hitachi, 2009). Consequentially, companies have to develop and introduce new products at a higher pace (Geissbauer, 2010). This is creating enormous pressure on the supply chain; next to dealing with the uncertainty, the time for setting up the supply chain is under pressure too. Consequently, the importance of new product development/innovation of technology driven company's increases (Geissbauer, 2010). As a result of the decreasing time to market and increasing demanding customers of high tech products, the capital intensity increases. This because the products require more capital and the total development time decreases.

#### *1.2.1.4 Challenge technology driven companies*

The previous three paragraphs describe the dynamic environment in general for western technology driven companies by the identification of three underlying trends. The study focuses now on the challenge of technological driven companies in order to deal with these trends.

As described earlier, the global trends are closely related and are reinforcing each other occasionally (Hitachi, 2009). The global information availability, made possible by internet, has a major impact on these trends. In response to the trends described above, western technology driven companies focus on the customer demand and new product development while parts of supply chains are being outsourced (Geissbauer, 2010). Subsequently, technology driven companies are becoming more dependent on their suppliers. The following figure 1-1 shows the trends described above in relation to each other, ultimately leading to consequences for technology driven companies in general [based on previous argumentation].

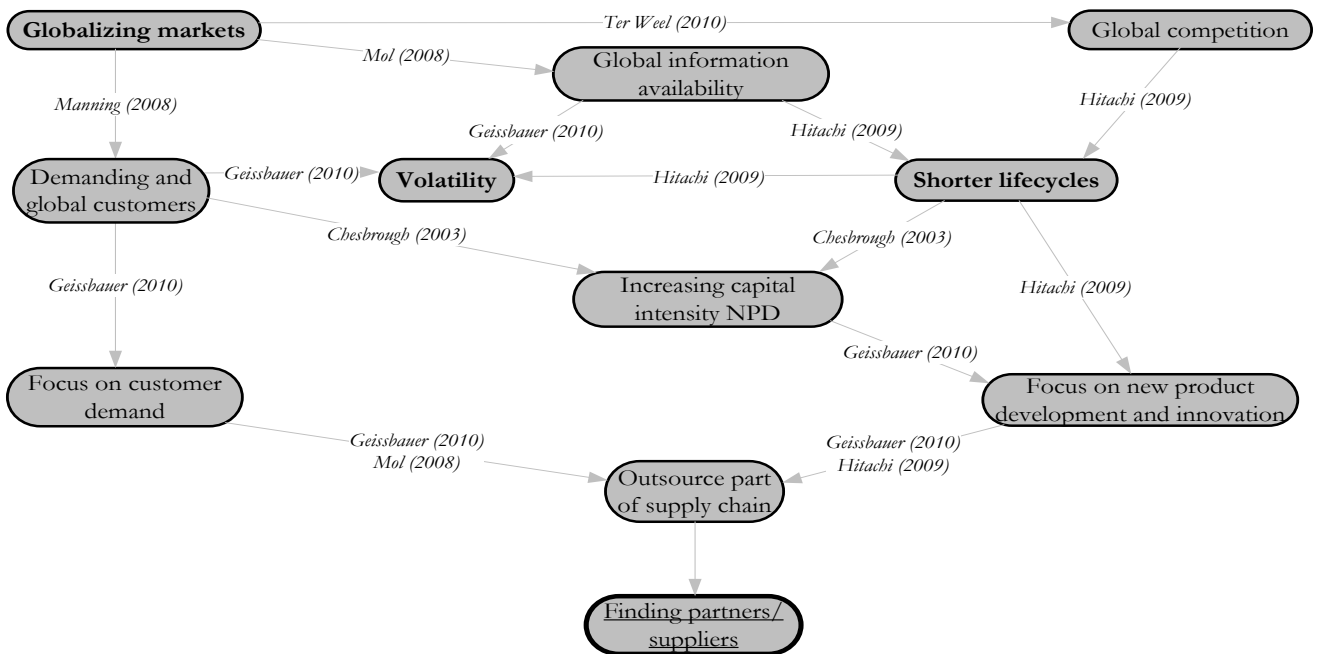


Figure 1-1: Global trends in relation to each other for technology driven companies

As the figure 1-1 above describes requirements for survival are changing and finding partners/suppliers will become increasingly important on a potential global scale. In addition, increasing levels of outsourcing leads to a higher dependency on suppliers for technology driven companies and therefore importance on supplier selection.

### 1.2.1.5 The techno start-ups

The previous paragraphs concluded that the dynamic environment caused by globalization, volatility and shorter lifecycle eventually increases the importance of finding partners/suppliers in the future. Traditional large technological driven companies have great difficulties dealing with above described dynamic environment. The changing environment requires, next to the focus on finding suppliers, different organization structures in order to deal with the dynamic environment (Hesselbein, 2009). The large multinationals of today understand that rapid change is needed for sustained competitive performance and are therefore becoming leaner, flatter, and more flexible (Hesselbein, 2009)<sup>1</sup>. Our discussion now focuses on a specific type of technological driven company which theoretically could well be able to deal with the dynamic environment: The techno start-up.

<sup>1</sup> Typically seen as the Horizontal Corporation

The following definition of a techno start-up is used in this paper: “A company which is recently founded with a technological invention or new application of a current technology”, as defined by Timmermans (2009). It is widely believed that start-ups in general have an important role in the economy and are crucial for enabling and facilitating innovation and ultimately wealth (Langerak, 2010). A Dutch research organization (EIM), calculated that techno start-ups are responsible for 15.902 FTE<sup>2</sup> employment (Timmermans, 2009). A high number of techno start-ups is, however, unable to facilitate growth, and fail within the first couple of years. Research shows that 47 percent of the techno start-ups operating in the industry and 65 percent of the techno start-ups operating in services survive the first 5 years. These percentages are based on techno start-ups established in 2004 and participated in survey in 2009 (Timmermans, 2009).

Having defined techno start-ups and the quite dramatic survival rate it can be questioned what the reason behind this is. As the techno start-ups are operating in the same environment as the technology driven companies in general, the trends described in the previous paragraphs are also influencing the techno start-ups. These effects could well have a stronger impact on techno start-ups as the resources are more limited and the time to market more crucial. Taken the difficult situation of the techno start-ups and the important role for facilitation of innovation and impact on domestic economy, it is essential that the survival rate of the Dutch techno start-ups improve.

#### 1.2.1.6 *Supplier selection techno start-ups*

As described, finding suppliers/partners has become and will become even more important for technology driven companies. Our discussion now focuses exclusively on the supplier selection of techno start-ups.

Global trends are influencing the supplier selection process. Low Cost Countries (LCC) can provide, next to cost advantage, the scarce blue color workers. If executed correctly, global sourcing can therefore be the answer on order to deal with the scarcity of adequate employees using the more international markets of today's economy. In addition, globalization and information technology offers the techno start-ups potential benefits on the sourcing side. Due to the removal of trade barriers and advancements in infrastructure together with global information availability, the amount of potential suppliers is grown dramatically.

On the other hand, volatility together with shorter lifecycles forces techno start-ups to create flexible and agile supply chains. Dutch techno start-ups have to react quickly to market trends and therefore require a corresponding supply chain.

The trends described above make it crucial that the best supplier is found quickly. These requirements for the supplier selection, quickly finding the best supplier, results in the following trade off:

- ✓ Effectiveness, defined as the evaluation of the supplier, how is the selected supplier performing compared to what is expected?
- ✓ Efficiency, defined as the effort in seeking the supplier, how much effort is spent in order to select the supplier?

Derived from the global trends described above in figure 1-1 the following trade-off is applicable on the supplier selection process of techno start-ups:

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<sup>2</sup> Full-time equivalent

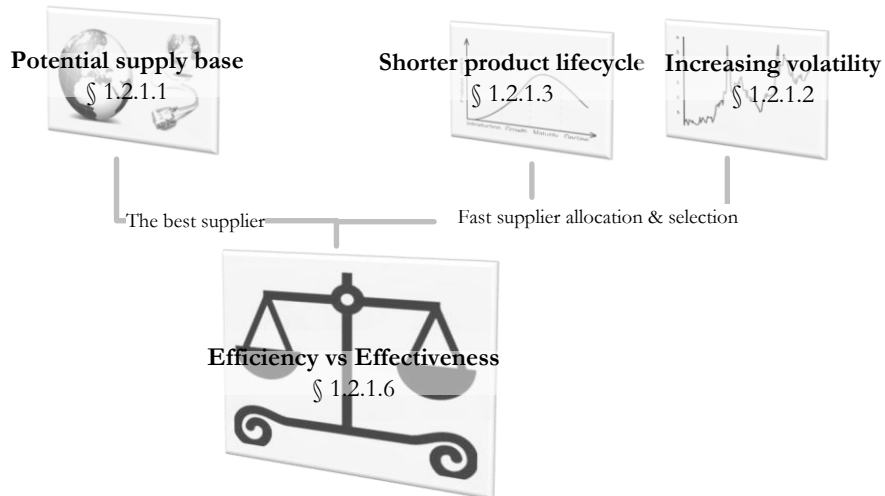


Figure 1-2: Problem statement from practical point of view

Having defined the trends influencing the trade-off during supplier selection the question arises how these two performance indicators are related to each other.

Supplier selection can be compared with the selection of partners based similarities in the selection process. At every step of the process, candidates have to be eliminated in order to select the best partner. Chesbrough's (2003) open innovation philosophy states that in order to find the best supplier a filtering process has to be passed defined as the "filter problem"<sup>3</sup>. The following diagram represents this filter problem by Chesbrough (2003) on the left side of the figure. Derived from this, on the right side the efficiency and effectiveness in relation to each other applied to supplier selection using the definitions previously described.

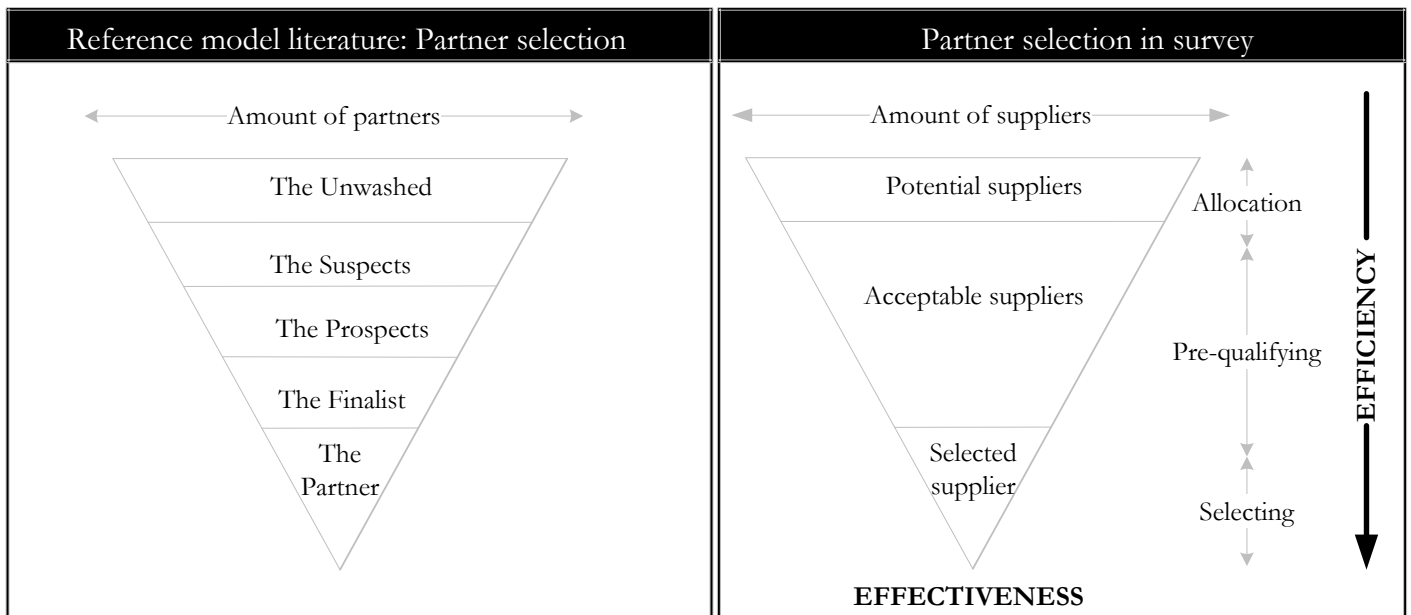


Figure 1-3: Left side Chesbrough (2003) partner selection, right side the supplier selection in research

<sup>3</sup> The process of selection from the unwashed to ultimately partner

Chesbrough (2003) stated that although the process of finding the partner within the unwashed follows the same procedure, the type of partner can have an influence (“first step in order to build the shopping list is to determine whom you are targeting”).

#### *1.2.1.7 Conclusion practical gap*

The high-tech market and supply chain are globalizing and is becoming more dynamic. Technological driven companies are increasingly engaged in outsourcing non-core processes to be able to compete globally. Shorter product lifecycles and volatility of the supply chain increase the level of outsourcing even more. As more processes are being outsourced, the dependency on suppliers increases leading to an increased importance of supplier selection for technology driven companies.

Traditional technological driven companies have difficulties dealing with the dynamic environment and see outsourcing processes as one strategy, as described. However, other organization structures can theoretically work better in the mentioned dynamic environment. Techno start-ups have with their agile organization structure the capacity to deal with this dynamic environment. The techno start-ups will increasingly compete globally as the environment in which these companies are established are facing the same global trends. Shorter product lifecycles and volatility in the supply chain/market demand forces techno start-ups to react quickly on changing environments. This forces the techno start-up to focus on innovation and ultimately, as techno start-ups also purchase items, establish a world-class supply base. In order to do so the supplier selection process of western techno start-ups has to meet the same world-class standards. Having stated this challenge, together with the important role in the business environment<sup>4</sup> and lack of research, the supplier selection process of western techno start-ups is the focus of the practical gap.

Techno start-ups need suppliers to react as quickly as possible to shorten the time-to-market without making concessions on the overall value delivered by the supplier. The possibilities of value delivered by the supplier have, because of the potential global supply base and market transparency, increased. Globalization together with advancements in information technology results in a dramatic expansion of companies in the potential supply base. Companies are easier to find and connected to other parts of the world [see paragraph 1.2.1.1 globalization]. This results in the trade-off between time to find the supplier and value of the supplier. Large MNE's have the capabilities and processes in line in order to deal with this trade off and have a competitive purchasing process. The question arises whether the techno start-ups, which are facing the same global trends, can also have a competitive purchasing process with a corresponding supplier selection process.

In order to select the best supplier within the shortest timeframe the techno start-up can use third party service providers. This research focuses on the question to what extent these third party service providers are used, and under which conditions. In addition, what is the effect of these parties on the efficiency (defined as hours spent during supplier selection) and effectiveness (evaluation supplier) of the supplier selection process? Finally, this trade-off is likely to depend on the type of supplier selected. Strategic and foreign suppliers could have a different selection procedure than domestic non-critical; therefore, this research also considers this.

## **1.2.2 Literature gap**

This paragraph will analyze the previously sketched situation from a theoretical point of view. First, the challenge of the techno start-ups, the most effective and efficient way of finding suppliers will be analyzed. Second, potential strategic solutions will be described starting by analyzing literature. Both research areas will be analyzed first, after the gap will be identified. Finally, a conclusion of this literature gap will be outlined. A detailed schematic overview of the literature gap can be found in appendix II.

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<sup>4</sup> Techno start-ups are generally seen as the facilitators of innovation and creator of jobs

*1.2.2.1 Challenge: Most efficient and effective way of finding suppliers*

The resource based view of firms (Wernerfelt, 1984) states that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal. In addition, the rather traditional field of research suggest that firms have to focus on their core competences or put it differently on what they are doing best (Prahalad, 1990). However, in order to deal with the dynamic environment of today [see paragraph 1.2.1] organizations have to be flexible. Therefore, strategic management scholars focus on a rather new research direction called “dynamic capabilities” which uses the following definition: “The firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Mitchell, 2007). Following the dynamic capability philosophy partners and suppliers are required in order to bring products to the market. Having stated the importance of suppliers/partners the selection is logically equally important. This challenge of finding suppliers will be discussed this paragraph.

Finding a partner is often associated with uncertainty about both the skills of the potential partner and its reliability (Luo, 1997). The importance of this supplier/partner selection is widely proven (Li, 2008; Büyüközkan, 2008; Reijnders, 2009). As the chance that this supplier is located around the corner is limited, global sourcing becomes an inevitable research area and therefore the first literature pillar.

Second, the global environment in relation to start-ups have caught the attention of scholars, resulting in studies on this specific business model, namely the born-globals and early internationalizing companies (e.g. Knight, 2004; Chetty, 2004). This type of company operates on a global scale right from the start. The studies on born-globals focus on the capabilities and success factors of these businesses.

Having defined the two pillars of current literature, global sourcing strategy for MNE’s, and the born global business model, the discussion now focuses on the gap within these areas.

First, global sourcing and international outsourcing for MNE’s received extensive attention from scholars. Strategies in particular for SME’s, however, have received far less attention in management literature and academic research, among few exceptions of e.g. Murtha (1991), Scully (1994) and Di Gregorio (2009). The literature for start-ups sourcing strategies is even more limited. Start-ups and SME’s have, in general, the advantage of less bureaucratic structures and hierarchical thinking compared to MNE’s (Di Gregorio, 2009). This together with entrepreneurial cultures, making as responsive to international opportunities, or even more, than MNE’s (Liesch, 1999). With revolutions in the information and communication technology, even very young and small companies may enter international markets and succeed in industries traditionally dominated by MNE’s (Di Gregorio, 2009). Given the proven benefits and performance improvements of global sourcing strategies of MNE’s by several scholars, the start-ups can benefit from the same potential improvements. Empirical research investigating global sourcing of start-ups is inadequate, even since empirical research on global sourcing effectiveness is limited to one paper to the best of the author’s knowledge (Petersen, 2002).

Second, scholars studying companies operating from their start or very early within an international network (defined as “born-globals”) merely focus on the market and business side of the company (e.g. Knight, 2004; Chetty, 2004). The procurement, or sourcing side, which could create growth (as proven by MNE’s) by using specific capabilities and cost reduction, have not yet received attention by researches. In addition, as these companies have a global customer base, having operations close to the customer can be beneficial. This sourcing side, together with the entrepreneurial character of the organization, could offer remarkable benefits.

To the best of the author’s knowledge, there has not yet been such a research on global sourcing in particular for start-ups focusing on the effectiveness and efficiency of one of the most important and first step: The selection of suppliers. In order to deal with this trade-off the techno start-ups has several strategic solutions.

These solutions in order to select supplier will be discussed in the next paragraph from a theoretical point of view.

#### 1.2.2.2 *Strategic solution*

As described in the previous paragraph, the techno start-up has to deal with the trade-off between efficiency and effectiveness during supplier selection. In order to deal with this trade-off the techno start-up has several solutions. Based on literature, we can define three distinctive solutions, which will be described in this paragraph. This list is not exhaustive but based on attention from the literature.

The first alternative, do it in-house, has received in this specific context no attention from scholars to the best of our knowledge, as is described in the previous paragraph. In literature, two other solutions using a third party service provider can be found: The cybermediary and the purchasing office.

In response to upcoming internet based business models, several scholars have researched the distinctive electronic intermediary (Grieger, 2003), cybermediary (Barnes, 2007) and/or infomediary (Sarkar, 2002). These organizations retain a fee for negotiating or conducting transactions over the internet as a third party. The studies on this type of intermediary focus on the value creation in specific chains and markets.

The second type of intermediary, the purchasing offices that manages the complete sourcing process, has received attention due to the success of several purchasing offices like Li&Fung. These studies were executed in the form of case studies examining their business model (Cheng, 2010; Magretta, 1998; Loveman, 1995). In addition, a recent paper by Belavina (2010) investigated the specific conditions, based on decentralization inefficiency<sup>5</sup> and supplier competitive advantage<sup>6</sup>, in which mediated sourcing is most beneficial in comparison to direct sourcing. The results of this report can be found in paragraph 2.3.3 [specifically figure 2-6] which is published with the permission of Mrs. Elina Belavina.

In summary, three solutions in order to select suppliers have received limited attention from the literature: In-house, the cybermediary and the purchasing office. Based on this, the efficiency and effectiveness of purchasing offices and electronic intermediaries from market perspective on supplier selection, is identified as literature gap of the strategic solution. The studies, executed in the past, merely take the position of the third party. This while a market survey under techno start-ups, which requires assistance, as described in the previous paragraph, has not yet been executed.

#### 1.2.2.3 *Conclusion literature gap*

The challenge of the techno start-ups, finding the best supplier within the shortest time-frame as part of their sourcing strategy, has received limited attention from the literature. Sourcing strategies have been researched extensively, specifically for MNE's. Start-ups however, which cannot be compared with MNE's based on resources and organization characteristics, did not receive this attention from the literature. This possibility was, however, never translated to supplier selection papers in literature.

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<sup>5</sup> Scored using the following parameters (based on personal contact with Mrs Belavina):

- ✓ Specifications of delivered
- ✓ Specifications are unobservable
- ✓ Specifications are costly to verify
- ✓ It is hard to ensure conformance of manufacturing process with labor/environmental/social norms
- ✓ There is significant proprietary information
- ✓ Accurate forecasting is impossible
- ✓ There have to be significant relationships specific investment made with suppliers

<sup>6</sup> Scored using the following tradeoff (based on personal contact with Mrs Belavina):

- ✓ One supplier has distinct advantage vs suppliers are comparable

Second, literature has researched distinctive strategies in order to find suppliers as part of the sourcing strategy. Current literature has researched the first alternative, namely “do-it-yourself”, in the form of studies on MNE’s (global) sourcing trajectories and studies on the “born-global”<sup>7</sup> business model. A combination of both areas, sourcing strategies (more specifically supplier selection of start-ups) and start-ups, has however not been researched. Taken the success of both businesses, which has been extensively proven in literature, a combination could therefore have major potential.

Using a third party service provider is the alternative to the “do-it-yourself” supplier selection. The strategic solutions identified by the literature are the cybermediary, providing information for supplier selection, and the purchasing office, managing the entire purchasing process. However, the result of these business models towards techno start-ups for supplier selection has not been researched from a user’s perspective. Taken the importance of these companies on the domestic economy and innovation together with the proven value of these third parties, the combination could give interesting insights. This combination of factors will be described in the next paragraph.

### 1.3 Problem statement

Following the research methodology of O’Leary (2005), this paragraph elaborates on the problem statement, based on the practical and literature gap mentioned earlier.

Technological driven companies have to deal with a dynamic environment caused by globalization, volatility and shorter lifecycles. Outsourcing part of the supply chain and subsequently focusing on suppliers/partner selection partly solves to the problem. The traditional large technological driven company has more difficulty, partly due to the focus on core competences instead of dynamic capabilities<sup>8</sup>, in dealing with the dynamic environment compared to flexible organization structures. This difficulty leads to opportunities for other organization structures. The agile techno start-up is potentially better in dealing with dynamic environments focusing rather on dynamic capabilities than core competences. However, given the limited resources of a techno start-ups the level of dependency on suppliers is even higher compared to the traditional technological driven company outsourcing part of their supply chain. Subsequently, supplier selection is even more crucial for the techno start-up while there are limited resources available. Taken the growing importance and potential of techno start-ups together with limited research of supplier selection process, this is the focus of the problem statement.

Having stated that the general problem of techno start-ups is the supplier selection process, we now zoom in on this specific problem. Techno start-ups strive, as large technological driven companies, for a competitive purchasing process on potential global scale. Logically, supplier selection is an important part in order to achieve this. Techno start-ups want the best supplier, defined here as “*effectiveness*”, as result of the supplier selection process. The possibilities for supplier selection has increased due to globalization and increased market transparency, on one hand. On the other hand, techno start-ups want to achieve this as fast as possible, defined here as “*efficiency*”, in response to shorter lifecycles and volatility. The selection of the best supplier within the short timeframe results in an ancient tradeoff: Effectiveness versus efficiency.

Third party service providers could give the techno start-ups a competitive advantage by providing assistance during the supplier selection process. The literature briefly investigated two kind of third party service providers. The cybermediary, which supplies information, and the purchasing office, which is responsible for

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<sup>7</sup> Companies operate on a global scale right from the start as explained in paragraph 1.2.2.1

<sup>8</sup> As stated in paragraph 1.2.2.1



entire purchasing process. Taken these different strategies into account, the best supplier selection strategy for specific environments cannot be provided by the literature or practical research.

In conclusion, the dynamic business environment requires flexible organization structures in the form of large technological driven companies focusing on dynamic capabilities or agile techno start-ups. In order to retain this flexible organization structure suppliers are increasingly important as the level of outsourcing increases. In response to the increasing importance of supplier the supplier selection process becomes equally important. A third party service provider could give the techno start-ups helpful assistance in order to build a world-class supply base on a potential global scale.

#### 1.4 Research question

From the problem statement in the last paragraph, we can conclude that techno start-ups are potentially successful in dealing with the dynamic environment. An important condition in order to do so is they have a well-organized supplier selection process. In this paragraph, following the previous three paragraphs, the main research question together with sub-questions are presented. As these questions focus on case and supplier specific situations, the questions are asked for one supplier selection process.

This research focus on the following main research question:

**Question: To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?**

In order to answer this main research question the following sub-questions are described. For every sub-question, the research methodology is briefly described and the relevance is motivated.

*Sub-question 1: How do techno start-ups select their suppliers?*

The conditions under which the supplier selection strategy is currently chosen are unclear. Therefore, before the effect of the supplier selection strategy on various performance indicators can be measured the decision variables are investigated. The type of supplier required, strategic vs. non-critical, could influence this decision. In order to be able to make distinctions between suppliers based on the place in the portfolio the Kraljic Matrix is used. The Kraljic matrix plots the supplier on a matrix based on “impact on profit” and “supply risk”. This results in that a non-critical supplier is plotted in the left bottom corner (low impact on profit and low supply risk). The strategic suppliers are positioned in the right upper corner (high impact on profit and high supply risk). Furthermore, the geographical location of the supplier could well influence the strategic selection strategy of suppliers based on global sourcing literature.

Conclusively, this question analyzes for which situations, defined as type of supplier and geographical location of the supplier, specific supplier selection strategies are used.

*Sub-question 2: What is the effect of the supplier selection strategy on the efficiency of the selection process?*

The main research question describes the relation between the supplier selection strategy and the efficiency of the selection process. This will be investigated in this question.

An (theoretical) advantage of outsourcing part of the selection procedure in the form of working with third party service providers, is the decrease of hours spent during the process. These spent hours are defined as the efficiency of the process. It is, however, unclear whether this promise is fulfilled in practice. Moreover, the type of supplier, defined using the previous described Kraljic matrix, and the geographical location of the

supplier are likely to influence the efficiency of the process. The impact of these predictors are however unclear for the techno start-ups.

Conclusively, this question can give Dutch techno start-up a forecast of hours required based on selection strategy, type of supplier, and location of the supplier.

*Sub-question 3: What is the effect of the supplier selection strategy on the effectiveness of the selection process?*

The second performance indicator captured in the main research question is the effectiveness of the supplier selection process. This effect will be investigated in this sub-question.

Another (theoretical) advantage of using third party service providers during supplier selection is that ultimately better suppliers are found. The selection of better suppliers can be measured by the evaluation of these supplier (which is defined as the effectiveness of the process). The type of suppliers, using the described Kraljic matrix, should have no effect on this evaluation, as strategic and non-critical suppliers should be evaluated equally. The location also should not influence the evaluation of the supplier, this because evaluation is a personal interpretation of what is expected and what is realized.

Conclusively, this question can provide a techno start-up the answer whether the third service provider actually increases the evaluation of the supplier. Furthermore, it answers the question whether geographical location together with type of supplier influences the evaluation of the supplier.

*Sub-question 4: What is the effect of the supplier selection strategy on the satisfaction of the selection process?*

In order to give a honest representation of the effect of the supplier selection strategy on the selection process the two ratio's effectiveness and efficiency are insufficient. Therefore, a third performance indicator is added to be able to answer the main research question.

The personal perception of the process could well defer from the trade-off between efficiency and effectiveness, as measured and defined in previous questions. Therefore, a new performance indicator, namely satisfaction of the process, is introduced. As the third party service providers want to be competitive they have to increase the satisfaction of the process. The geographical location together with type of supplier, using the Kraljic matrix, could also well influence the perceived satisfaction of the techno start-ups of the supplier selection procedure.

In conclusion, this question reveals whether third party service providers positively influence the personal evaluation of the process, defined as satisfaction. In addition, the impact of geographical location and type of supplier on satisfaction will show what kind of and where suppliers are selected the easiest according to personal perception.

*Sub-question 5: What are the most important evaluation criteria of suppliers for Dutch techno start-ups?*

The decision variables of the supplier selection strategy and the impact on three performance indicators are now covered in sub-questions.

A performance indicator of the process is the evaluation of the supplier, defined as effectiveness in this research. This evaluation is based on specific metrics that can be ranked by comparing them with general satisfaction of the supplier (supplier exceeded expectations).

Finally, this question will show which evaluation criteria of these metrics are found most important when selecting (and evaluating) suppliers by Dutch techno start-ups.

*Sub-question 6: What is the effect of the place in the portfolio on the geographical region of the supplier?*

As described in the previous question the place in the portfolio, using the Kraljic metrics: Impact on profit and supply risk, and the geographical location of the supplier can influence the performance indicators: Efficiency, effectiveness and satisfaction. However, the type of supplier can also influence the location of the supplier. It is

generally believed that if an item has a high supply risk, it is sourced from safe sourcing markets (taken the position of a Dutch company). Taken the entrepreneurial character of techno start-ups it is questionable whether this general belief is applicable to these types of companies.

Conclusively, this questions reveals if there is a relation between geographical regions and the type of suppliers, using the Kraljic matrix, which are selected by the Dutch techno start-ups.

## 1.5 Research methodology

First, the literature is consulted in order to answer the questions stated above and gaining a deeper academic understanding of the questions. This will be done by indentifying three main areas of research, which have an overlap with the main research question. The research question and sub-questions together with the literature review results in a literature framework.

Subsequently, taken the lack of empirical data for this specific research together with the goal of investigating relationships the preliminary research model is based on exploratory qualitative research. This will be executed by in-depth interviews with experts in the field in the form of practitioners and third party service providers.

The ultimate goal of this research is investigating relationships and testing proposition. Therefore, thirdly a testing quantitative research is executed under Dutch techno start-ups. Before the deliverables can be described in the next paragraph the scope of the research have to be lined out.

### Scope

*Research merely focusing on selection phase*

Reijniers (2009) concluded in his book that the costs savings potential are 35% during the specification phase, and 15% during the selecting phase (5-7% during contracting). The specification phase, although it is crucial in order to allocate and select the best supplier, is not incorporated in this research because specifications are often unclear during new product development processes within entrepreneurial companies. As early supplier involvement is likely during new product development (Reijniers, 2009) of techno start-ups together with the costs savings potential this report will merely focus on supplier selection.

*Drivers of (global) sourcing are not in the scope of the research.*

The drivers are not in the scope because scholars have done extensive research on the drivers in the past and gaps are minimum.

*Research focus on Dutch techno start-ups*

The research, as stated in the research question merely focuses on Dutch techno start-ups.

## 1.6 Deliverables

- ✓ Ultimately, a framework with tested proposition with efficiency, effectiveness and satisfaction of the supplier selection process as performance indicators. Supplier selection strategy, type of supplier (using the Kraljic matrix: Impact on profit and supply risk), and geographical location are the predictors. This is mainly intended for research purposes.
- ✓ Second, Dutch techno start-ups can ultimately be advised considering their supplier selection. Based on specific scenarios, type of supplier and geographical location, the best supplier selection strategy can be advised, e.g. do it in-house vs. purchasing office. In addition, taken the choosing supplier selection strategy together with the type of supplier and the geographical location required, a general forecast can be drawn considering hours needed in general. Finally, general supplier selection and evaluation recommendations can be given to Dutch techno start-ups.

- ✓ The third deliverable is considering the third party service providers. The third party service providers can be advised for which conditions they are mostly used by Dutch techno start-ups. Feedback can also be given on their performance defined as decrease hours spent and increase supplier evaluation from a customer's point of view. In addition, a general market satisfaction grade can be given to the several different forms of third party service providers.

### 1.7 Outline of thesis

First, the problem is analyzed from a practical and literature point of view resulting in the problem statement. The research question, which is derived from this problem statement, is described. This research question is the focus of the literature review, which is structured around three main research areas, resulting in the literature framework. Based on this literature framework and the leading research question, the research methodology, with corresponding data collecting chapter, is described. This literature framework is tested using the qualitative research resulting in a conceptual model. Derived from this conceptual model, propositions are described and motivated by literature or qualitative research. Finally, the propositions will be tested using the gathered data in quantitative study. Ultimately, the recommendations for practitioners and future research together with the limitations of the study are described in the last chapter.

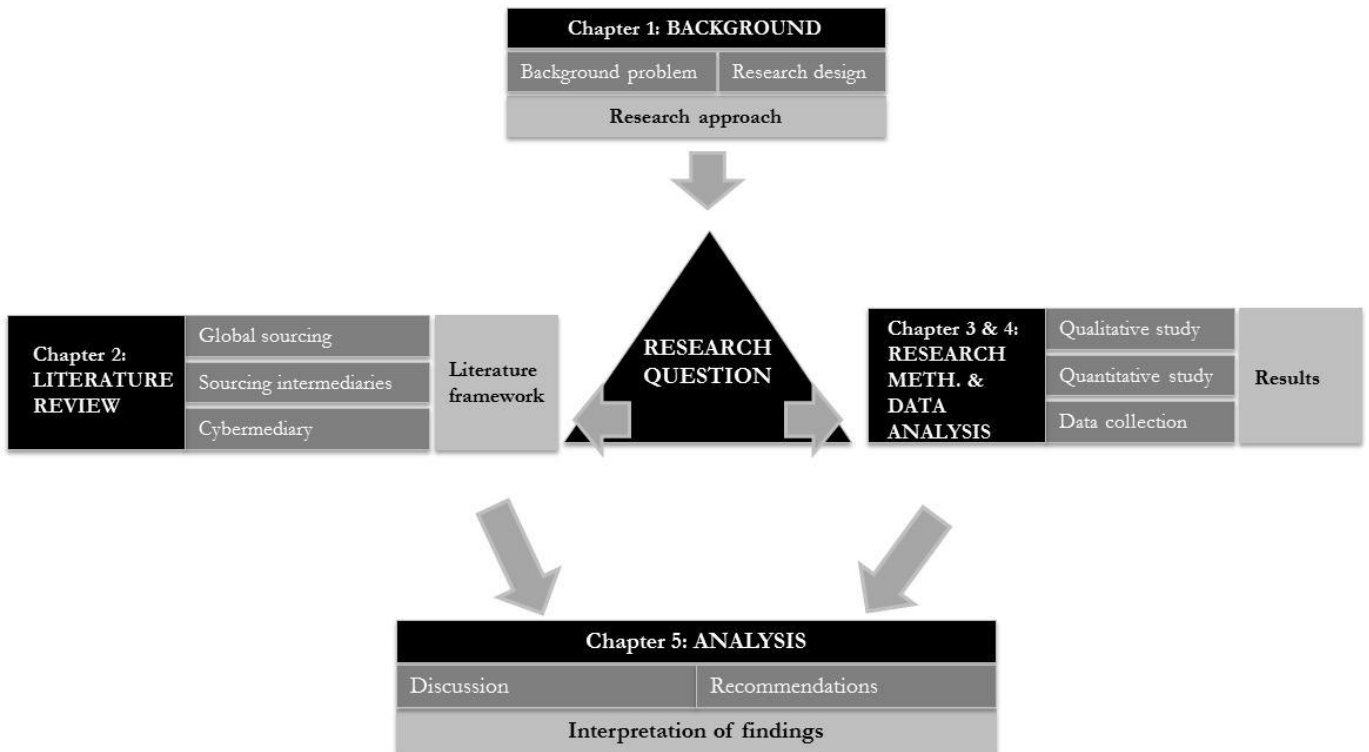


Figure 1-4: Outline thesis

### 1.8 Conclusion

Global trends are influencing technology driven companies. Globalization, volatility and shorter lifecycles, which are reinforcing each other, forces technology driven companies to focus on customer demand and innovation/new product development. In order to achieve this, parts of the supply chain are outsourced. As direct result finding partners/suppliers will become more important.

Techno start-ups, which can be seen as facilitator of innovation and employment, are facing the same trends as these companies are also competing more and more globally. This sets the supplier selection process of techno start-ups under pressure. The trends described above are also influencing the possibilities and requirements for the supplier selection process. Globalization, enabled by information technology, leads to more possibilities for the supply base. On the other hand, volatility and shorter life cycles require a fast supplier selection process. This leads to the trade-off of finding the best supplier (defined as effectiveness) versus finding the supplier fast (defined as efficiency). The type of supplier required and the geographical location of the supplier could have an impact on this trade-off. Consulting the literature for this requirement three different strategic solutions can be found: Do it in-house, cybermediary (internet based information supplier) and purchasing office (responsible entire purchasing process). An answer to the practical gap described above cannot be found. Therefore, the research question is the following: *“To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?”*

After a literature review based on three research areas of the highest relevance the research question is analyzed using a survey. This survey is held under Dutch techno start-ups and will test sub-research question. The insight, however, gained by practical and theoretical research is not sufficient in order to build this survey. Qualitative research, in the form of in-depth interviews with practitioners and third party providers will be executed to test the gathered information in preparation of the quantitative research (the survey).

Ultimately, a framework with the proposition tested on efficiency, effectiveness and satisfaction of the supplier selection process as performance indicators can be composed. Supplier selection strategy, type of supplier (defined using Kraljic matrix: Impact on profit and supply risk), and geographical location are the predictors. This is mainly intended for research purposes.

In addition, techno start-ups can be advised in their supplier selection strategy based on the type supplier and the geographical location required. General evaluation advise of suppliers and forecast of hours required based on these variables can be given.

Finally, third party service providers can be advised on under which conditions they are mostly used by Dutch techno start-ups. Feedback can also be given on their performance defined as decrease hours spent and increase supplier evaluation towards their customer. In addition, a general market satisfaction grade can be given to the several different forms of third party service providers.

## Chapter LITERATURE REVIEW

# 2

This chapter will analyze the research question. After a general introduction, three distinctive pillars are described: First global sourcing literature, second sourcing through intermediary and third the cybermediary. Finally, the portfolio matrix is briefly described.

### 2.1 Introduction

Over the last two decades, the reduction in trade barriers, improved communication technologies and differences in costs between geographies and geographical skill specialization have led firms to employ increasing levels of global sourcing. Additionally, in times of economic difficulty, outsourcing seems to be a solution; operating on a temporary base from a small organization while projects are done by suppliers results in a more flexible structure. This magnifies two sourcing challenge for western companies specifically. First, the more distributed supply chains increases the firms exposure to uncertainty to currency exchange rates, tariffs on trade, transportation, communication, input prices, supply disruptions and other risks from changes in the business environment of the firm (Koevelis, 2004). Second, global sourcing leads to a reduced ability to monitor, contract and control the actions of suppliers. In order to maximize the benefits while managing the risks doing business with the best supplier is crucial. MNE's have, despite the presence of knowledge and capacity, difficulties maximizing the benefits of global sourcing. Moreover, SME's and ultimately start-ups have even more difficulties organizing global sourcing or even local sourcing.

In facing these risks, firms offering sourcing services, sourcing intermediaries, have grown rapidly with different business models. The question from a techno start-up perspective *"To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?"*, remains unanswered.

The objective of this chapter is laying the foundation, from a literature point of view, to get insight in the sketched problem statement. This foundation rests on three distinctive literature pillars, which will be described in corresponding order, as figure 2-1 shows overlapping areas are of higher relevance.

The last paragraph, the portfolio matrix is not taken into account in this figure since it only briefly described in this literature overview.

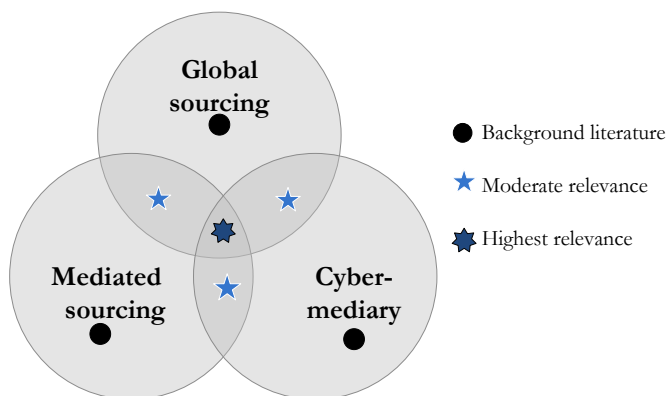


Figure 2-1: Pillars in the literature

### 2.2 Global sourcing

This first chapter will outline the relevant literature on global sourcing and international outsourcing. In order to clarify the extensive available literature this chapter is divided into specific paragraphs. The first paragraph will describe and define the global sourcing and the outsourcing phenomenon in general together with the interpretation used in this research in the form of a definition. Subsequently, this paper zooms in on the

western world, by describing the consequences of outsourcing in this particular geographical region. Thirdly, our discussion focuses on a specific outsourcing processes; namely manufacturing outsourcing. Finally, the last paragraph will elaborate on organizational structures, it will describe global sourcing considering Small Medium Enterprises (SME's). This focus is derived from chapter 1 and builds the theoretical understanding of supplier selection of western techno start-ups. Before the literature can be consulted field of research is defined in the next paragraph.

### 2.2.1 Definition of the field

Researchers from a variety of disciplines like economics, supply chain management and international business started to study global sourcing and outsourcing; resulting in that international (out)sourcing is a growing phenomenon. However, according to Mol (2008), it is wrong to state that international (out)sourcing did not have any forerunners. Much of the previous related research refers to an almost historical question from organizational theory: "What determines the boundaries of the firm (e.g. Parmigiani, 2009)?" In addition, outsourcing literature relates to the general business strategy literature in the form of the make-of-buy decision (Leiblein, 2002; Quinn, 1994). Even the old organization form, described by Adam Smith<sup>9</sup>, relied on an inter-organizational division of labor and subcontracting of manufacturing activities. As stated, international (out)sourcing is not an entirely new phenomenon, but has enjoyed an explosion of attention in the last decade (Mol, 2008).

This interest from several point of views, resulted in that the definition of outsourcing and global sourcing has changed in meaning overtime. The meaning of global purchasing is, on first sight, clearly similar to global sourcing (Kotabe, 1998; Trent, 2003), international purchasing (Motwani, 2000), worldwide sourcing (Monczka, 1992), import sourcing (Swamidass, 1993), offshore sourcing (Frear, 1992) and international procurement (Scully, 1994). Additionally, there are some new terminologies named by Mol (2008) like subcontracting, contracting out, contracting, external sourcing and farming out. As these definitions could be a source of confusion, this paper will focus exclusively on internationally sourced activities (as well near- as offshore), thereby excluding captive off shoring (e.g. internally managed Foreign Direct Investment) but incorporating all forms of global sourcing including international purchasing. Purchasing is generally seen as a straightforward process, where simple specifications lead to delivery according to these specifications (Mol, 2008). Figure 2-2 below, including definitions (Van Weele, 2010; Mol, 2008), outlines the procurement processes in six steps based on van Weele (2005) with corresponding terminology:

- ✓ Procurement: "Broader term, it includes all activities required in order to get the product from the supplier to its final destination"
- ✓ Purchasing: "Purchasing management of company's external resources in such a way the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured at the most favorable conditions"
- ✓ Sourcing: "Popular term relates to developing the most appropriate supplier strategy for a certain commodity of product category".

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<sup>9</sup> Adam Smith (1723-1790) most important work, "An Inquiry into the Nature and Causes of the Wealth of Nations", researches the ground and causes of wealth in nations and lays the foundation of the economic liberalism which we know today.

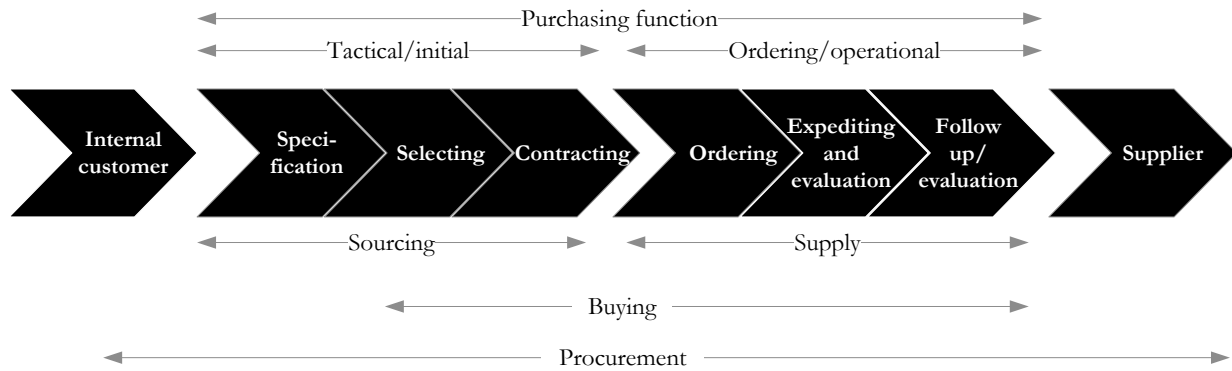


Figure 2-2: The procurement process (van Weele, 2005)

The definition used in this particular research also includes sub-contracting. Subcontracting is occasionally used in the context of projects of limited duration and, it is also used in situations where buyers drive the supply process and mostly operational information is exchanged (Mol, 2008). Subcontracting also refers to a special type of purchasing: a mix of services and materials, as shown in Figure 2-3 below. In addition, in subcontracting the buyer makes/defines the specifications.

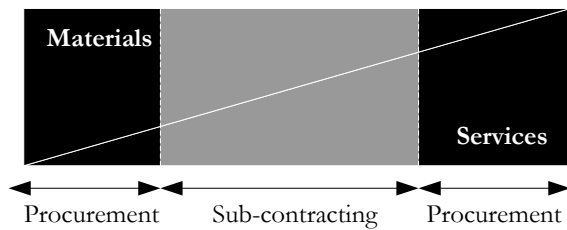


Figure 2-3: Relation subcontracting with procurement

The third definition that has a direct link with global sourcing and sub-contracting is outsourcing. Following figure 2-4 will clarify the distinctive place in the literature of global sourcing, sub-contracting in relation to outsourcing; “Outsourcing is the transfer of current internal business processes to external parties, both in the form of existing independent companies as well as subsidiaries of the current firm” (Mol, 2008).



As shown in Figure 2-4 the process of procurement and outsourcing differs but there are also similarities; the tactical process, outlined in Figure 2-2, follows the same procedure during procurement and outsourcing.

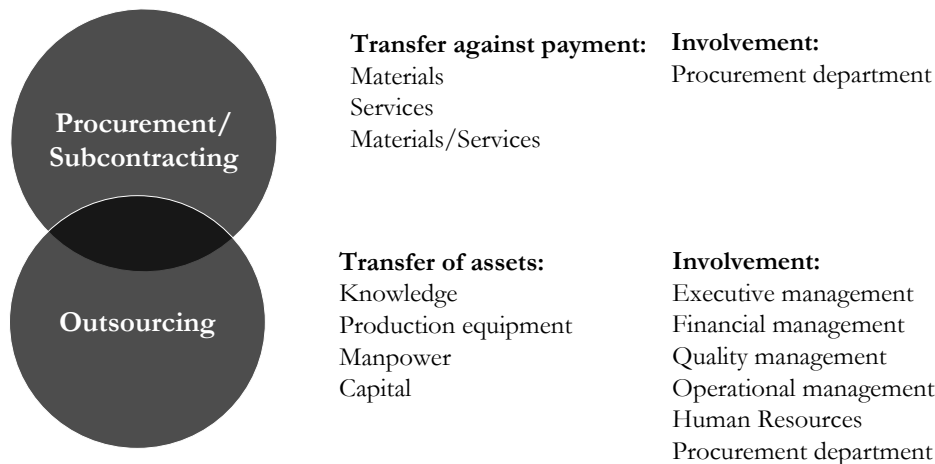


Figure 2-4: Relation procurement and outsourcing

Conclusively, in line with Bozarth (1998), Van Weele (2005) and Mol (2008), this paper defines global sourcing as follows:

*“The activity of searching and obtaining goods, services and other resources from external suppliers, on a possible worldwide scale, to comply with the needs of the company and with a view to continuing and enhancing the current competitive position of the company”.*

As this paper discusses global sourcing it also partially incorporates, as explained before, sub-contracting and outsourcing. Special attention will occasionally be spent on outsourcing since the close relation during the sourcing process as shown in Figure 2-4.

A natural interpretation of the increased attention, from both the academic and the practitioner’s perspective, is that firms should have good reasons for initiating global sourcing and international outsourcing processes. Kondratowicz (2005) illustrates this increased attention by stating that international outsourcing grew by approximately 30% between 1970 and 1990. An important objective of a firm, possibly the key one, is to obtain high level of performance; Increase in outsourcing levels is generally believed to be motivated by a desire to increase firm performance and, indeed, by a belief that outsourcing does increase firm performance (Mol, 2008). International business and strategic management scholars typically view international outsourcing, together with off shoring, as a mechanism to reduce costs and increase efficiency (Doh, 2005; Ramamurti, 2004; Farrell, 2005). Companies engage in global sourcing specifically, or outsource certain processes to foreign suppliers, to benefit from lower costs, particularly labor costs (Quintens, 2006). Next to lower costs and higher efficiency, outsourcing contributes to flexibility and development of new capabilities (Parmigiani, 2009) or as Spencer (2005) concludes: “Vertical integration involves higher fixed cost than outsourcing”. In addition, outsourcing creates growth for the purchasing department, which is responsible for controlling the process (Amaral, 2004), in the form of new relations to be managed and new contracts to be created (Mol, 2008). In conclusion, international outsourcing allows firms to concentrate on their core-competences and leverage their firm skills and resources for increased competitiveness (Quinn, 1994), while contracting out non-core

processes. In addition, based on above described literature and on Vos (2011) the following table 2-1 summarizes the opportunities/benefits and risks/challenges of global sourcing.

Opportunities/benefits	Risks/challenges
<b>General</b> <ul style="list-style-type: none"> <li>- Contribute to firm's competitive advantage</li> <li>- Introduce competition to domestic supply base</li> </ul>	<b>Quantitative</b> <ul style="list-style-type: none"> <li>- Logistics</li> <li>- Economical (e.g. exchange rates, duties)</li> <li>- Quality (e.g. damaged products)</li> <li>- Information and communication (e.g. time zones)</li> </ul>
<b>Differentiation opportunities</b> <ul style="list-style-type: none"> <li>- Better quality</li> <li>- Access to (advanced) technologies</li> <li>- Access to limited sources</li> <li>- Flexibility</li> <li>- Increased supply performance</li> </ul>	<b>Qualitative</b> <ul style="list-style-type: none"> <li>- Political/legal</li> <li>- Cultural/language</li> <li>- Other; e.g. bureaucracy, environment, human rights, (child) labor policies</li> </ul>

Table 2-1: Opportunities and risks of global sourcing (Vos, 2011; Quintens, 2006; Monczka, 2008)

### 2.2.2 Western economy

Having defined global sourcing, this paragraph will take the perspective of the western economy that purchases from Low Cost Countries (LCC). Narrowing down the western world in general, this paper briefly analyzes two distinctive Western countries, The Netherlands and Germany, to investigate the general influence of global sourcing and outsourcing.

From an economic point of view, several scholars and practitioners share the opinion that sourcing from and outsourcing to emerging markets (e.g. China) has more advantages than disadvantages for the Netherlands. The argument behind this reasoning is that the Netherlands is the gate to Europe, resulting in huge potential for the logistic and the transit business<sup>10</sup>. The lower manufacturing costs results in lower prices for the users/buyers. On the other hand, the import can be a danger of domestic manufacturing.

Beside the changes in logistics, global sourcing and outsourcing has an impact on the wages of western employees; especially less complicated work as stated in the introduction, moves to Low Cost Countries. A model described by Spencer (2005) explains that outsourcing influences the wages; each import has a share in increasing the capital/labor ratio of the exporting country. In addition, Geishecker (2008) investigated the impact of outsourcing on wages in Germany and concludes that the consequences can be divided according to skill classifications. He states that one percentage point increase in outsourcing reduced the wage for workers in the lowest skill categories by up to 1.5% while it increased wages for high-skilled workers by up to 2,6%. Subsequently, the research concluded, applying the ISCED<sup>11</sup> definition for low-skilled workers, that between 1991 and 2000 increased outsourcing accounts for a reduction in hourly earnings by €0,66 and €0,86 for narrowly and broadly defined outsourcing. Conclusively, this accounts for an average low-skilled worker, with 1.600 working hours per year, to an earning loss of €1.055 and €1.375. On the other hand, high skilled workers gain significantly, as stated before, from increased outsourcing. On average, their hourly wage increased by about €1,98 and €2,21 in 2000 compared with 1991, accounted to outsourcing (Geishecker, 2008). Again, assuming 1.600 working hours per year, this represents an earnings gain of €3.168 and €3.538 for narrow and wide outsourcing.

<sup>10</sup> Exporting goods which were firstly imported

<sup>11</sup> International Standard Classification of Education

We can state, based on previously sketched developments from an economic point of view, that the evolution of the western world to a more post-industrial service providing economy, including an increasing number of high skilled workers as a result of outsourcing “simple work”, can be seen as a positive development. Geishecker (2008) remarks that Germany is an interesting case to analyze as there is a general consensus that relative wages of high- vs. low skilled workers have remained virtually unchanged since the 1980’s even though outsourcing of activities has increased substantially during the 1990’s together with the opening of low-wage Eastern and Central European markets. Still, as Geishecker (2008) continues, Germany is a highly regulated labor market, in terms both of price of (thought the unions) and quantity (through high levels of employment protection), as described by Ochel (2002).

The next paragraph will set the next step in order to focus on relevant global sourcing literature.

### 2.2.3 Manufacturing

Having narrowed down the global sourcing process to the western world, this paragraph will focus on outsourcing a specific process closely related to global sourcing, namely outsourcing the manufacturing process. This focus is derived from the technological driven company, as described in chapter 1.

The first category work suitable for outsourcing was the unskilled blue color work. Second candidate was the information technology (Mol, 2008). During the seventies and eighties entire IT-departments of banks were transformed and moved around continuously; IT was difficult to manage resulting in exploding budgets. As a result, organizations started to see IT as non-core business and outsourced it to specialized suppliers of solutions. In case of right management, the benefits were. The next step in the outsourcing field was the recruitment of staff and manufacturing. This paragraph focuses on present literature considering manufacturing outsourcing/manufacturing outsourcing, and summarizes the specific difficulties organizations are facing. In 2000, the Outsourcing Institute and Dun & Bradstreet did research (van Weele, 2005) on the nature of outsourcing and concluded that, only, 7% of the outsourced activities had a manufacturing background. This paragraph will briefly analyze why companies are so anxious starting with manufacturing outsourcing and draws a future prediction.

Outsourcing manufacturing, like other processes, is easier when the organization has the processes under control. This means that the process-steps are documented, quality criteria of the in- and output are described and responsibilities are known. In recent years, enabled by revolutions in the information and communication technology, many businesses successfully standardized their processes in particular manufacturing, making the process more suitable for outsourcing.

Haffmans (2005) advises in his research suppliers to focus more on delivering modules and by doing so, following the OEM’s<sup>12</sup>, outsourcing part of their manufacturing to Low Cost Countries. In his research, Haffmans also concluded that suppliers focused on fabrication treatments (drilling, cutting, bending etc) have great needs for flexibility, which is, as stated in the introduction, a clear result of outsourcing. In addition, small manufacturing firms, especially module builders, can increase their company result on the short term by focusing procurement (Haffmans, 2005). In this sense, outsourcing and global sourcing can offer benefits for material treatments firms as well the module builders.

Having stated that global sourcing and outsourcing can offer benefits for the module builders and material treatment firms, when should a manufacturing firm start sourcing services on a global scale and when manufacturing? Research by Di Gregorio (2009) stated that offshore services impacts international

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<sup>12</sup> Original Equipment Manufacturer

competitiveness more strongly than offshore manufacturing does, with the underlying argument of more human interaction. Manufacturing outsourcing, specifically identified in the form of product specifications, can be transferred via impersonal communication lines (e.g. email and documents). As contracting is essential in all outsource processes, this is even more of the essence in manufacturing outsourcing. The benefits may be less, as stated by Di Gregorio (2009), but the difficulties managing the process are also less since manufacturing is more standardized.

Concluding, as manufacturing becomes more standardized together the need for flexibility of material treatment firms and potential benefits on the sourcing side for module builder, global sourcing and manufacturing outsourcing can be a great promise for western firms. However, choosing the right partner/supplier is essential in maximizing the value, as widely investigated by scholars (Luo, 1997; Li, 2008; Büyüközkan, 2008).

#### 2.2.4 Small and Medium size Enterprises

Having narrowed the international literature down to Western manufacturing firms, we will focus our discussion on the Small Medium Enterprises (SME's).

Both large Multinational Enterprises (MNE's) and smaller companies face increased pressure sourcing from and outsourcing processes to countries with a stable supply of highly skilled, low-cost workers. Scholars (Gupta, 2007; Ramamurti, 2004) typically see cost reduction as main driver behind outsourcing of manufacturing activities for large organizations, yet SME's may also benefit from possible benefits that LCC's can offer. Typically, MNE's outsource existing processes internationally in order to reduce cost and achieve greater efficiency (Doh, 2005; Ramamurti, 2004). As a result, these MNE's create thousands of new jobs in a Low Cost Country while eliminating a lower number of jobs in the home country. Not surprisingly, these outsourcing activities have caught the attention of managers, policymakers, politics and researchers (e.g. Ramamurti, 2004; Doh, 2005). Global sourcing and international outsourcing by SME's has received far less attention in management literature and academic research, among few exceptions of e.g. Murtha (1991) and Scully (1994). This is quite surprising since Chetty (2000) states that the first step in order to internationalize their business is on the sourcing side rather than through direct or indirect exports. Global sourcing could therefore be the first step in order to internationalize for manufacturing SME's.

A reason for the low attention compared with MNE's could be that scholars typically associate small firms with serving domestic markets using domestic resources (Di Gregorio, 2009). The author believes that the motivations, challenges, organization, and performance outcomes associated with global sourcing by SME's might differ from those of MNE's in several aspects. Chetty (2000) states that SME's perceive fewer benefits from global sourcing compared with MNE's and less helpful in competing with low-cost manufactures. Again, economies of scale and expert knowledge play a role. Although SMEs lack size and resource compared with the large MNE's, they have competitive advantage since they may have a narrower<sup>13</sup> bundle of capabilities<sup>13</sup>, as stated back in 1990 by Prahalad (Prahalad, 1990). Having said this, SME's have greater motivation to concentrate on growth but simultaneously remain operating from their core competences while outsourcing the non-core activities.

In addition, as compensation for lack of economies of scale in order to compete with MNE's, SME's have next to the narrower working method, the advantage of less bureaucratic structures and hierarchical thinking

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<sup>13</sup> Focused operations and core competences

together with entrepreneurial cultures making them more responsible for international opportunities (Liesch, 1999; Di Gregorio (2009)). With revolutions in the information and communication technology, even very young and small companies may enter international markets and compete successfully in industries traditionally dominated by MNE's (Di Gregorio, 2009). The flexibility and efficiency benefits, which are general for outsourcing, are substantial for SME's since outsourcing allows a firm operating under resource constraints to tap into valuable resources located in other countries (Di Gregorio, 2009). By doing so, SME's can overcome size disadvantages by obtaining foreign-location-specific advantages without needing to build internal multinational operations. In addition to the cost and efficiency advantages as a result of utilizing low cost workforce abroad, SME are likely to gain competitive advantage through accessing talent and innovation. SME's often lack the resource to hire the most talented employees and as stated by the SCP<sup>14</sup> (Josten, 2010) the pool from which can be hired from is shrinking. By accessing highly competent and educated workers, SME's may gain both cost and access innovative capabilities as a result of global sourcing from LCC's. The research of Di Gregorio (2009) indicates that the most important drivers of US manufacturing SME's to engage in offshore outsourcing were, in order of importance: Efficiency and cost reduction (labor, transport, travel, other), retain flexibility and access unique resources and capabilities abroad.

Having stated that global sourcing has specific potential benefits for the manufacturing SME, including young organizations, question arises what the differences are between MNE's and SME's in risks? As stated before by Gupta (2007) the relation between the western company and LCC supplier has a strategic nature. In contrast to large MNE's, SME's act more in a entrepreneurial environment and may be less anxious adopting innovations arise from these strategic relationships. For resource constrained small companies entering into a foreign market is a risky undertaking. Taking risks and the ability of the SME managers to recognize opportunities in the international markets, may therefore affect the degree to which their firm pursues such ambitions (Zahra, 2005).

In conclusion, global sourcing can serve, yet as another mechanism, to successfully internationalize the typically resource-constrained SME or start-up. More specifically; given that manufacturing and technical work is human capital intensive, cost are high and rising together with decreasing availability, small businesses can overcome their resource constraints and strengthen their competitiveness (internationally) via global sourcing and outsourcing parts of the manufacturing processes. Policymakers of SME's should approach this opportunity with careful consideration rather than fear. In addition, from a national economy point of view; when a large firm initiates outsourcing to LCC's it often leads to closure of domestic operations and the loss of jobs. In contrast with smaller firms, global sourcing and international outsourcing does not necessarily have to lead to displacement of domestic existing operations; it may enable SME's in facilitating growth, and to compensate the resource and capabilities constraints they cannot access internally or from the domestic environment. "SME's are more likely to enlarge in offshore outsourcing as a means of initiating new activities and processes than to displace existing activities that have hitherto taken place in the company's home market", as described by Di Gregorio (2009). Further explanation, besides the above described literature, and interpretation of the role of procurement within SME's is to the best of the authors' knowledge not supplied by the literature.

### **2.3 Sourcing through intermediaries**

Having defined specific global sourcing literature this paragraph describes one distinctive way of sourcing. Strategies for sourcing have been a central focus of recent research in supply chain management and various

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<sup>14</sup> Dutch Social and Cultural Planning-agency, a scientific government funded research institute

research areas, as outlined in paragraph 2.2. However, existing work has studied issues in the context of direct sourcing. To the best of the authors knowledge, with the exception of the recently released working paper by Girotra (2010) and some case studies on Li & Fung (Loveman, 1995; Magretta, 1998), not much attention has been spent on mediated sourcing. The first paragraph will give a definition of the field. Second, the general potential of sourcing through intermediaries is described. Finally, the discussion focuses on the differences between direct and mediated sourcing using, although limited, existing literature.

### 2.3.1 Definition of the field

Again, before the literature can be analyzed the field has to be defined. A number of scholars have researched intermediaries or brokers in general (Burt, 1992; Klerkx, 2008). The study of Kirkels (2010) indicated various roles that the broker can take:

- ✓ Coordinator: Enhances interaction between members of the group he belongs to
- ✓ Gatekeeper: absorbs knowledge from a group and passes it to the group he belongs to
- ✓ Representative: Diffuses knowledge of the own group to another group
- ✓ Cosmopolitan: Mediates as an outsider between members of the same group
- ✓ Liaison: Enhances as an outsider interaction between different groups.

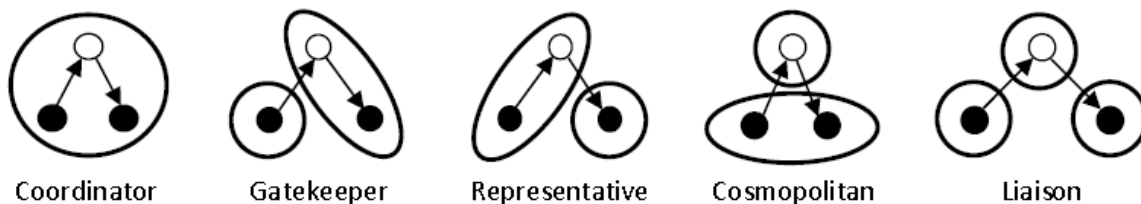


Figure 2-5: Roles of intermediaries/brokers (Kirkels, 2010)

Kirkels (2010) state in her study on brokerage in SME networks that brokers stimulate others and try to keep an objective position; the interested third person. In this particular research the broker is appointed, not analyzed using network externalities, and termed the “intermediary” acting in the liaison role as it establishes bridges between buyers and sellers (different groups). This paragraph will describe a specific intermediary in the value chain, namely the position of the purchasing office taking responsibility of the entire sourcing process. This specific intermediary role, enabling mediated sourcing as sourcing goes *through* the intermediary, will be termed “purchasing office” to avoid confusion with the intermediary in the matchmaking role.

### 2.3.2 General potential

Now that the field is defined, it can be questioned what the general potential is for mediated sourcing/sourcing through intermediaries.

While the changing economic landscape requires firms to retain flexibility and avoiding sourcing commitment from any one supplier, the desire to achieve the supply chain goals requires firms to inflexible commit to one or two suppliers. Sourcing through intermediaries could break through this trade-off by allowing firms to retain flexibility while enjoying a majority of the benefits that arise from committing to one supplier. Essentially, intermediaries could possibly achieve a higher extent of flexibility within their extensive network, while also reinforcing the relationships. Over the last decade a new breed of intermediaries with a global network of supplier and buyers have emerged (Belavina, 2010). Remarkable is that these businesses have grown at rates far larger than the growth rate in global sourcing (Cheng, 2010). Examples can be found in the form of Li-Fung (Magretta, 1998), which recently signed a multi-year multi billion deal with Walmart and Olam

International, which is another fast growing intermediary that focuses on the sourcing of agricultural products. Concluding from the fast rising companies offering services as sourcing intermediary together with the general possible benefits, we can state that there is definitely a potential. In addition, Kirkels (2010) state that SME's and start-ups don't have the capacity managing large networks, resulting in potential for the intermediary in this specific value chain.

### 2.3.3 Direct vs. mediated sourcing

Having stated that there is potential for sourcing through intermediaries; the distinction in sourcing strategies will be clarified and discussed in this paragraph.

Two sourcing strategies can be in general identified:

- 1) *Direct-sourcing*, where the buyer makes all the decisions; the firm selects and manages the suppliers directly, in line with the traditional relationship-based sourcing practices.
- 2) *Mediating sourcing*, where the buyer delegate all their decisions to a purchasing office; which chooses the supplier and manages the relationship while consolidating demand from multiple buyers.

Girotra (2010) summarizes three key phenomena that differentiate direct and mediated sourcing. First, Girotra states: "The consolidated demand from multiple buyers leads to preferences over the suppliers such that the mediated sourcing profits are maximized at a more egalitarian allocation of business between suppliers than those from direct sourcing". Put it differently, an intermediary is better off than a direct buyer with a more distributed allocation of business. "Second, the larger consolidated demand volume that flows through the intermediary allows it to better distribute the demand in any one sourcing period across multiple suppliers, which limits its exposure to self-interested behaviors by any individual supplier" (Girotra, 2010). Due to the larger demand volume, the intermediary can make these decisions while still sourcing more often from the cheaper suppliers. Finally, as Girotra (2010) states, direct sourcing has an advantage over mediated sourcing: "Direct sourcing buyers with very strong preferences over suppliers can focus on incentivizing the favored supplier, while the intermediary's consolidated preferences attenuate any individual buyers' preferences and thus it can be more difficult for it to incentivize an individual supplier." Having defined the three mechanisms through which direct sourcing differs from mediated sourcing; firms have to make the decision based on these characteristics between the two strategies. Girotra (2010) translated these characteristics into two dimensions. The first is decentralization inefficiency, which is driven by the benefits that can be realized by coordinating on cooperative outcomes as opposed to opportunistic behavior. Decentralization inefficiencies are high in sourcing situations where the product specifications are unclear, unobservable or costly to verify, it is hard to ensure conformance of the manufacturing process of specific norms<sup>15</sup>. Decentralization inefficiency is driven by benefits that can be realized by coordinating on cooperative outcomes. The second key factor is related to the complete advantage of one supplier over the other (Girotra, 2010). It is the difference between the likelihood of suppliers being lower-cost. If neither supplier has a significant advantage over the other, both suppliers are equally likely to be lower-cost and the suppliers are comparable. If, on the other hand, one supplier has a distinct advantage over the other supplier, it is more likely that one supplier is lower-cost than the other. Mediated and direct sourcing is scored using these two factors in figure 2-6 below. Derived from this model we can state that if suppliers are comparable, mediated sourcing offers less advantage over direct sourcing:

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<sup>15</sup> Such as labor, environmental and social norms, see paragraph 2.3.2 for the specific variables

		<u>Decentralization inefficiency</u>		
		Low	Medium	High
Competitive advantage	One supplier has a distinct advantage	<b>Mediated or Direct</b> (Depends on the suppliers characteristics)	<b>Mediated &gt; Direct</b>	<b>Mediated &gt;&gt; Direct</b> (More egalitarian allocations in dual sourcing)
	Suppliers are comparable	<b>Mediated ≈ Direct</b>	<b>Mediated &gt; Direct</b> (limited exposure allows for cooperation and flexibility)	<b>Mediated &gt; Direct</b>

≈, > and >> indicate small, medium and large differences in sourcing profits, respectively

Figure 2-6: Prescribed sourcing strategy (Girotra, 2010)

The trade-off between committing to source from a restricted set of suppliers in order to get benefits of long term relationships (defined as cooperation, as the traditional sourcing literature suggest (Scully, 1994; Quintens, 2006)) and flexible sourcing from the cheapest supplier is the central focus of the model above. It can be questioned that this trade-off actually has to be made applying mediated sourcing, as the following example of Li&Fung customers explains:

*“Li & Fung’s customers claim that the size Li & Fung’s suppliers network allows firms to switch manufacturing sites quickly when the economies of purchase transactions changes. They further state that working with Li & Fung provides them competitive advantage in sourcing from lower-cost suppliers more often. This is crucial as many of its customers are operating in highly competitive industries with low margins and must source products at the lowest price to stay competitive” (Loveman, 1995).*

Flexible sourcing against low prices can go hand in hand while the intermediary simultaneously maintains long-term relationships, as the traditional literature suggest, with the suppliers. Intermediaries are able providing sourcing firms an increasing level of flexibility in their sourcing choices, while at the same time ensuring cooperative behavior towards the suppliers.

Girotra (2010) analysis states that sourcing through intermediaries is most beneficial when there is an intermediate level of inefficiency and the suppliers are, on average, equally preferred or when the inefficiency is high and one supplier has an advantage over the other supplier. Questions arise if these general benefits have different potential consequences for sole<sup>16</sup> and dual sourcing<sup>17</sup>.

Girotra (2010) summarizes these possible consequences between direct and mediated sourcing together with sole and dual sourcing in following table 2-2:

Key difference between Direct and Mediated sourcing	Potential consequences for sole sourcing	Potential consequences for dual sourcing
<i>Selectivity:</i> Direct sourcing allows buyer to pick suppliers better matched to their needs.	Direct sole sourcing leads to higher sourcing profits.	-
<i>Egalitarian Allocation:</i> In mediated sourcing, cost minimization leads to a more egalitarian long-	Direct sole sourcing provides better supplier incentives to cooperation to	Mediated dual sourcing provides better incentives for the critical

<sup>16</sup> Cooperation with one supplier

<sup>17</sup> Cooperation with two suppliers



term allocation of business between suppliers.	one of the two suppliers and worse incentives to the other.	supplier.
<i>Limited exposure:</i> in any sourcing period, mediated sourcing can limit exposure to opportunistic behavior.	Mediated limited exposure retains a substantial amount of flexibility of dual sourcing to the potential rerouting of flows.	Mediated limited exposure strategies are easier to enforce than dual sourcing strategies.

Table 2-2: Differences between direct and mediated sourcing (Girotra, 2010)

The results of table 2-2 indicate the effect of mediation is different for sole sourcing and dual sourcing strategies.

Conclusively, as the intermediary can definitely offer benefits for the sourcing process, the strategic decision between direct and mediated sourcing has to be made based on supplier’s characteristics and decentralization inefficiency [Figure 2-6] while taking the potential consequences for sole and dual sourcing into account [table 2-2].

## 2.4 Cybermediary

This chapter will first lay the theoretical foundation for the cybermediary by firstly defining the field. Second, a general introduction considering virtual marketplaces playing the role of digital intermediary will be described by using various examples and comparisons with the “traditional intermediary”. Thirdly, the role of these electronic marketplaces is analyzed and finally the role of e-markets and supply chain is analyzed from a literature point of view. This type of third party service provider receives extensive attention due to the exponential rise and success of business models together with lack of literature.

### 2.4.1 Definition of the field

Internet based intermediaries enabling internet based mediated sourcing are not as upcoming or renowned as the global sourcing and outsourcing phenomenon, therefore some clarification regarding the definition is required.

The electronic market (or e-market/e-marketplace) is the place where buyers and sellers interact with the use of internet based ICT (Grieger, 2003). Within the electronic market of buyers and sellers, electronic intermediaries exist. These electronic intermediaries consist of purely internet based intermediaries, so called cybermediaries, which have diversified themselves to the electronic market. Next to the term cybermediary, there are other terminally used by scholars expressing a quite similar business model. One example is the infomediary business model, according to Chu (2005) and Sarkar (2002), which recognizes that there is value in personal data and the infomediary seeks to act as a trusted agent, providing the opportunity and means for clients to monetize and profit from their own information profiles. An agent works with the customer to capture profiles about the customers, helps them to manage those profiles and maximize their value and helps the customer to protect that information from access by vendors, as described by Chu (2005). Another definition is the e-market of Dai (2001), who states that B2B electronic markets in principal behave as digital intermediaries that concentrate on industry verticals or specific business functions.

The terms described above differ on platform (e-markets) or services/position (infomediary/cybermediary), as stated by Fazlollahi (2002). Based on these terminologies and definitions this report consistently uses the term “cybermediary” to avoid misunderstandings between the different definitions. The definition of a cybermediary used in this report is based on Barnes (2007): “*A business organization that occupies an intermediary position in a supply chain between a buyer and a seller, and whose business is based on the use of Internet-based ICT*”

### 2.4.2 Introduction cybermediaries

Information technology has been long been applied to support the exchange of goods, services and information between organizations. The online connectivity offered by online trading networks creates value by lowering communication and searching costs (Dai, 2001). However, on the other hand, purchasing firms wants to maintain established long-term relationships with preferred suppliers (Van Weele, 2005). Information technology (IT) has been applied to support information sharing between organizations and streamline corporate purchasing (Dai, 2001). A report back in 2000, estimated the value of goods and services sold via cybermediaries would reach \$2.7 trillion by year 2004 (GartnerGroup, 2000). The research also concluded that, as the corporate procurement online is on the rise; the number of cybermediaries in the United States had increased from 300 in 1990 to more than a 1000 in 2000. Most of these cybermediaries focus on one type of commodity, for example: Cybermediaries for steel and metal products like E-Steel.com and metalsite.com, or for cars like autoxchange.com and GM Tradexchange.com and even chemicals like chemconnect.com and chematch.com.

As the virtual value chain is formed, facilitating direct exchange between the buyer and supplier, the role of intermediaries is being threatened, but at the same time opportunities for new intermediaries arise. Interestingly, some of the largest Internet businesses act as major intermediaries between other players (e.g. Amazon and E\*trade) can be thought of middleman. Portals and vortals are both some form of electronic intermediary. This suggests that rather than disintermediation<sup>18</sup> is becoming the norm, a new norm of intermediary, cybermediaries, may evolve creating even hyper-mediation/re-intermediation<sup>19</sup> in specific markets (Carr, 2000). This is motivated by the research of Hackney (2004), on value creation by virtual intermediaries. Having stated that there is a market for the cybermediary in the form of virtual marketplaces<sup>20</sup>, now our discussion focuses on the advantages and disadvantages of this form of procurement.

B2B e-markets can function as digital intermediaries focusing on industry verticals or specific business functions as they set up virtual market places where firms participate in buying and selling activities (Dai, 2001). Next to lowering searching and communication costs, as stated in the introduction, the marketplace creates value by bringing buyers and sellers together to create “transactional immediacy” and “supply liquidity”, and by supporting the exchange of demand and supply information (Dai, 2001). With electronic catalogs, electronic auctions and other capabilities supported by new electronic markets, buyers can do one-stop, comparison shopping for thousands of suppliers and select the best source in real time (Dai, 2001). At the same time, focusing on SME’s with smaller IT-departments, they do not need to make a commitment to a dedicated procurement information systems infrastructure. This, obviously, is especially attractive for the smaller firms since it is likely to be cost minimizing in many ways together.

However, having stated some benefits considering virtual marketplaces, previous research (Dai, 2001) states that buyers possibly do not necessarily like to take full advantage of the opportunity enlarging their supplier base. Instead, they may prefer cooperating with just a small number of suppliers and make investments in systems that enable and support buyer-supplier coordination (Bakos, 1993). In addition, reducing the coordination costs can lead, according to Clemons (1993), to more inter-firm coordination and information exchange, resulting in closer inter-organizational relationships. Considering the set-up costs for establishing these integrated buyer-supplier relationships, firms want to protect these relationship specific investments in order to achieve economies of scale in transacting, buyers will prefer to develop strong partnerships with a key suppliers group (Dyer, 1997).

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<sup>18</sup> Removal of intermediaries in supply chain

<sup>19</sup> Reintroduction of an intermediary between end users (consumers) and a producer

<sup>20</sup> Also in the form of more specific matchmaking: [www.alibaba.com](http://www.alibaba.com)

Having stated the advantages of virtual marketplaces facilitated by cybermediaries together with the possible downside, now our discussion focuses on role of these cybermediaries.

### 2.4.3 The role of cybermediaries

Just any expert non-technological intermediary can match the buyer and seller in electronic markets together with arranging the payments and gathering demand and supply information. However, industry-specific expertise is an important asset that electronic market intermediaries are able to leverage (Dai, 2001). This important factor that has enabled “traditional intermediaries” to reposition and start doing business in the electronic commerce (Chircu, 2000). When the business process or product selection procedure is complex, expert advice can save the buyer time and effort spending on supplier selection as part of the sourcing process. Concluding, both market facilitation and expert services have to be integral parts of the offerings associated with the new electronic market business models of the World Wide Web (Dai, 2001). In spite of the benefits, which the electronic market together with the expert knowledge of the intermediary can offer, these information systems have not been as widely adopted as one might expect. Especially among the smaller firms, as stated in Dai (2001), the adoption stays behind. Reasoning behind this, as Dai (2001) argues, is that smaller firms have failed finding the robust technical standards that are needed to make IOIS<sup>21</sup> adoption economical. Grieger (2003) and Bakos (1998) mention that a cybermediary can create value by two fundamentally different mechanisms: aggregation and matching. The aggregation mechanism brings a large number of buyers and sellers together under one virtual roof. They reduce transaction costs by providing one-stop shopping. This mechanism is static in nature because prices are pre-negotiated. Adding another buyer to the market benefits only the sellers, and adding another seller benefits only the buyers. The matching mechanism on the other hand brings buyers and sellers together to negotiate prices on a dynamic and real-time basis. The roles of the players are fluid: buyers can be sellers, and vice versa. Therefore, adding any new member to the cybermediary increases the liquidity and thus benefits both buyers and sellers. Grieger (2003) defines an important point, which differentiates transactions through a cybermediary from other B2B transactions, namely that through a cybermediary an exchange involves multiple buyers and sellers, it centralizes and matches buy and sell orders and provides post-trade information. Grieger (2003) applies two characteristics of a cybermediary: Institutional as a medium and social as a community consisting of buyers and sellers. As a medium, it facilitates the exchange of information, goods, services, and payments. Involving with roles of rights and duties are examples of a social community.

Electronic markets, facilitated by cybermediaries, do not require services related to the matching of customers and suppliers in the physical space. In fact, the information infrastructure may make it so easy to match customers and suppliers that the role of intermediaries may be reduced or even eliminated (Bailey et al, 1997). As a result some roles of the intermediaries may be less important in electronic markets, and new roles for intermediaries are emerging.

However, in the existing literature there are different categorizations of roles cybermediaries fulfill. Barnes (2007) has made a literature comparison of the roles of cybermediaries by examining several models; finally, he has come up with his own overlapping model. Barnes (2007) classifies all roles of cybermediaries in five different roles: Informational, transactional, assurance, logistical, customization. The informational role involves the provision of information about buyers, sellers and their products. The transactional role contents that a cybermediary acts as a buyer or a seller in a direct transaction. The assurance role is one of providing assurance of the quality of the goods to be purchased and in the legitimacy of the purchasing. The logistical

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<sup>21</sup> Inter-Organizational Information Systems

role involves delivering the goods and services to the customer. Tailoring of products and services to better meet the needs of individual customers is about the customization role.

Describing the roles of intermediaries using Barnes (2007), the question arise how these cybermediaries differ from their traditional counterparts. To explain these differences this paper uses two publications; merging Giaglis et al. (2002) model with roles described by Barnes (2007). However, Giaglis et al. (2002) use three phenomenon's: Disintermediation, re-intermediation and cybermediation. Disintermediation, which in essence is about the moves toward a shorter value chain in e-markets because intermediaries tend to add significant costs to the value chain (Benjamin & Wigand, 1995), will not be used because it is less relevant for this paper because it focuses on the cybermediaries not their disappearance. Therefore, focus will lie with re-intermediation and cybermediation.

<b>Informational</b>	Determination of product offerings	Intermediaries receive market signals and pass them on to sellers, allowing them to configure an improved product mix.
	Searching	Intermediaries can reduce search costs for both sellers and buyers by providing a 'one-stop shop' for information gathering, advertising and transaction management
	Price discovery	Intermediaries can generate the necessary liquidity for smooth market operation and in certain cases (e.g. auctions) may even provide the infrastructural mechanism for price discovery.
<b>Logistical</b>	Logistics	Intermediaries can achieve economies of scale and scope for logistical operations more easily than individual sellers can.
<b>Transactional</b>	Settlement	Intermediaries facilitate, monitor and guarantee the settlement transactions.
<b>Assurance</b>	Trust	Intermediaries guarantee to sellers and buyers the non-opportunistic behavior of other market participants.
<b>Institutional infrastructure</b>	Legal	Intermediaries (usually governments and international bodies) provide infrastructure the legal basis for market operation.
	Regulatory	Intermediaries provide mechanisms for the enforcement of legal, ethical, and behavioral rules in markets

Table 2-3: The role of intermediaries in traditional market functions (Giaglis et al., 2002; Barnes 2007)

Because both traditional and cybermediaries essentially provide the same functions, at least in this model, they appear to be quite similar. However, there are some notable differences. The first difference is in the determination of product offerings; new cybermediaries can create value by bundling products and services traditionally offered by separate industries (Bakos, 1998). Demand aggregation as well as searching performs similar activities as their traditional counterparts. The second difference is price discovery; this function has been taken to a completely new level. In the redistribution, electronic auctions have emerged for products that were traditionally sold through other mechanisms and, on the other hand, completely new price discovery mechanisms have been developed. The economies of scale and logistical expertise remain similar to the traditional functions. The third difference is that of settlement; traditional as well as new payment intermediaries have entered this market by not only moving their traditional services on the internet but also entering differentiated modes of service (Clemons et al., 1996) which emerge due to advances in electronic payment mechanisms. The last difference is that of trust; this appears to be a similar feature but protection against opportunistic behavior is more important in electronic markets than in traditional markets (Giaglis et al., 2002). Because the electronic market is less transparent, there is an increased need for monitoring the behavior of market participants and alerting buyers in case of malpractice. Thus specialized intermediaries are required, for example public key infrastructure and certificate authorities as well as privacy guarantee services

(Benassi, 1999). Conclusively, although cybermediaries appear similar to traditional intermediaries, they differ significantly in key areas and these differences will only increase, as advances in technology will lead to new possibilities for cybermediaries.

#### 2.4.4 Cybermediaries and supply chain management

The relationship between cybermediaries and supply chain management appears to be problematic in case of amount of suppliers in the chain (Grieger, 2003): Co-operative supply chains aim to reduce the number of suppliers and form long-term strategic alliances that 'lock in' suppliers and 'lock out' competition, while intermediaries promote competition and allow buyers to search for suitable suppliers and support "transaction-based" partnering. Gural et al. (2001) mention also that the flow of information between the supply chain partners can be efficiently managed over the internet. It will reduce the costs and increase the speed and the quality of data transfer. On the other hand, he concludes that the cybermediary should organize a complementary physical logistics system in order to distribute material products to its clients. Gural et al. (2001) argues for value networking, in which the cybermediary is organizing and managing a complex portfolio of partnerships with physical logistics service providers.

Market function	Electronic market influences	Effects on intermediation
Determination of product offerings	Product/service bundling	Cybermediation: Integration of related products/services in a single market
	Demand aggregation	Cybermediation: Lower costs of buyer pooling to negotiate volume discounts
Searching	Higher search costs for buyers	Cybermediation: Infomediaries for filtering information in the extended search space of the e-market
Price discovery	Redistribution of mechanisms between markets	Re-intermediation/cybermediation: Alternative price discovery mechanisms not normally used in their traditional market counterparts
	New price discovery mechanisms	Cybermediation: New price discovery schemes
Logistics	Economies of scale	Re-intermediation: Traditional intermediaries will leverage their expertise by emerging as major players in e-markets
Settlement	Increased need for trust	Re-intermediation: Traditional intermediaries with strong brand names will transfer their service portfolio in the e-market
	New payment mechanisms	Cybermediation: New entrants will emerge to provide settlement support for e-payments
Trust	Increased requirements for monitoring and protection	Cybermediation/re-intermediation: Trusted third party support in e-market transactions, new and traditional intermediaries
Legal & regulatory	Institutional support for electronic markets	Re-intermediation/cybermediation: Governmental organizations continue to set rules for electronic markets 'operations to ensure transaction transparency and tractability

Table 2-4: The likely effects of electronic markets facilitated by cybermediaries on intermediation (Giaglis et al., 2002)

## 2.5 Research model

Derived from the main research question with corresponding sub-questions and literature review this paragraph draws the research model. This framework will be used as research model for the research methodology. First, the possible strategies in order to select suppliers for the Dutch techno start-up are summarized using the literature review. Second, the performance indicators are described and scaled. Third, other variables influencing the impact of supplier selection strategy on performance indicators are identified and described. In the last section all variables are presented in a table including scale and positioned in a preliminary research model figure.

Before the supplier selection strategies for the western techno start-up can be assessed, they firstly have to be identified. Paragraph 2.3 “sourcing through intermediaries” and 2.4 “cybermediary” represents two strategic alternatives for the techno start-up considering supplier selection. Paragraph 2.2 “global sourcing” represents indirectly the strategic solution to select supplier without third party service providers. In summary, these chapters lead to the following summary of supplier selections strategies: In-house, cybermediary and purchasing office. These three alternatives are conceptually used as possible supplier selection strategies. The main focus of this research is measuring the effect of these strategies on the specific performance indicators, which will be discussed in the next section.

As described in the main research question there are two distinctive performance indicators measuring the supplier selection process. The first one is the efficiency of the supplier selection process measuring the effort spent on selecting the supplier. The literature is not clear considering the scale of measurement for efficiency in this context. However, the selection of supplier can be divided in three distinctive steps: Allocation, Pre-qualification and selection.

The second performance indicator, effectiveness, measures the evaluation of the selected supplier. There are numerous scales in literature and practice but for this research the scale has to meet two requirements: Valid for research and understandable for the respondent. The evaluation metrics of AMSL is therefore chosen which is also evaluated by and Monczka (2008). The possible supplier selection strategies together with the efficiency and effectiveness scaling considering the supplier selection process are now defined using literature. The measurement and scaling of these two performance indicators are conceptually as qualitative research has to be performed before this scaling can be confirmed [see paragraph 3.4.1 measurement dependent variables]. The last step in order to compose a research model is checking for variables influencing above described relationship.

The first variable which possibly could have an influence on the above described relationship is the location of the selected supplier. The global sourcing paragraph 2.2 states that there are major difference between domestic sourcing and global sourcing. Therefore, this item should also be included as predictor of the performance indicators.

Second, the supplier selection process cannot be generalized for every supplier. As stated in paragraph 1.2.1.6 the type of supplier can have an influence on the supplier selection of Dutch techno start-ups and a distinction has to be made. The Kraljic Portfolio Purchasing Model is chosen in order to make this distinction. The matrix was created by Peter Kraljic and it firstly appeared in the Harvard Business Review in 1983 (Kraljic, 1983). Despite its age, it is still a popular and useful model used in companies worldwide. Its purpose is to help purchasers maximize supply security and reduce costs, by making the most of their purchasing power. In doing so, procurement moves from being a transactional activity to a strategic activity. Put it differently, using the

title of the article: “Purchasing must become supply management”. The following figure 2-7 describes the Kraljic matrix with corresponding strategies:

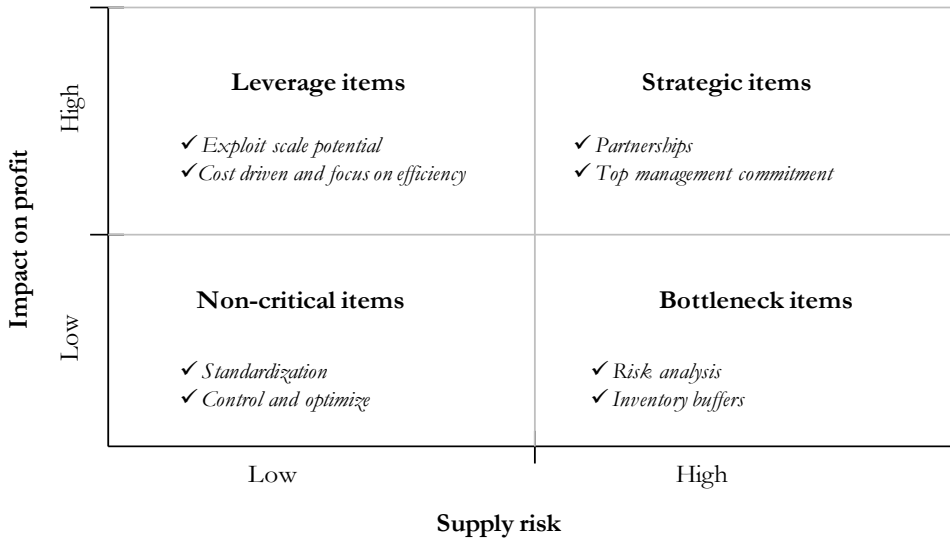


Figure 2-7: Kraljic (1983) portfolio matrix with corresponding strategy (Monczka R. H., 2008)

Having defined the variables which could possibly influence the main relation the research model can be composed. The following table 2-5 and figure 2-8 summarizes above described variables leading to the research model based on literature review:

Item	Explanation	Scale	Literature
Supplier selection strategy	The supplier selection strategy used by techno start-ups	1. In-house 2. Cybermediary 3. Purchasing office	Belavina, 2010; Cheng, 2010; Fazlollahi, 2002; Sarkar, 2002
Location	Geographical location of selected supplier	Based on industrial regions in the world	Chetty S. C., 2004; Reijniers, 2009; Mol, 2008
Kraljic	The positioning of the supplier based on “impact on profit” and “supply risk”	1. Supply risk 2. Impact on profit	Kraljic, 1983; Gelderman, 2010
Efficiency	Effort selecting supplier	Not scaled yet but based on three phases: Allocation, pre-qualification and selection	Specific detailed description of the supplier selection step based on (Gelderman, 2010; Van Weele, 2005)
Effectiveness	Evaluation of the selected supplier	5-point likert scale based on Quality, Logistics, Technology and Costs	Based on ASML (Dijkhuis, 2007) and Monczka R. H. (2008)

Table 2-5: Literature overview, table

Applying these items together with chapter 1, the following literature framework can be drawn:

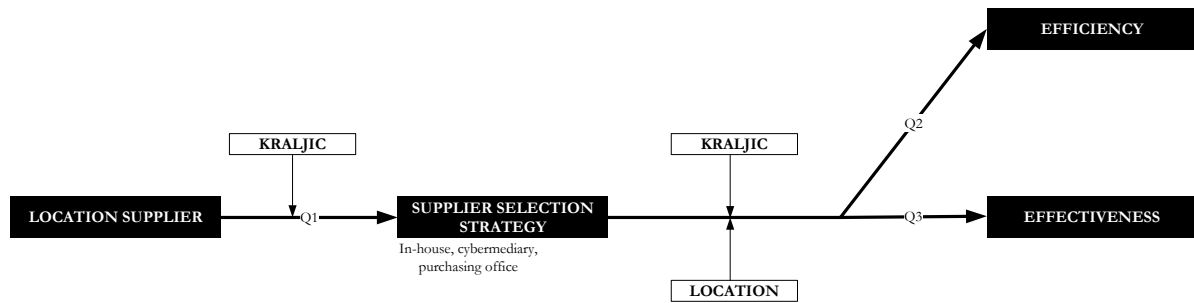


Figure 2-8: Literature framework, schematic

## 2.6 Conclusion

The western civilization is changing to a post-industrial, service-providing knowledge-civilization and adequate staff for manufacturing companies will become harder and harder to find. LCC's could provide, besides cost advantages, these capabilities. If executed correctly global sourcing could therefore be the answer since markets have also become more international.

Young SME's or start-ups have great difficulties organizing international value chains, which is for some industries inevitable in order to survive the global and dynamic market. The manager should do his homework extensively, starting by selecting the best partner, in order to make global sourcing work.

The literature indicates that the intermediary could take various roles in order to add value in the international value chain between western companies and companies located in LCC's. The first role of the intermediary identified by the literature is the purchasing office. The purchasing office takes full responsibility of the purchasing process. This business model received attention in the form of case studies, due the success of Li&Fung, and mediated sourcing studies.

The second business model which received attention from the academic world is cybermediary. The cybermediary supplies information using an internet platform in order to select suppliers. Theoretical research focused on the value creation and marketing side of these business models.

Having defined three methods in order to select suppliers, in-house, purchasing office and cybermediary, the type of supplier required could well play a role in the selection process. Therefore, one of the most famous purchasing models, the Kraljic matrix is used to make this distinction. The Kraljic matrix grades supplier on "impact on profit" and "supply risk" in order to distinct the strategic supplier from the no-critical supplier.

From this literature review can be concluded that the research question cannot be answered using merely literature. Therefore, a literature model is composed using the literature review in order to answer the main research question.



## Chapter **RESEARCH METHODOLOGY**

# 3

Starting from the literature framework described in figure 2-8, a conceptual research model based on qualitative research is designed. Second, the research questions with propositions are summarized based on this. Finally, the specific variables and scaling are motivated with special attention for the depending variables.

### 3.1 Introduction

There are mainly two types of research: Qualitative, that explores new phenomena and gain new insights on one hand. On the other hand, quantitative research, which focus on the confirmation of relationships by testing proposition (Maxwell, 2005). Taken the lack of empirical data for this specific research, together with the goal of investigating relationships, this research model is based on mainly proposition testing quantitative research with an exploring qualitative research foundation.

### 3.2 Qualitative research

The literature for supplier selection strategies, which is the focus of this research, is in general limited [see paragraph 2.3 & 2.4 of the literature review]. As described, this research focus specifically on supplier selection of Dutch techno start-ups. First, the goals of this qualitative research are summarized. Second, the qualitative research design together with general findings are described. Third, the goals of the research are evaluated resulting in a conceptual research model.

The first goal of this qualitative research is producing an exhaustive list of supplier selection strategies. The literature review describes three different strategies (in-house, cybermediary, purchasing office), but it can be questioned if this covers all possible supplier selection strategies.

The second goal is gaining new insights considering the literature model by testing the items and relationships on practical relevance. Based on the lack of research, this qualitative research explores this fairly new phenomenon.

The qualitative research is executed in the form of semi-structured interviews with experts in the field and practitioners. If possible the interviews were taken in person, the others were taken by telephone. The authors personal business network was used for contacts and appointments were easily made. This qualitative research is executed in the form of semi structured in-depth interviews with a cybermediary (C), intermediary (G), and purchasing offices (D,E,F,H). In preparation to these interview, two interviews were taken with procurement managers (A,B).

To be able to test the literature model, specific questions were asked to all respondents. First, company characteristics like their role, amount of FTE and markets, were asked. Second, the most important process step and the business model is asked. In addition, the added value towards the buyer and supplier is asked in order to reveal why the third party service providers think they are used by customers. Finally, the vision on the future of the respondent is asked indicating which developments/trends are influencing their company and sector.

After the interviews were taken, of which a detailed summary can be found in appendix III, every answer on the specific questions is analyzed. The following table 3-1 shows this analysis for every question. The last column provides the conclusion and is that sense an answer to the question.

Company	C	D	E	F	G	H	Summary
<b>Role</b>	Cybermediary	Purchasing office	Purchasing office	Consolidator (type of purchasing office)	Intermediary	Purchasing office	<b>Wide variety</b>
<b>FTE</b>	160	6	70	12, within 2 months 22 FTE	1	100	<b>Wide variety of organization size</b>
<b>Markets</b>	Various SME's market	Metal and plastic industry, mostly OEM	Various market for various roles in supply chain	Mainly OEM in automotive and cooling	No target market	Promotional items for large customers	<b>Wide variety of markets</b>
<b>Most important process?</b>	No particular process	Supplier selection and quality control	Specification and supplier selection	-	Supplier selection on long term	Design and quality control	<b>Supplier selection and quality control</b>
<b>Business model</b>	Matching buyers and sellers on internet for various markets	Taking care of the whole purchasing process (incl. product quality)	Provide buying office services on outsource basis	Purchasing office without direct payment	Matchmaker and mediator who can work for both supplier as buyer	Trading company that adds value from design to logistics and take full responsibility	<b>Business model is related with role and can be generalized</b>
<b>Value-proposition buyer</b>	Supplying sales leads	Quality and logistics are guaranteed	Speed, process expertise and global footprint	Sourcing directly from China, without roots, is never the best option in the long run. Added value: Payment terms, less work purchasing office and faster	Find suitable suppliers	Quality assurance  Financial strength  Design	<b>Speed, quality assurance and logistics are most important</b>
<b>Value-proposition supplier</b>	Get quotations	-	-	-	Find suitable buyers	-	<b>Only the non purchasing offices add value towards the supplier</b>
<b>Future</b>	Satisfied with role	LCC remain interesting learning curve flat so role for intermediary. Purchasing office for western Europe less valuable. Expand in China by new assembly lines.	More global and different business models (not only fixed fee).	After credit crunch lot of third party service providers were bankrupted. Large companies continue to source from China while smaller companies seek supplier closer to their home market.	E-tendering is a good concept for well defined projects in order to achieve short term gains. But there is no attention for the long term. The role of intermediary/matchmaker remain important for the future. Most specifically between markets with different cultures.	In the future more focus on sustainability. Asia will become next to a sourcing market also a sales market. This can result in different sourcing approach. Final, e-commerce will become more important and business models have to be transparent in the future.	<b>The purchase office add more value when doing business with China. The internet has opportunities for growth.</b>

Table 3-1: Summary qualitative study

As the table 3-1 above shows, there is a wide variety of company characteristics and type of services they are providing. The third party service providers have also different markets segments.

Considering the most important process, there is an underlying factor. Most interviewees find the supplier selection, together with specification phase, the most important step during the purchasing process. This confirms the problem statement described in paragraph 1.3. In addition, the quality assurance is found important.

The business models of the third party service providers are comparable to each other based on their role.

Considering the value towards the buyers, the purchasing offices claim that speed, quality and logistics are most important. The intermediary and cybermediary have comparable value-propositions towards the buyer and seller, as these business models focus on merely matching. The added value is, therefore, in the form of introducing both parties to each other. The purchasing offices don't have a value-proposition towards the seller, as described in table 3-1.

In the last question, the vision of the respondent on the future is asked considering their own company and on the entire market. Almost unanimously the respondents answered that the role of the intermediary in the purchasing process will remain in the future. Specifically when dealing with the Chinese sourcing market an intermediary is required in the long term. In addition, the respondents see that in response to revolutions in the internet, business models will become more transparent. The purchasing offices see this revolution as an opportunity rather than a threat.

As described this qualitative study has two specific goals. The first goal of the research, on which the literature does not provide a clear answer, is the creation of an exhaustive list of possible supplier selection strategies for Dutch techno start-ups. Based on the underlying structure of business models in table 3-1, we can identify four possible strategic solutions in order to select suppliers (with the note that there is significant difference in paid and unpaid intermediary):

1. Do it yourself  
*Managing the whole sourcing process in-house from start to delivery*
2. Use of cybermediary  
*Use of an electronic intermediary for finding/allocation suppliers acting as a matchmaker, the rest of the process is managed in-house*
3. Use of intermediary (paid and unpaid)  
*A dedicated intermediary finds the supplier, which meets the requirements and potentially offers additional services as setting up the contract*
4. Use of purchasing office  
*The whole sourcing process is outsourced to a dedicated purchasing office*

Obviously, in the first strategic solution, do-it-yourself, the Dutch techno start-up manages the whole sourcing process in-house. In the second strategic solution, the cybermediary, the specification process of the supplier is executed using pre-determined formats of the cybermediary on the internet. The selection of the supplier is executed in corporation between the cybermediary and the Dutch techno start-up. The third strategic solution, the intermediary, goes one step further in the purchasing process. Although the buyer makes the ultimate decision considering the selection, the guidance by the intermediary is more intense. Also the contract phase is executed in corporation. The last strategic solution is the purchasing office. In case of this strategic solution, the whole sourcing process is outsourced and managed by a dedicated purchasing office.

Translating these strategies to the van Weele purchasing process [see figure 2-2], the strategies differ on the level of outsourced activities. Figure 3-1 schematically describes the level of outsourcing during the purchasing process, specifically sourcing, for each strategic alternative. In gray the activities are described which are executed in-house and in black the activities, although in corporation, by a third party. For a detailed overview from trends toward these strategic solutions, see appendix I.

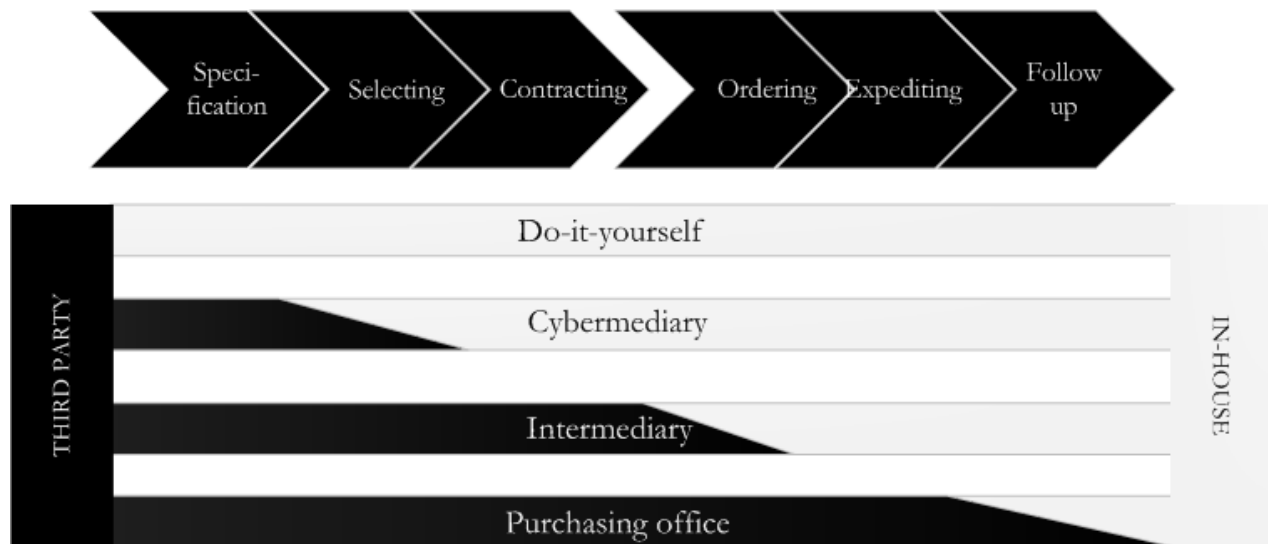


Figure 3-1: Level of outsourcing for each strategic solution in order to select suppliers

Having defined the possible supplier selection strategies for Dutch techno start-ups, the qualitative research has a second goal: The verification of the literature framework. Literature states that the goal of exploratory research is the production of inductively generalizations about the groups, process, activity, or situation under study (Stebbins, 2005). An explorative methodological approach in the form of interviews is initially used because the environment of this specific research has received little or no empirical attention (Stebbins, 2005). The verification [using table 3-1] of the literature framework [as shown in figure 2-8] resulted in the following findings:

- ✓ Confirmation of the importance of the geographical location on the supplier selection strategy and on the selection process.  
*Most respondents state that the role of the intermediary is more beneficial when sourcing from e.g. China*
- ✓ Confirmation of the importance of the type of supplier on the selection process.  
*The type of supplier is leading in order to deal with one of the most important process in the purchasing process, selection of suppliers.*
- ✓ Confirmation of the impact of supplier selection strategy on the efficiency.  
*Some interviewees states that "speed" is a value-proposition*
- ✓ Confirmation of the impact of supplier selection strategy on the effectiveness  
*Respondents state that due extended (global) network ultimately better supplier are found*

In addition, next to the above described confirmations of the literature framework, the interviewees were almost unanimously interested in the customers' perception of the process. They were interested in the answer on the question "are they satisfied with the process?" As this curiosity from practitioners cannot be neglected, a third depending variable is introduced: Satisfaction. This new depending variable measures the buyers evaluation of the supplier selection process. Questions arises which items can be used in order to grade this buyers evaluation of the supplier selection process.

First, one of value-propositions of the service providers is speeding up the selection process and making it easier for the customer. The first items measuring the satisfaction of the supplier selection process are therefore "easiness of the process", "efficiency" and "transparency".

Second, some purchasing offices claim to have a global footprint and information considering suppliers which can be generated easily. This suggests that purchasing offices have information considering many suppliers

which also can be trusted. Because of this value-proposition the third party service provider can deal with the most difficult process during purchasing: Supplier selection [as described in table 3-1]. This trade-off in information management result in two items: “Amount of information” and “trustfulness of information”. Additional motivation considering this trade-off from a literature point of view can be found in paragraph 3.4.1.

Third, the goal of the supplier selection process is finding a supplier who can meet the expectations. Therefore, the last item in order to measure the satisfaction of the supplier selection process from a Dutch techno start-up point of view is the following: “The supplier exceeded the expectations”. The table 3-2 below summarizes the measurement of satisfaction based on this qualitative study:

Construct	Item
Satisfaction of the supplier search	Easiness of process
	Efficiency
	Transparency
	Amount of information
	Trustfulness of information
	The supplier exceeded the expectations

Table 3-2: Measurement satisfaction

The introduction of this new depending variable also enables the measurement of another relation. The metrics used for supplier evaluation can be ranked as the general supplier evaluation is asked in this question. Therefore, seen its relevance for this research, this is also added in the conceptual framework. Conclusively, the qualitative study has the following results:

- ✓ Production of an exhaustive list of supplier selection strategies by Dutch techno start-ups [see fig. 3-1]
- ✓ Confirmation of the literature framework [see summary on the former page]
- ✓ Addition of a new dependent variable (Q4), satisfaction of the supplier selection process, with specific items [see table 3-2]
- ✓ Addition of a new research question (Q5) which is enabled by the measurement of satisfaction

These findings result in the following revised conceptual model:

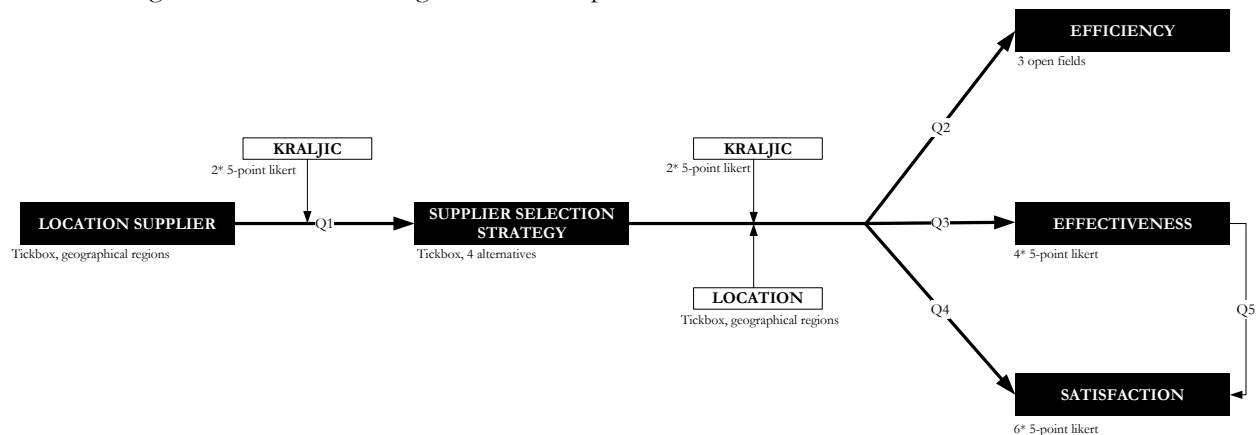


Figure 3-2: Conceptual research model based on exploratory qualitative research

As this research model is condition specific the questions are related to finding the last supplier. A deeper motivation of the items and variables, which are mainly based on this qualitative research (interviews and case studies), can be found in appendix IV.

### 3.3 Propositions

Derived from the conceptual research model, propositions have to be described in order to test the relationships and to be able to answer the sub-questions [as described in paragraph 1.4]. First, the goal of every sub-question is revealed. Second, the propositions are described and motivated using the literature review and qualitative research for every sub-question. As described earlier, due to the newness of this specific research area the propositions cannot be motivated by literature only and a combination with qualitative research is made.

✓ *Sub-question 1: How do techno start-ups select their suppliers?*

This question should reveal which factors are influencing the choice of supplier selection strategy. The list of strategic options is produced using qualitative research [see figure 3-1 in paragraph 3.2]: Do-it-yourself, cybermediary, intermediary and purchasing office.

From the qualitative study we can conclude that if suppliers are selected in China the use of third party service providers increases. In addition, according to the literature review [see paragraph 2.2: Global sourcing], there are substantial risk involved in order to source globally. Quantitative risk, like logistics en economical, and qualitative risks, political en cultural e.g. [see table 2-1]. In order to deal with these risks associated with global sourcing companies are more likely to work with third party service providers during supplier selection compared to domestic sourcing.

P1.1: Third party service providers are more often used in case of supplier selection abroad.

Based on the qualitative research, we can state that third party service providers can manage the risk of logistics and quality during purchasing [common value-proposition purchasing offices, as described in table 3-1]. The impact of suppliers on profit increases the importance of supplier management and supplier selection [as defined by Kraljic in paragraph 2.5]. Therefore, strategic suppliers are more often selected using third party service products, in comparison with non-critical suppliers.

P1.2: Strategic suppliers are more often being found using third party service providers

✓ *Sub-question 2: What is the effect of the supplier selection strategy on the efficiency of the selection process?*

This question has the goal of finding the effect of the supplier selection strategy, using the list of possible strategies, on efficiency of the supplier selection process, using total hours spent during process.

From the qualitative study we can state that the third party service providers almost unanimously mention “speed” as a value-proposition [see table 3-1]. This suggest that the buyer spends less hours on selecting suppliers if a third party service provider is used. Theoretically, working with a third party during supplier selection, therefore, improves the efficiency of the process. Or put it differently, it reduces the hours spent of the buyer.

P2.1: Outsourcing supplier selection increases the efficiency of the selection process

There are major difference between domestic and global sourcing [see table 2-1 in the literature review]. Global sourcing typically increases the risks compared to domestic sourcing. Supplier selection, as important part of the sourcing process, can therefore also defer. Ultimately, in order to select a foreign supplier more hours are required during the selection process.

P2.2: Suppliers abroad are harder to find than supplier located in the Netherlands

The selection of strategic suppliers requires a different level of intensity considering the relationship, compared to non-critical suppliers [see figure 2-7]. Having said this, it can be assumed that the selection of these strategic

supplier also require a different approach. Taken the importance of strategic companies the importance of the selection also increases. Companies are eager to select the best strategic supplier and are less motivated to select the best non-critical supplier. A Dutch techno start-up will, therefore, spent more hours finding strategic suppliers than non-critical suppliers. Put it differently, the selection of strategic suppliers decreases the efficiency of the process relative to non-critical suppliers.

P2.3: Techno start-ups spent more hours finding strategic supplier than non-critical suppliers

✓ *Sub-question 3: What is the effect of the supplier selection strategy on the effectiveness of the process?*

This question investigates the effect of the supplier selection strategy on the effectiveness of the process, defined as the evaluation of the supplier. The evaluation of the supplier is rated using the quality, logistics, technology and costs metrics [see table 3-3: The unit of measurement].

One of the most important processes of the third party service providers is supplier selection [see table 3-1]. In addition, a value-proposition of the third party service providers is that they have an extended network of potential suppliers on a global scale. Working with a third party during supplier selection should, therefore, lead to a better supplier.

P3.1: Outsourcing supplier selection increases the effectiveness of the selection process

A driver behind global sourcing is improving the quality and decreasing the costs of the supplier [see table 3-1 of the qualitative research]. However, the evaluation done by the Dutch techno start-ups is based on expected and realized performance of the supplier. In case a supplier is selected in e.g. China these expectations are adjusted. Therefore, there is no relation between geographical location and evaluation of suppliers.

P3.2: Suppliers found abroad are equally evaluated compared to domestic suppliers

Evaluations of suppliers are based on expected and realized performance. Expectations can vary, next to geographical location, also based on the type of item required and therefore supplier required. Suppliers delivering strategic items are evaluated differently than supplier delivering non-critical items [see Kraljic matrix in paragraph 2.5]. Taken the importance of the strategic suppliers the evaluation of these supplier are also more important. However, both evaluations are incomparable due different expectations of the buyer.

P3.3: Type of supplier does not influence the evaluation of the supplier

✓ *Sub-question 4: What is the effect of the supplier selection strategy on the satisfaction of the process?*

This question investigates the added depending variable satisfaction. The satisfaction is defined as the evaluation of the selection process using specific items from qualitative research [see table 3-1].

Third party service providers state that speed is one of their most important value-proposition [see table 3-1]. As the third party service providers are trained professionals in the selection of supplier the satisfaction of the selection process of the Dutch techno start-up should theoretically increase. Therefore, working with a third party should positively influence the satisfaction of the process since the process is (party) managed by dedicated professionals.

P4.1: Outsourcing supplier selection increases the satisfaction of the selection process

Global sourcing has specific benefits and risks [see table 2.1 in paragraph 1.2.1.1]. These risks/challenges clearly has the consequence that domestic sourcing is easier than global sourcing. Suppliers located in the Netherlands are therefore easier to be found by Dutch techno start-ups compared to other regions. Finding suppliers abroad is harder and, therefore, there is an increased chance of lower satisfaction of the supplier selection process by the buyer.

P4.2: Suppliers found abroad decreases the satisfaction of the selection process

The Dutch techno start-ups know the difference between a strategic supplier and a non-critical supplier [using metrics of Kraljic described in figure 2-7]. Therefore, the forecasted processes differ based on the type of supplier required. Consequently, the place on the Kraljic matrix does not affect the satisfaction of the selection process.

P4.3: Type of suppliers does not influence the satisfaction of the selection process

- ✓ *Sub-question 5: What are the most important evaluation criteria of suppliers for Dutch techno start-ups?*

This question reveals which metrics of quality, logistics, technology and costs are found most important in the general evaluation of the selected supplier.

From the qualitative research on the third party service providers we can conclude that quality and logistics assurance are two of the three value-proposition towards the buyers. Based on this, the third party service providers are likely to evaluate the supplier using quality and logistic as most important metrics. However, Dutch techno start-ups have a wider focus [see 1.2.1.5: The techno start-ups] and cost and technology cannot be neglected in the selection and evaluation of the supplier. Conclusively, it is assumable that the Dutch techno start-up find the four evaluation metrics equally important for the general evaluation of the selected supplier.

P5.1: The evaluation metrics (quality, logistics, technology and costs) are approximately equally important

- ✓ *Sub-question 6: What is the effect of the place in the portfolio on the geographical region of the supplier?*

Specific risks/challenges of global sourcing have a political, cultural or social background [see table 2-1]. In addition, there is the risk of bad information sharing and communication lines. These risks are mainly region specific and can be seen separate from the possible bad performance of the supplier (in terms of quality, logistics, technology and costs). In figure 2-7 of the literature review it is stated that strategic suppliers require a different strategy in comparison to e.g. non-critical suppliers. Taken this information into account, the Dutch techno start-ups will select the strategic and bottleneck suppliers, having a high supply risk, in the Netherlands or similar regions. In addition, the Dutch techno start-ups will have the goal to source non-critical items easily avoiding difficulties. On the other hand, leverage suppliers, having a low supply risk and high impact on profit, can be selected in low cost countries [based on global sourcing strategies in paragraph 2.2]. The suppliers are categorized using paragraph 2.5 of the literature review, and more specifically the Kraljic matrix: Impact on profit and supply risk.

P6.1: Leverage suppliers are found in low cost countries

### 3.4 Quantitative research

Derived from the conceptual model in figure 3-2 this paragraph describes the quantitative research design by firstly clarifying the measurement of efficiency and effectiveness within the research. Second, the sample of respondents together with the data collection are revealed. Finally, the unit of measurement consisting of scaling and motivation on item level is described.

#### 3.4.1 Measurement dependent variables

The problem statement in paragraph 1.3 concluded that the techno start-up want the best supplier within the shortest time-frame. In the measurement of this requirement, the “filter problem” of Chesbrough (2003) is used, as schematically described in figure 1-3. This requirement, together with the figure of Chesbrough, results in the measurement of effectiveness and efficiency of the supplier selection process. Based on the qualitative research [as mentioned in paragraph 3.2], the satisfaction of the supplier selection from a user point of view is added



as performance indicator of the supplier selection process. This paragraph will describe how these three performance indicators of the supplier selection process are measured.

The first dependent variable is the effectiveness of the selection process. In general, effectiveness is associated with the capability of producing a desired effect, or in management literature as “getting the right things done”. Projecting these definitions on the supplier selection process together with the problem statement [see paragraph 1.2] the effectiveness is defined as the evaluation of the supplier. After all, the goal of supplier selection is doing business with the best supplier available. Mandal (1994) defines the best supplier as follows: “The company which can supply the right amount of a service or product of the requested quality for an acceptable price”. This suggests that the best supplier is rated on “right amount”, “quality” and “price”. These dimensions measuring the evaluation of suppliers are tested using other (more recent) literature and practice. Evaluation methods from the literature can be found in the form of Monczka R. H (2008). Best practice can be found from one of the leading technology firms: ASML (Dijkhuis, 2007). In conclusion, the respondent can evaluate the selected supplier on the following metrics using a 5-point scale:

- ✓ Quality: Level of meeting product specifications
- ✓ Logistics: Level of meeting delivery specifications
- ✓ Technology: Level of supplier driven innovations
- ✓ Costs: Level of total costs of products and delivery (TCO)

The second dependent variable is the efficiency of the supplier selection process. Efficiency is in general described as the extent to which time or effort is well used for the intended task or purpose. The intended purpose in this specific research is the selection of a supplier. The efficiency in this context is, therefore, the effort spent during the supplier selection process. The supplier selection process can be divided, according to literature (Van Weele, 2005; Gelderman, 2010) and practice (qualitative research as described in appendix III), in an allocation, pre-qualification and selection step. This deviation of the supplier selection is also used in this particular research. The effort spent during the supplier selection process is measured using the amount of hours spent by the Dutch techno start-up. Ultimately, the efficiency is measured by an open box in which the respondent can fill in the amount of hours spent during the allocation, pre-qualification and selection step.

The third and final dependent variable is the satisfaction of the supplier selection process. The measurement of satisfaction has received extensive attention from the literature in mainly consumer marketing studies. However, the measurement of satisfaction of a search requires different items and methodology. Selecting the best supplier depends on several factors of which information availability/handling is one the most important. This gives business models like cybermediaries and intermediaries/matchmakers the opportunity to add value. The difference in information handling between the two strategic solutions, cybermediary vs. intermediary, in order to find the best supplier is based on reach and richness of the information. Du Plessis (2007) illustrates the trade-off by the following example:

*“Shoppers traditionally and mainly go to retail stores to do their shopping. This requires the spending of time for travel and time in a store. The value of such travel and time costs varies by the opportunity cost of time for the individual. Going to the shop involves the concept of ‘reach’. Because there are practical limits to the number of shops that a consumer could visit in order to look at the alternative products available for selection, there are limitations to ‘reach’. ‘Richness’ refers to the quality of the information available to shoppers (as defined by accuracy, relevance, adequacy etc.), while ‘reach’ refers to the number of shops that they visit to compare product quality and prices. Within a certain period of time allocated for shopping, the larger the number of shops a shopper visits, the smaller the amount of information the shopper can elicit from any individual store and vice-versa”.*

Translating this trade-off to the position of the third party service providers, the cybermediary has a high reach due the information handling capacity (internet) and with a lower richness due the lack of personal contact. The other two alternatives, intermediary and purchasing offices, have personal contact with customer by which the information is rich. On the other hand, the reach is low due the lack of information handling capacity. This trade-off has received, due growing possibilities and importance of information, attention (although limited) from the literature (Hildreth, 2004; Du Plessis, 2007). The trustfulness of the information and the availability are therefore taken into account in order to measure the satisfaction of the process. In addition, qualitative research result in six specific items measuring satisfaction of the supplier selection process [as described in table 3-1]. Conclusively, these items are graded by the respondent using a 5-point likert scale from totally disagree to totally agree.

### 3.4.2 Sample and data collection

The survey is held under active techno start-ups within the Netherlands that were consulted by LiveWire<sup>22</sup> or Syntens<sup>23</sup>. Using this database, 2.552 companies are approached for participation in the online survey. The survey was send out using a pre notice and three waves, as shown in Appendix V. Research shows (Dillman, 2009) that this approach results in the highest response rate. A part of the final survey, which is applicable for this research, can be found in appendix V.

As described earlier, the sample contains start-ups. It is, therefore, highly likely that these organization count less than 70 FTE. This indicates that hiring a dedicated purchaser is, in most cases, not relevant [rule of thumb, based on interviews as shown in appendix III]. The managing director mostly executes supplier selection, as strategic part of procurement, which is therefore the most relevant person for this particular research. Following this reasoning, the survey has, in the majority of the cases, been sent to the managing directors acting in the role of purchaser and responsible for supplier selection.

### 3.4.3 Unit of analysis

In table 3-3 below the previously described variables together with control variables are motivated and scaled.

<i>Variable</i>	<i>Item</i>	<i>Scale</i>	<i>Motivation</i>
Supplier selection strategy	Supplier selection strategy	1) Do-it-yourself 2) Internet based paid intermediary, 3) Non-profit intermediary 4) Offline paid intermediary, 5) Purchasing advisor	Reviews by both academics and practitioners were used to provide validity (Cook, 1979) [see figure 3-1]
<i>Variable</i>	<i>Item</i>	<i>Scale</i>	<i>Motivation</i>
Organizational characteristics	Type of organization	1) OEM 2) Supplier of integrated modules 3) Component supplier 4) Jobber 5) Supplier of technical services 6) Distributor 7) Retailer 8) Engineering firm/consultant: 9) Other, ....	Organization type based on place in the value chain defined by Gelderman (2010) and Van Weele (2005)
	Year of establishment	Open field	
	Size	Open field	
Personal	Gender	Male/Female	

<sup>22</sup> An initiative of Shell to help technical innovative entrepreneurs with their company: [www.livewire.nl](http://www.livewire.nl)

<sup>23</sup> Subsidized organization that helps SME's with innovation: [www.syntens.nl](http://www.syntens.nl)

characteristics	Age	Open field	
	Education	1) Elementary school 2) Lower vocational education (LBO) 3) secondary vocational education (MBO) 4) Higher professional education (HBO) 5) University (WO) 6) PhD	Based on the education system the Netherlands
Market characteristics	Location market	Percentage geographical origin of turnover 1) Netherlands 2) Western Europe 3) Northern Europe 4) Central/Eastern Europe 5) Northern America 6) South America 7) Asia 8) India 9) Rest of the World	Based on industrial active industrial regions in the world. Relevant regions are split up for the Netherlands.
	Customers	1) B2B 2)B2C 3)B2G	
Purchasing characteristics	Purchasing importance	Percentage purchasing spent relative to turnover	Standard measure as described in (Van Weele, 2010)
	Location suppliers	Percentage geographical origin of purchasing spent (same regions as “type of market”)	Based on industrial active industrial regions in the world. Relevant regions are split up for the Netherlands.
Supplier characteristics	Supplier classification	Classification of “Impact on profit” and “Supply risk” on a 5 point likert scale	Based on Kraljic (1983) to identify the suppliers’ position in portfolio.
	Location supplier	Location of specific supplier	Based on industrial active regions in the world. Relevant regions are split up.
	Purchasing spent	Percentage of purchasing spent at specific supplier relative to total purchasing spent	Based on spent analysis (Pandit, 2008)
<i>Variable</i>	<i>Item</i>	<i>Scale</i>	<i>Motivation</i>
Effectiveness	Quality	5 point likert scale from very bad to very good	Based on ASML (Dijkhuis, 2007) and Monczka R. H. (2008)
	Logistics	5 point likert scale from very bad to very good	Based on ASML (Dijkhuis, 2007) and Monczka R. H. (2008)
	Technology	5 point likert scale from very bad to very good	Based on ASML (Dijkhuis, 2007) and Monczka R. H. (2008)
	Costs	5 point likert scale from very bad to very good	Based on ASML (Dijkhuis, 2007) and Monczka R. H. (2008)
Efficiency	Allocation	Hours	Specific detailed description of the supplier selection step based on (Gelderman, 2010; Van Weele, 2005)
	Pre-qualification	Hours	
	Selection	Hours	
Satisfaction of the supplier search	Easiness of process	5 point likert scale from totally disagree to totally agree	Personal interpretation of easiness of the process [see table 3-1 & 3-2]
	Efficiency	5 point likert scale from totally disagree to totally agree	Personal interpretation of the process [see table 3-1 & 3-2]
	Transparency	5 point likert scale from totally disagree to totally agree	Personal interpretation of the process [see table 3-1 & 3-2]
	Amount of information	5 point likert scale from totally disagree to totally agree	Based on the digital information trade-off between richness and reach of information as described in paragraph 3.2.1
	Trustfulness of information	5 point likert scale from totally disagree to totally agree	
	Supplier fulfilled the specifications on forehand completely	5 point likert scale from totally disagree to totally agree	Based on interviews with practitioners, [see table 3-1 & 3-2]

Table 3-3: Unit of measurement survey

### 3.5 Conclusion

In this chapter the research methodology is described in preparation for the main data collection in the form of a survey. The qualitative research, in the form of in-depth semi-structured interviews with practitioners and third party service providers, contributed to this research in several ways. First, an exhaustive list of supplier selection strategies is produced. The literature was not able to provide this list therefore the verification of this list is the first contribution. The following strategic solutions are mentioned in order to select supplier from a Dutch techno start-up perspective: Do it yourself, cybermediary, intermediary (paid and unpaid) and the purchasing office. These strategic solutions distinct themselves based on the offered services and responsibilities.

Second, the qualitative research has the goal to test the literature framework in preparation of the quantitative research. Communalities in the qualitative research confirmed specific relationships described in the literature framework. Besides these confirmations, the respondents were interested in a new depending variable: Satisfaction. This variable measures the personal evaluation of the Dutch techno start-up considering the selection process. The items in order to measure this new variable are motivated using the qualitative research and literature. Ultimately, the literature framework is tested and revised by this qualitative research in order to produce a conceptual model.

Based on this conceptual model, propositions are described and motivated using literature and the qualitative study in order to test the relations and ultimately answer the (sub) research question(s).

Subsequently, the propositions will be tested using the quantitative study, which is the main data collection method. First, the measurement of the depending variables (efficiency, effectiveness and satisfaction) is described and motivated. Second, the sample of 2,552 Dutch techno start-ups is analyzed and the strategy of approach is described. Final, the unit of measurement of all items, including control variables, are described and motivated. The data collection and analysis as result of the preparation until this chapter will be described in the next chapter.

## Chapter DATA ANALYSIS

# 4

This chapter analyzes the propositions using the gathered data of the quantitative research which executes the plans made in chapter three. First, general data examination is described. Second, the sub-research questions with corresponding propositions questions are tested using statistical methods.

### 4.1 Explorative data analysis

This paragraph presents the explorative data analysis. First, a sample examination is executed in order to check for response bias and generalizability of the sample. Second, a general data examination is performed and observed data is described for all dependent and independent variables. Final, an exploratory factor analysis explores the underlying factors of the data, as described in Hair (2006).

#### 4.1.1 Sample examination

The survey has been send out to a total of 2,552 techno start-ups using the database of LiveWire and Syntens [see paragraph 3.4.2]. As result, a total of 279 valid responses were gathered (response rate of 10,9%) of which 221 had suppliers. The company characteristics of the respondents were the following:

Company characteristic	Scale and frequency									Mean	St. Dev.
Establishment date (year)	<1999	1999-2004	2005	2006	2007	2008	2009	2010	2011	Mean	St Dev
	28	54	22	21	25	26	28	8	4	2001	18,233
Part in supply chain	OEM	Supplier integrated parts	Component supplier	Jobber	Supplier technical services	Distributor	Retailer	Engineering firm/consultant	Different	Mean	St Dev
	84	32	27	7	38	40	37	77	53	-	-
Total purchasing spent (%)	<20	21-40	41-60	61-80	>80					Mean	St Dev
	55	73	44	21	14					39,49	25,20
Type of customers	B2C	B2B	B2G							Mean	St Dev
	38	168	12							-	-

Table 4-1: Company characteristics respondent

These sample characteristics tell us that considering the company characteristics, the sample has a good variation [see also for a graphical presentation of the company characteristics the blue graphs in appendix VI]/answers are well spread over the possibilities. The type of market, position in supply chain are all well spread. The majority of the sample are start-ups (establishment date >1999) and have business customers (B2B). The purchasing spent, which is categorized in this table 4-2, has an high standard deviation with a mean of 39,49%. This can be seen as representative to the population compared to the type of companies in the sample. The following table 4-2 shows the personal characteristics of the respondent:

Personal characteristic	Scale and frequency								Mean	St. Dev.
Level degree	Elementary school	Lower vocational education (LBO)	Secondary vocational education (MBO)	Higher professional education (HBO)	University (WO)	PhD	Other		Mean	St Dev
	11	4	28	87	75	10	5		-	-
Age	<31	31-35	36-40	41-45	46-50	51-55	56-60	>60	Mean	St Dev
	22	25	34	28	52	36	12	8	43,94	9,621
Gender	Male	Female							Mean	St Dev
	192	26							-	-
Are of degree	Economic /management		Technical/ engineering		Social psychology				Mean	St Dev
	75		103		17				-	-

Table 4-2: Personal characteristics respondent

Considering the personal characteristics of the respondent, we can say that the majority has a higher professional education or master degree in engineering or economics/management and is male. The age of the respondent is well spread over the sample with a mean almost 44 years [see also for a graphical presentation of the personal characteristics the red graphs in appendix VI].

As this thesis focus on techno start-ups this variation of the company and personal characteristics of the sample was expected. We can conclude that the “non-response bias”<sup>24</sup> is limited as the respondents have, assumable, the same characteristics as the entire population. The findings can be generalized to the entire Dutch techno start-up population. Until what extent the findings can be generalized to western techno start-ups, as they are in some way comparable with Dutch techno start-ups, is not investigated in this research.

#### 4.1.2 General data examination

This paragraph describes the general examination of the generated data. The data underlying the analysis need to meet all of the requirements for a regression analysis. Missing data, outliers, and statistical characteristics of the data need to be checked using Hair (2006) and Field (2005). After these assumption checks, a complete dataset of 279, of which 221 respondents have suppliers, was appropriate for analysis. The following table 4-3 describes the frequency and, if possible, the mean with standard deviation of the items:

Variable	Scale and frequency							
	The Netherlands	Western/Northern Europe	Eastern/Central Europe	Northern America	Southern America	Asia	India	Rest of the world
Location supplier	136	38	7	13	1	21	2	1
Supplier selection strategy	Myself	Internet intermediary	Non-paid intermediary	Paid intermediary	Purchasing office			
	208	2	8	1	1			

Construct	Items	Scale and frequency					Mean	St. Dev
		Very low	Low	Neutral	High	Very high		
Kraljic matrix		Very low	Low	Neutral	High	Very high	<i>Mean</i>	<i>St. Dev</i>
	Impact on profit	24	36	70	78	12	3,08	1,082
	Supply risk	35	66	82	31	4	2,56	,983
Effectiveness		Very bad	Bad	Neutral	Good	Very good	<i>Mean</i>	<i>St. Dev</i>
	Quality		1	40	135	43	4,00	,632
	Logistics		12	60	111	36	3,78	,782
	Technology	1	3	85	84	46	3,78	,806
	Costs	2	9	92	89	27	3,59	,792
Satisfaction		Totally disagree	Disagree	Neutral	Agree	Totally agree	<i>Mean</i>	<i>St. Dev</i>
	Very_easy	9	39	63	84	23	3,33	1,022
	Very_efficient	2	16	74	95	31	3,63	,850
	Very_transparent	5	31	74	86	22	3,41	,932
	Enough_information	5	30	76	91	16	3,38	,894
	Trustfulness_information	2	22	96	81	17	3,41	,811
	Supplier_exceeded_expectations	2	13	69	105	29	3,67	,815

<sup>24</sup> Non-response bias occurs in a statistical survey if those who respond to the survey differ in the outcome variable (for example, evaluation of the need for financial aid) from those who do not respond. Often, the differences, which may include race, gender or socioeconomic status, are reported and/or accounted for through statistical modeling in any publication of the results.

Efficiency		0-20 Hrs	21-40 Hrs	41-60 Hrs	61-99 Hrs	>100 Hrs	Mean	St. Dev
	Allocation	190	13	6	5	4	14,98	32,31
	Pre_qualification	190	16	3	3	6	12,45	26,72
	Selection	184	18	1	5	10	19,58	79,19

Table 4-3: General observed data survey

As described in the table 4-3 above, the majority of the suppliers are found using own resources in the Netherlands. The average type of supplier is just in the strategic quadrant of Kraljic [see figure 2-7]. The selected supplier is well evaluated across the metrics with an average of 3,8 on a 5-point scale. The satisfaction of the supplier selection process items are also comparable to each other with average of 3,4 on a 5-point scale. The observed data considering the efficiency is centered in the 0 till 20 hours category.

Having briefly described the observed data, some computations have to be made for analysis purposes. As stated in table 3-3, the efficiency items are filled in by the respondents using an open box, this data is categorized in table 4-3. For analysis purposes a new variables is introduced: Total hours spent. This variable, measuring the total efficiency of the supplier selection process, is the sum of hours spent during allocation, pre-qualification and selection. In addition, as the observed data is centered from zero till twenty hours the data is computed using a “log” in order to stimulate a normal distribution (Hair, 2006).

The measurement of the supplier selection strategy is executed by a tick box [see table 3.3] where the respondents can choose between the various strategic alternatives. Due the lack of variation in the observed data (majority filled in the option “Do-it-yourself”), a dummy variable is created (0=self, 1=outsourcing). In addition, the location of the supplier was measured using a tick box where the respondent can fill in the geographical location of the supplier [see table 3-3]. Again, for analysis purposes another dummy variable was created (0=Netherlands, 1=Other).

The last part of the data analysis is checking the variables for correlations. The correlation matrix shows [see table A-1 in appendix VII] that there are underlying factors for effectiveness and satisfaction. Therefore, an exploratory factor analysis is performed in the next paragraph.

#### 4.1.3 Exploratory factor analysis

The correlation matrix shows, as described above, signs of underlying factors for two depending variables: Effectiveness and satisfaction. An exploratory factor analysis is, therefore, performed in order to discover these underlying factors. The output tables together with assumption checks can be found in appendix VIII.

The factor analysis considering the effectiveness, measured using four items on a 5-point likert scale, has a Cronbach alpha value of 0,686. This shows that the scales are reliable. Ultimately, after the assumptions have been checked one underlying factor is extracted in order to measure the effectiveness.

Second, the factor analysis is performed for the satisfaction measurement. Satisfaction is measured using six 5-point likert scales and has a Cronbach alpha value of 0,833, showing that the scales are reliable. Ultimately, one factor in order to measure satisfaction is extracted, as shown in appendix VIII.

Now that the factors have been identified, the correlation matrix is reviewed again. Table A-2 in appendix VII now shows there are no signs of concern as almost all Pearson correlation are close to zero ( $-0,3 < 0 < 0,3$ ) which is good according to Field (2005). In addition, in case all items related to efficiency and satisfaction are incorporated in the factor analysis, two factors can be extracted. This confirms that the two factors are independent.

## 4.2 Results quantitative study

In this paragraph, the research questions with corresponding propositions are evaluated using the gathered data. First, the method of analysis is described. Second, the analysis is performed and output tables are analyzed. Finally, the propositions are evaluated if they are rejected or conformed.

### Sub-question 1

✓ *Sub-question 1: How do techno start-ups select their suppliers?*

Most of the techno start-ups use their own resources in order to select supplier [208 of the 221 companies with suppliers). The impact of geographical location and type of suppliers does not influence this decision [see appendix IX]. Therefore, all propositions regarding this sub-question are not supported by the generated data.

### Sub-question 2

✓ *Sub-question 2: What is the effect of the supplier selection strategy on the efficiency of the selection process?*

The efficiency is measured using the new total variable [as described in 4.1.2]. The linear regression shows the following output in testing the propositions corresponding with sub-question 2:

Proposition	Prediction	Independent variables	Beta	Sig.	Evaluation
H2.1	Negative	Outsource supplier selection (dummy: 1=outsourced)	,011	,862	Not supported
H2.2	Positive	Supplier abroad (dummy: 1=abroad)	,262	,000	Confirmed
H2.3	Positive	Impact on profit	,216	,004	Confirmed
H2.3	Positive	Supply risk	,102	,166	Not supported

Table 4-4: Predictors of Log\_efficiency using linear regression

As shown in the table 4-4 whether the supplier selection process is outsourced or not does not affect the hours spent. The geographical location of the supplier, whether located abroad or not, does have a positive significant impact on the hours spent. Of the two variables forming the Kraljic matrix only impact on profit has a significant relationship with hours spent during supplier selection.

### Sub-question 3

✓ *Sub-question 3: What is the effect of the supplier selection strategy on the effectiveness of the selection process?*

The effectiveness is, as described, measured using one factor representing the four items (Quality, Logistics, Technology and Costs). Taken the characteristics of the data linear regression if performed. The output tables are shown in appendix IX.

Proposition	Prediction	Independent variables	Beta	Sig.	Evaluation
H3.1	Positive	Outsource supplier selection (dummy: 1=outsourced)	,040	,533	Not supported
H3.2	Non-significant	Supplier abroad (dummy: 1=abroad)	,089	,189	Confirmed
H3.3	Non-significant	Impact on profit	,295	,000	Rejected
H3.3	Non-significant	Supply risk	-,352	,000	Rejected

Table 4-5: Predictors of factor\_effectiveness using linear regression

Only the two variables of the Kraljic matrix, as shown in table 4-5 above, explains the variance in the evaluation of the supplier. A supplier with a higher impact on profit variables has a positive impact while supply risk has a strong negative impact on effectiveness of the supplier selection by Dutch techno start-ups. Inserting the control variable “establishment date” did not result in a significant relationship while the other predictors remained significant. Therefore, the conclusion can be drawn that this has no significant effect.



### Sub-question 4

✓ *Sub-question 4: What is the effect of the supplier selection strategy on the satisfaction of the selection process?*

The satisfaction of the process is, as described, measured using one factor representing six items. Linear regression was the best suitable method of analysis in order to test the propositions.

Proposition	Prediction	Independent variables	Beta	Sig.	Evaluation
H4.1	Positive	Outsource supplier selection (dummy: 1=outsource)	,038	,563	Not supported
H4.2	Negative	Supplier abroad (dummy: 1=abroad)	-,141	,040	Confirmed
H4.3	Non-significant	Impact on profit	,171	,022	Rejected
H4.3	Non-significant	Supply risk	-,338	,000	Rejected

Table 4-6: Predictors of factor\_satisfaction using linear regression

As shown in the table 4-6 above, if a supplier is located abroad this negatively influences the satisfaction of the supplier selection process. Impact on profit has a positive influence on the satisfaction of the Dutch techno start-up. In case a supplier is selected with a high supply risks this strongly influences the satisfaction of the selection process. Taken into account these two predictors, impact on profit and supply risk, are graded on a 5-point likert scale these are strong predictors. Inserting the control variable “establishment date” did not result in a significant relationship while the other predictors remained significant. Therefore, the conclusion can be drawn that this has no significant effect.

### Sub-question 5

✓ *Sub-question 5: What are the most important evaluation criteria of suppliers for Dutch techno start-ups?*

The evaluation metrics, used for grading the effectiveness of the process are used as independent variables. The variable “supplier exceeded expectations” is used as dependent variable.

Proposition	Prediction	Independent variables	Beta	Sig.	Evaluation
H5.1	Positive	Quality	,152	,055	Not supported
H5.1	Positive	Logistics	,227	,002	Confirmed
H5.1	Positive	Technology	,042	,563	Not supported
H5.1	Positive	Costs	,160	,016	Confirmed

Table 4-7: Predictors of "supplier exceeded expectations" using linear regression

Table 4-7 above shows that not all metrics have a significant impact on the general supplier evaluation (defined as “supplier exceeded expectation”). Only logistics and costs have a significant relationship while quality is just non-significant, strictly speaking. The proposition that technology predicts the general supplier evaluation is not supported.

### Sub-question 6

✓ *Sub-question 6: What is the effect of the place in the portfolio on the geographical region of the supplier?*

Until now, the location has been used in the form of a dummy variable in analysis. The place of the supplier on the Kraljic matrix could well, as described, influence the geographical location of the supplier. As there are different samples (with different means, variances and sample sizes), the standard t-test cannot be executed since this is assuming that both samples have the same variance. In order to deal with this, the Welch unpaired t-test is performed. Using this test the significance of the geographical location compared to the Netherlands can be tested, as described in appendix IX. The following regions have a significant different value on the Kraljic matrix compared with the Netherlands:

Proposition	Geographical region	Impact on profit	Supply risk	Welch unpaired t-test	Evaluation
	The Netherlands	2,83	2,40		
H6.1	Western/Northern Europe	3,71	2,89	Significant	Rejected
H6.1	Asia	3,36	2,90	Significant	Rejected

Table 4-8: Welch unpaired t-test Kraljic matrix on geographical region

Figure 4-1 below visualizes the relation between the place on the Kraljic matrix and the geographical location of the supplier. The mean of the impact on profit and supply risk creates the center of the diamond, while the width and height of the diamond symbolizes the standard deviation of both variables.

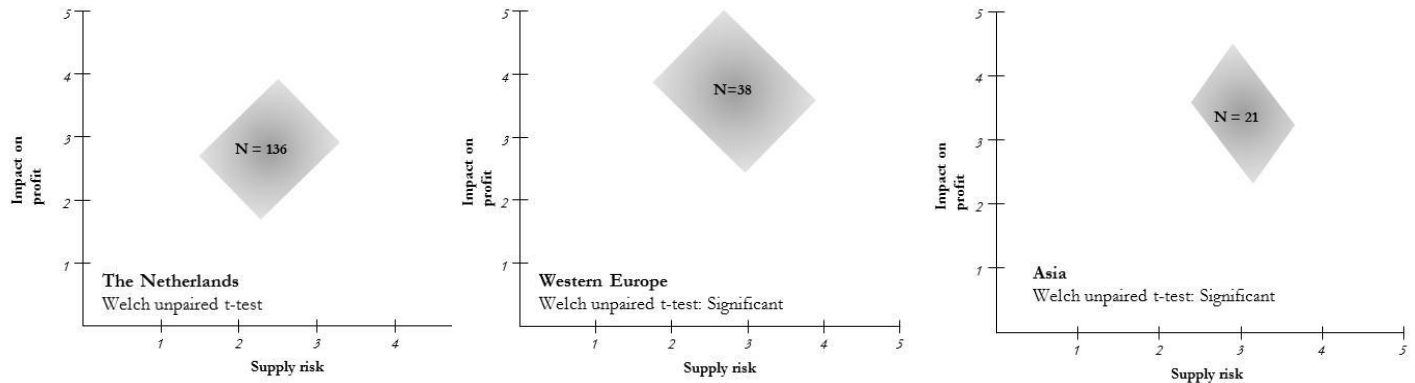


Figure 4-1: Visual representation relation Kraljic and geographical location

As shown in table 4-8 and figure 4-1, the proposition that strategic and bottleneck suppliers are found in the Netherlands, delivering specifically high supply risk items, is rejected. Using the Welch unpaired t-test we can conclude that there are significant differences between the suppliers found in the Netherlands and in western Europe/Asia in relation to the place on the Kraljic matrix.

### 4.3 Reflection

The objective of this research, examine the third party service provider during supplier selection of Dutch techno start-ups, is due the lack of usage not succeeded. Propositions regarding decisions variables together with impact on performance indicators are not supported due non-significant relationships. As this was an uncertainty, other questions were included in the survey be able to come to conclusions and recommendations on/for Dutch techno start-up. From a reflection point of view we can say it is superfluous do execute the same study within the same population. The rest of the data-gathering went according to plan.

### 4.4 Conclusion

This chapter elaborates on the data analysis using SPSS in order to test the described propositions earlier. From the sample characteristics, both company and personal, can be concluded that the sample represents the entire population of Dutch techno start-ups fairly well. Second, the correlation matrix showed that there are underlying factors in the effectiveness and the satisfaction of the process. Data reduction is therefore performed resulting in one factor for both dependent variables. After this factor analysis is performed, no correlations between variables were found which can be a cause of concern.

Subsequently, the propositions were tested using logistic and linear regression, in general. Of the eighteen propositions six were not supported (non-significant relation), six were confirmed (in line proposition), and six were rejected (not in line proposition). One reason behind this high number of not supported propositions is the low variation in the supplier selection strategy; the majority did the supplier selection in-house, as mentioned in the reflection [see paragraph 4.3].

## Chapter 5 CONCLUSIONS AND DISCUSSION

# 5

The conclusions and limitations of the study in general are discussed in this chapter. Second, the recommendations for practitioners and future research are given.

### 5.1 Introduction

In this chapter, the conclusions based on the sub-questions are summarized. First, every sub-question is answered in the discussion section. Second, party based on these answers the conclusions of this report are drawn. Next, the limitations of the study are described. Finally, recommendations for practitioners and future research are described based on this research.

### 5.2 Discussion

The original goal of this research was investigation of the effect of working with third party service providers during supplier selection by Dutch techno start-ups. This supplier selection process was measured using efficiency (defined as hours spent during supplier selection process) and effectiveness (defined as the evaluation of the supplier). The main research question, *“To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?”*, can be evaluated as followed: We found that the supplier selection of Dutch techno start-ups is mainly executed in-house with no third party involvement. The benefits of these third party service providers in terms of better suppliers (defined as effectiveness) against less effort (defined as efficiency) can, therefore, not be measured. In addition, the factors influencing the choice of supplier selection strategy do not have significant relationships. Having said that, most Dutch techno start-up find and select their suppliers using their own resources; this predictor is eliminated for further conclusions in this paragraph.

For the second sub-question, *“what is the effect of the supplier selection strategy on the efficiency of the selection process?”*, we found that suppliers abroad require more time to be selected. This was also predicted by the literature and the qualitative study and therefore confirms the proposition. The second proposition was that strategic suppliers, defined as high impact on profit and supply risk (applying the Kraljic matrix), also require more hours during supplier selection. This was partly confirmed, as impact on profit had a significant positive impact on the hours spent while supply risk had a non-significant impact. This contradicts the literature, as a higher supply risk means in general that there are fewer suppliers delivering the items. Therefore, the hours required to find these suppliers would, theoretically, be higher than suppliers with a low supply risk. A reason behind this could be that the Dutch techno start-ups do not have a clear view of the place in the portfolio matrix of the supplier required and merely focus on the impact on profit.

The third sub-question, *“What is the effect of the supplier selection strategy on the effectiveness of the selection process?”*, also had some interesting findings. The proposition was that the type of supplier and the geographical location did not have a significant relationship with the evaluation of the supplier. This was assumed as the evaluation is relative and based on the ratio between expected and realized performance of the supplier. For the geographical location, whether abroad or not, this was confirmed. The Kraljic matrix variables, however, had significant impact on the evaluation of the supplier. Impact on profit had a significant positive impact on the evaluation of the supplier while supply risk had a significant negative impact. Ultimately, leverage suppliers (high impact on profit and low supply risk) are evaluated higher, compared to other suppliers. A reason behind this could be that Dutch techno start-ups merely focus on impact on profit, and that this focus is taken into account during the supplier evaluation.

The fourth sub-question was the following: “What is the effect of supplier selection strategy on satisfaction of the selection process?”. This third performance indicator was added based on qualitative research on third party service providers during supplier selection. Again, it was expected that if the supplier was located abroad the satisfaction would decrease as the selection of a supplier abroad is more difficult in general. This was also confirmed by the data analysis. As satisfaction is, again, a performance indicator based on what is expected and what is realized by the Dutch techno start-up, the type of supplier should not have a significant impact. However, data analysis shows a significant positive relationship of impact on profit on satisfaction while supply risk has a significant negative relationship. Dutch techno start-ups are dissatisfied when it comes to finding suppliers with a high supply risk. This indicates that market transparency, as stated in the problem definition, is merely applicable to low supply risk suppliers. On the other hand it is possible that there are just no comparable suppliers, which increases the supply risk.

The fifth sub-question, “What are the most important evaluation criteria of suppliers for Dutch techno start-ups?”, analyzes the specific evaluation metrics of Dutch techno start-ups. It was predicted that all metrics, in the form of quality, logistics, technology and costs, have a contribution to a higher general supplier evaluation; this, however, is not found in the data analysis. Only logistics and costs contribute to a higher general supplier evaluation. Quality was just non-significant while technology had a non-significant impact on the general supplier evaluation. The Dutch techno start-up is, in that sense, focused on getting the item on time for the lowest costs which is based on the rather traditional way of sourcing. Value sourcing, focusing on balancing quality, logistical performance technology and cost, is in general not applied.

Subsequently, the sixth sub-question, “What is the effect of the place in the portfolio on the geographical region of the supplier?”, investigates the relation between the Kraljic matrix and the geographical location of the selected supplier. The prediction was that strategic suppliers are found in the Netherlands while leverage (high impact on profit and low supply risk) items are supplied by suppliers located abroad (or at least in Low Cost Countries). Against all predictions, this was not found in the data analysis. There was a significant difference in impact on profit and supply risk between suppliers located in the Netherlands in compared with those based western/northern Europe and Asia. The suppliers found in western/northern Europe and Asia have a more strategic character suggesting that sourcing leverage items on a global scale is not applied. The Dutch techno start-up initially focuses on sourcing in Netherlands and in the search for strategic items they wider their vision to supplier selection abroad.

### **5.3 Conclusion**

This research was initiated by the growing interest for techno start-ups together with the dynamic environment in which they are established. This background is further analyzed in chapter 1. This chapter came to the conclusion that the dynamic environment is caused by globalization, volatility and shorter lifecycles. Technological driven companies see outsourcing as an answer in order to deal with these trends by maintaining/achieving an agile organization structure. Consequently, this leads to higher dependency on suppliers and corresponding increased importance of the supplier selection process. The techno start-up is theoretically better in dealing with this dynamic environment, due agile organization structure and working method. Subsequently, the challenge of traditional technological driven companies is projected on the techno start-ups leading to the conclusion that techno start-ups can experience even more difficulties with the supplier selection process. The motivation behind this lays in the lack of resources, limited network and that in most cases the manager director is responsible of the supplier selection in comparison with the large technological driven companies with dedicated purchasing manager. Having defined the challenge of techno start-ups, a well organized supplier selection process, this report concluded that the success can be measured using two

distinctive performance indicators: Effectiveness, finding the best supplier, and efficiency, find the supplier fast. From a theoretical point of view the challenge of supplier selection is analyzed using the resource based view of firm and core competences theories. Having defined these two rather traditional research directions and putting these into the dynamic environment leads to contradictions. These contradictions are grounded in the need for flexibility and therefore the “dynamic capability” research area is more in place, as this has a more flexible focus on companies. Following this approach the need for suppliers and the selection of them is derived from this flexible view on companies.

Second, from theory several solutions are researched in order to deal with the selection of suppliers. Three of these strategies are applicable on the techno start-ups: Do it in-house, the cybermediary (internet based matchmaker), and purchasing office (responsible entire purchasing process). Based on this practical and theoretical gap the following research question is formulated: *“To what extent is the use of third party service providers by Dutch techno start-ups improving the efficiency and effectiveness of the supplier selection process?”*

The first step in order to answer this research question was the execution of a literature study, as described in chapter 2. The three strategic solutions in order to select supplier, as mentioned above, were analyzed using literature. From the literature review, it can be concluded that the knowledge about the supplier selection process of techno start-ups is limited in both theoretical and practical literature. An initial research framework, as result of the literature review, is developed together with conceptual scaling.

Next, qualitative research is executed using several practitioners and third party service providers in chapter 3. The findings of the literature review have been tested and reformulated using these semi structured interviews leading to a revised research model. Subsequently, the quantitative research is designed consisting of description of propositions derived from sub-research questions, measurement depending variables, sample and data collection and the unit of analysis.

In chapter 4 the preparations are set in action and the survey has been send out to Dutch techno start-ups leading to 220 valid responses. Based on the company and respondent characteristics we can conclude that the sample represents the entire population of Dutch techno start-ups. The results of the study, consisting of the evaluation of the propositions, are objectively presented in this chapter. Unfortunately, the usage of third party service providers during the supplier selection process of the sample is limited leading to not supported propositions regarding this.

In conclusion, the question arises “what have to learned from this”? There are no benchmark studies executed in this specific context so outcomes cannot be compared. In addition, studies in general on supplier selection processes in combination with third parties from a user point of view are never executed. This research lays, therefore, the first step in understanding the supplier selection process by creating and testing variables influencing performance indicators. Due the lack of usage of third party service providers this research ask for additional data gathering, testing and refinement. This all with the aim to create a better understanding to redefine and extend recommendations towards buyers and third party service providers.

Based on the gathered data the first important conclusion is that the Dutch techno start-ups have a narrowed focus on “impact on profit” while neglecting “supply risk”. More hours are spend during the search for high impact on profit suppliers, while supply risk does not have an impact. In addition, the selection process and evaluation of leverage suppliers are evaluated higher than bottleneck suppliers (“impact on profit” has a significant positive impact on supplier selection process evaluation and supplier evaluation while “supply risk” has on both a significant negative impact). A reason behind this focus could be that the Dutch techno start-up does not has a clear overview and understanding of the consequences of high supply risk suppliers/items.

The second important conclusion which can be drawn is that Dutch techno start-ups have a rather traditional view on the supplier selection strategy. The motivation behind this lies in the geographical location of specific type of suppliers and the evaluation criteria of selected suppliers. Dutch techno start-ups select the more strategic supplier in western/northern Europe and Asia, this is logic and expected. However, leverage suppliers (high impact on profit, low supply risk) can also be candidates for global sourcing. In this sense, this finding is in contradiction with the former conclusion as the Dutch clearly makes the distinction in supply risk of items. It is also possible that in the search for leverage suppliers in the global supply base the nature of the items changes into strategic, as the supply risk increases.

As described earlier, the Dutch techno start-up has a rather traditional focus on evaluation metrics. Cost and logistics are found significant important while the importance of technology and quality is not supported. The definitions behind these metrics were clearly explained so the chance that the respondent did not understand the terminology is not a reason behind this outcome. A possible reason behind this is that Dutch techno start-ups find high quality of items as standard in order to compete in the market. In addition, a reason behind the not supported technology metric could be that techno start-ups usually has developed an innovation with possibly advanced technology leading to a lower need for supplier driven innovation (definition of technology evaluation metric).

#### **5.4 Limitations**

A number of limitations should be recognized in this research. First, there are some limitations regarding the sample. The sample characteristics, which are described in appendix VII, tell us that, considering the company's characteristics, the sample has a good variation; Market, position in supply chain are well spread. The majority of the sample are start-ups (establishment date >1999) and have business customers (B2B). Only this last characteristic, business customers, could be seen as a limitation to the study.

Considering the respondent characteristics, the majority has a higher professional education or master degree in engineering or economics/management and is male. The age of the respondent is well spread over the sample with an average of 44 years. This variation of the sample was expected, as this is general for the entire population and is therefore not a limitation to the study.

In addition, the sample was sent to the directors/owners of the start-ups, who are responsible for the supplier selection, as are required for the data collection. However, the database of companies approached for participation, have all consulted Syntens or LiveWire in the past. The limitations of this could be questioned since on the one hand, the sample is reasonably large but on the other hand, there are similarities in the sample compared to the total population.

The results and conclusions are only applicable, as the research question stated, to Dutch techno start-ups. Generalization, taken the similarities of economies and environment, is potentially possible to western/northern European techno start-ups. This is, however, not in scope of this research.

The interviews held under third party supplier selection providers all had an open character and appointments were made easily, partly due to a personal network. The data gathered during this qualitative study is only used for preparation of the quantitative study and significant conclusions cannot be drawn from this data. All possible roles of the third party services providers were covered in these interviews but due to availability more purchasing offices were interviewed. Since these interviews were intended for verification purposes of the literature framework only, this is not a limitation of the study.

#### **5.5 Recommendation for practitioners**

In general, the success rate of techno start-ups is low. This research investigated the sourcing strategies of Dutch techno start-ups and in particular the use and benefits of service providers during supplier selection.

Unfortunately, the usage of these service providers is not extensive enough to be able to draw any significant conclusions. The first recommendation, taken the proven benefits of these service providers, is to analyze the level of assistance required during the supplier selection and level of expertise available in-house (do a quick benefits-costs analysis) and then make the strategic choice of supplier selection. In addition, Dutch techno start-ups are dissatisfied with the selection procedure of high supply risk supplier, as observed in the data. The use of third party service providers for these suppliers could increase the satisfaction by giving professional advice, supplying information or even source the items and taken the risks.

Second, techno start-ups should be aware of the increase in hours spent for different suppliers, defined as strategic vs. non-critical and domestic vs. abroad. A quick hour forecast by plotting the supplier on the Kraljic matrix can prevent undesirable surprises. In addition, currently mainly suppliers are selected abroad for strategic items. The use of foreign suppliers for non-critical or leverage items are generally neglected. Taken the proven benefits of Low Cost Countries this could also be beneficial for the Dutch techno start-up as these items have a low supply risk.

Thirdly, analysis shows that techno start-ups are currently evaluating new suppliers delivering high supply risk items worse than supplier delivering low supply risk items. Impact on profit, as the second axis on the Kraljic matrix, improves the general evaluation of the supplier. Taking the bad evaluation for bottleneck items, high supply risk and low impact on profit, it is unwise to evaluate these supplier bad and only take the impact on profit into account as environment in which the supplier is evaluated. A recommendation for the techno start-ups is to first plot the supplier on the Kraljic matrix to get a clear impression of the position on the portfolio before evaluation.

Fourth, as described the evaluation of suppliers is based on four evaluation metrics: Quality, logistics, technology and costs. It was predicted that all four metrics have an equal contribution to the general supplier evaluation. However, there were significant differences between the four metrics; costs and logistics were significant while technology and quality were non-significant. This shows us that Dutch techno start-ups just want their products on time and for the best price. Supplier collaboration and value sourcing, which could well give the start-ups competitive advantage in terms of end product quality and reduction of the development phase lead time, is not applied. Ultimately, a recommendation for the Dutch techno start-up is to not only do traditional sourcing but also experiment with value sourcing.

## **5.6 Recommendation for future research**

This study gives an open representation considering the use of third parties during supplier selection of Dutch techno start-ups. Unfortunately, as described in this research, the use of these third parties is too low to be able to draw conclusions from the sample. Therefore, future research could include a cross-sectional research that focuses on customers of cybermediaries, intermediaries and purchasing offices. This research could focus on motivations and experiences, in terms of efficiency and effectiveness gains, for the customers. In addition, taken the limited usage of these services by the sample investigated in this research, the Dutch techno start-ups, this is not a big gap. However, taken the exponential growth of these third party service providers and more and more dynamic business environment (leading to increasing importance of supplier selection), studies focusing on different samples are required.

This study has been conducted from the perspective of the buyer, obviously, only the buyer's experiences of the supplier selection service providers have been analyzed. The study would have had an extra dimension if the other side of the supply chain was incorporated: The suppliers using these third parties. For the marketing

and international business research area, this would be an interesting field of research. Some business papers have already investigated “sales lead generation”, in response to the exponential growth of cybermediaries. Theoretical understanding of this rather new type of marketing is, unfortunately, limited.

Furthermore, since few studies examine the sourcing strategies of (techno) start-ups it is recommended for future research to investigate the different strategies and methodologies. As the research contributions are currently limited, the gaps in literature are extensive.

To finalize, due to the time restrictions a case study, based on the gathered interviews with the third party service providers, is not made. This could be an interesting research direction for the future.

In addition, a study based on the origin of the turnover and the purchasing spent in relation to performance indicators could well deliver interesting insights. As the data is already collected this is a good direction for future research.



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Appendix

**PRACTICAL GAP**

**I**

The practical gap with additional explanation based on 3 major trends from 4 perspectives

TREND	SUB-TREND				REQUIREMENT INDUSTRIAL SME/ TECHNO-STARTER
	Market	Supply Chain	Organizational	Information	
<b>Globalization</b>	<p><b>High tech markets are becoming global</b></p>	<p><b>High tech supply chain are becoming more global</b></p> <p>Both the mature high-tech SME as techno starter (born globals) supply chain are globalizing</p>	<p><b>Global competition demands focus on core competences</b></p> <p>High-tech SME's aren't only competing regionally but competitors are global forces them to focus</p>	<p><b>Global availability of information</b></p> <p>As result of advancement in the information technology the transparency of the global market will further increase</p>	<p><b>High-tech supply chain globalization in order to stay competitive while focusing on core business</b></p>
<b>Volatility</b>	<p><b>Increasing high tech market volatility</b></p> <p>Because of globalization of markets and information availability, events in other parts of the world can influence the demand. Shorter product lifecycles increase this effect.</p>	<p><b>Increasing supply chain complexity</b></p> <p>As result of globalizing high-tech supply chains the supply chains are increasing become more complex. Supply chain volatility is even higher in new product value chains.</p>	<p><b>Importance predictability customer market</b></p> <p>In response to the volatility and globalization of high-tech supply chains accurate forecasting of the global customer market will increasingly become more important in order to deal with these trends using global information availability</p>		<p><b>Organization structure requires an agile (responsiveness) and flexible (volume scaling) structure in order to respond to volatility of high tech supply chain</b></p>
<b>Shorter lifecycles</b>	<p><b>Increasing demanding customers</b></p> <p>Worldwide competition increases the pressure to develop new products at a higher pace</p>	<p><b>Pressure on setting up supply chain new products</b></p> <p>Due the pressure on the new product as result of shorter lifecycles and globalization, the time for setting up the chain has to be reduced</p>	<p><b>Increased importance NPD high-tech companies</b></p> <p>As result of globalizing competition high-tech companies will increasingly focus on NPD</p>	<p><b>Open innovation to manage cost</b></p> <p>In response to decreasing time to market and increasing capital intensity of high-tech product development the search for the best partner globally will become more important</p>	<p><b>Focus of high tech SME and techno-starter on new product development and decreasing time-to-market</b></p>
<b>Labor market development</b>	<p>Skilled technical and "lower" educated staff is harder to find</p> <p>Labor costs are rising in Western Europe</p>				<p><b>Access to skilled (cheap) labor</b></p>

Figure A-1: Practical gap\_Trends

Appendix  
II

**LITERATURE GAP**

The literature gap based on current literature based on challenge and solution research areas.

	<b>CHALLENGE</b>		<b>STRATEGIC SOLUTION</b>	
	MOST EFFICIENT AND EFFECTIVE WAY FINDING SUPPLIERS GLOBALLY		USE OF INTERMEDIARY	
<b>CURRENT LITERATURE</b>	<p><b>Global sourcing strategy MNE's</b></p> <p>Global sourcing strategy of MNE's has been a central focus of recent studies focusing on drivers behind it and ultimately performance improvements as well as more general studies</p>	<p><b>The "born globals"</b></p> <p>Recent years a new business model has received attention from several research groups: the "Born globals". These companies have from their foundation a global network. The studies merely focus on how these companies operate and what determines their success.</p>	<p><b>Purchasing offices</b></p> <p>Due the success of several purchasing offices, like Li&amp;Fung, several case studies have been conducted examining their business model. In addition, a recent paper investigated the specific conditions in which mediated sourcing is most beneficial in comparison with direct sourcing</p>	<p><b>Electronic intermediaries</b></p> <p>In response to upcoming internet based business models several scholars have researched distinctive electronic intermediaries/cybermediary/infomediary and how they create value in several value chains and markets</p>
<b>LITERATURE GAP</b>	<p><b>Global sourcing strategy SME's</b></p> <p>Taken the proven benefits and performance improvement of global sourcing strategies of MNE's by several scholars, the SME's could benefit from the same potential improvements.</p>	<p><b>Sourcing side "born globals"</b></p> <p>The majority of studies on the "born globals" focuses on the market side of the company. The sourcing side of these global oriented companies have not received much attention from the literature while sourcing local is not incorporated in their business model</p>	<p><b>Purchasing offices from high-tech SME perspective</b></p> <p>The success of purchasing offices and mediated sourcing has received (limited) attention from scholars. It is however unclear if these proven benefits are applicable to the high-tech SME value chain</p>	<p><b>Electronic intermediary from high-tech SME market perspective</b></p> <p>The role of the e-intermediary in several B2B and B2C market has been researched as well on how they add value. The high-tech SME, with specific characteristics, remains under lighted.</p>
<b>RESEARCH FOCUS</b>	<p><b>Supplier allocation and selection of Dutch techno starters</b></p> <p>In respond to potential benefits of global sourcing strategies of SME's and emerging business model of high-tech firm, the "born global", together with value adding 3<sup>rd</sup> parties during the sourcing processes the gap in the literature of this research has two origins: Researches on sourcing processes of high-tech SME's and positioning of intermediaries in this value chain.</p>			

Figure A-2: Literature gap

## Appendix **INTERVIEWS**

### III

This appendix describes all the relevant interviews with experts in the field starting with two general reach interviews. Second, summaries of interviews with a cybermediary, intermediary and purchasing offices are described.

#### **INTERVIEW: GENERAL RESEARCH ADVICE**

Person A Manager Contractors Procurement Company A, Arnhem	02-12-2010 10h00-11h30
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#### **Contacts**

- Contact “Döhler” located in Oosterhout have experience acting as intermediary.
- Also “pro filta” could be interesting

#### **Adding value as intermediary in the international value chain**

- Ordinary traders only increasing the prize and will be eliminated firstly in the chain
- Can add value in the form of knowledge and quality control

#### **Current roles:**

- Agents: acting, in most cases, from the supplier
- Distributors: concerning logistics, juristically buy of products so owner but doesn't sell

#### **Remarks:**

- Power in the chain is interesting, who has the power, and how intermediary prevents to be cut out.
- Purchaser always advising role never budget from management.



## INTERVIEW: GENERAL RESEARCH ADVICE

Person B Business Development Manager Company B, Zoetermeer	06-12-2010 10h00-11h15
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### General trends

- It could be an idea to contact John Baars, he wrote a master thesis for business administration on international outsourcing at Erasmus University in 2009/2010, he started this thesis when he worked for Tebodin, at the moment he works for Bluewater
- Quality:
  - Replace “loss” by “failures”
  - Quality can be assured by developing good and consistent technical specifications and drawings as part of the contract (appendices), reference to international and national codes and standards, a good inspection schedule should be part of the contract and guarantees should be included in the contract. Furthermore you can require a supplier for certification of ISO 9000 series.
  - When goods are delivered it should be inspected whether the goods comply with the contract and specifications or not. Often this does not happen sufficiently.
  - *Inspection of complete installations could be done via Factory Acceptance Test (FAT), testing at supplier site (factory) and/or Site Acceptance Test, testing on location where the installation is built*
- Management:
  - Project execution plan or project plan, for everyone accessible and includes *scope description, plan of approach, project organization, communication, quality procedures, distribution of documents etc, this could be part of contract*
  - *Communication* plan, includes frequency and way of communication. Normally part of project execution plan or project plan.
  - Steering committee, consisting of senior management of supplier and client, is responsible for evaluation and strategic decisions.
- For transportation conditions mostly Incoterms are used. Currently terms Incoterms 2000 are applicable, on 1 January 2011 the Incoterms 2011 become applicable.

### Contracting forms

- The name of a contract form does not say anything. In the contract you have always to define well what the actual contracting form includes.
- A contract form is derivate from the business model
- All contracting forms are applicable to the intermediary however Lump sum price (=fixed price), reimbursable (cost plus), share savings and unit rates are most likely. Turn-key is only used for complete machines and/or installations. The client only has to turn the key in order to start up the machine or installation.
- More contracting forms in one project are also possible; for example during the investigation phase hourly payment to minimize risks both sides (not much money) and second phase other contract form. Optional: evaluate after each process step to proceed or not
- Choose parameters based on risk (is in the interest of supplier but also of the client who does want to pay an higher amount for the unknown risks):
  - Risk high -> choose reimbursable (time and material) act as agent
  - Low risks or good estimation possible -> lump sum

- Other forms:
  - EPCM (Engineering Procurement Construction Management), procurement and construction on behalf of client and orders to suppliers and construction companies are placed by client. Used at engineering companies. In civil and infrastructure business abbreviation EPCM is used as Engineering Procurement Construction Maintenance (so including long term maintenance contract).
  - EPC (Engineering Procurement Construction). Similar to design & build and to lump sum turn-key.

#### **Other contractual commitments**

- Scope description is very important. Often this is missing or not complete and not consistent. Scope description can also be included in an appendix and in the contract you can refer to this attachment.
- SLA: not part of contract, this can be an appendix in case of long term maintenance or service contracts (for example in ICT, all kind of maintenance contracts). In this SLA operational agreements are made (for example operational responsibilities, way of communication, response times, required availabilities).
- Add as chapters in contract:
  - Conflict resolution: which court and applicable law
  - Management and control, steering committee (optional)
  - Term of agreement (period)
  - Termination of the contract
  - Payment terms, which moment (per month, % project), and payment period after date of invoicing; important for financing large projects
  - Confidentiality, liabilities, warranties/guarantees, Force majeure.
  - Intellectual property
  - Change “other” according to new information. Audit rights, inspection rights, transfer of rights and/or assets etc.

**INTERVIEW: CYBERMEDIARY**

Person C	16-02-2011
Account support/internal account manager	10h00-11h00
Company C, Amsterdam	

Company founded in 2000  
 Size: 160 FTE's

1. How is Company C established; how were the first customer acquired?

It is established in 2000, in France, were still the head office stands. The founders still in the management. They saw opportunities in the service generation market which is in the US a booming business. In Europe this was less, they than begun in France. Together with businesses with which they good contact with they start working together. The first quotation is received by fax. In four European countries has Company C 5,000 recognized suppliers and 160 FTE's.

Follow-up question: Digital intermediaries have problems when the number of suppliers and buyers layer is than a particular minimum. How did Company C deal with that?

We have no particular minimum at suppliers. By the creation of a category, there is no minimum that we want to have. There are 150/160 categories defined in which SMES can offer their services. If a request comes in, we then look if there are suppliers and send it through. In particular categories, there are 5 requests for 10 suppliers and other 100 request for 2 suppliers. There is no minimum or maximum for the categories

Follow-up question: Are there by the penetration of a new market (NL) suppliers used that already were active within an existing market (FR)?

Yes, that is right. In the Netherlands the first customer was Neopost – European market leader on territory of franking machines. From France it as easy to make an connection. Next to this other companies have also followed us to a new market.

2. In the literature, digital intermediaries can take five positions in the market, namely informational, transactional, assurance, logistical and customization. On basis of these categories, which position(s) take Company C at in the market?

The major position is the one of assurance, we qualify the request self on correctness and truth. Sometimes quotations aren't serious enough and Company C than decides not to distribute them. A validated request is an actual quotation to product or service. Further the role of informational because customers sometimes call to Company C regarding a specific question considering a customer.

Follow-up question: What about logistical and customization?

The delivery of a product or service goes in the form of a lead. Company C does nothing with the lead itself it is up the customer to respond. They provide an A-competence in the market through and that's it.

3. Does Company C uses segmentation of customers; Do large customers get more attention?

Each customer gets a equal amount of attention although Company C has different types of contracts. In that becomes distinguishing is made; If someone signs a contract of 4,000 Euros he gets that more attention than someone for 490 Euros per year.

4. One of the objectives of your (potential) customers is to get in contact with other parties. Ounce that is arranged the initiative of the customer disappears. What does Company C do after the contact is made in order to maintain the customer?

We ring 3 or 4 weeks after the contact establishment to see how it went. To be sure the quotations are handled correctly. We discuss the outcomes of the mentioned qualities controls with the customers.

5. Businesses like Amazon.com and Google offer customer specific information of relevant businesses to her customers, for instance a medical company receives information considering parties in the same sector information. How does Company C try to use such techniques to be able to offer narrowed information?

We use Google Adwords for well-known brands Douwe Egberts e.g. We advertise using these brands with the goal to generate more requests. Mainly Company C advertises that we can compare till a maximum 300 quotations to each other for products and services.

### **Position towards suppliers**

6. What is the added value of Company C for the suppliers?

Supplying qualified leads, leads generated from the SME segment. Leads are send on basis of a suppliers profile of the supplier; they can indicate what they want to receive on basis of particular criteria (type request and type company e.g.) After the profile approved is, leads can be send through.

7. Company C selects suppliers before they bring them in contact bring with customers. What are criteria are used during this selection? How does the 'supply base' evolve over the long term?

Parties edit in their profile which leads they want to receive, e.g. for which categories. Per category, there are specific criteria possibilities. The three fixed criteria are working territory, type of company and status of the business. Further additional criteria can be added for a specific product or service. On moment that it a request are submitted, at the most three parties are selected. Selection is based on targets & capping. A supplier indicated how many leads he want to receive per month. When there are two suppliers which want to receive 50 leads per month, and the other 100 leads per month and they have respectively received 40 and 30 leads halfway the month, then will the last (thus 30/100) will receive the lead. Percentage wisely the leads are being send. As a consequence, the parties will receive an equal percentage on each moment of the month.

Follow-up question: How does the supply base evolve over the long term?

We do business with at most three parties. If we have three parties which want to receive a infinity of leads without each criteria, then basically every category is full. We always looking for new customers and new categories. We want to maintain customer by offer other activities through for instance the offering of customer service. If a customer operates in a category in which Company C also mediates, they will approached to use the services of Company C.

### **Position towards buyers**

8. What is the added value of Company C for the buyers?

The term buyers is incorrect they only offer a service. They make to use of the services of Company C to generate quotations. By their need we must make a lead which we then sent to potential suppliers. The customer only has to fill in his needs and will be contacted by parties who can for fill these needs. This is done for more than 150 categories.

9. The intentions of customers relations with other parties can have a short term goal (incidental) and long term (period of several deliveries). What is the role of Company C in such a difference?

Company C doesn't make a difference. After a request comes and here is no control over it anymore. If there has been contact and get more business over the long term, than that for customer.

10. Taken the five previous mentioned positions that Company C take in the market, strives Company C to a different role in the future?

No, we are satisfied with the role we have at this moment. We, as European market leader, are always looking for expansions and improvement in our services. At this moment it is not necessarily to change positions or target.

**INTERVIEW: PURCHASING OFFICE**

Person D1 and D2 Founders, owners and managing directors Company D, Bergeijk Company founded in 2006 Size: 6 FTE	13-04-2011 13h00-14h30
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1. How is your company founded, how were the first customers acquired?

Both owners had experience in the field (purchasing and manufacturing background), based on their network and demand from market the business is founded. Initially they focused on SME's who hadn't have the capacity and knowledge to engage in global sourcing, later on MNE's became also their customer.

2. Could you describe your business model?

Take care of the whole purchasing process; Matchmaking, entire procurement with Dutch manager in China and Chinese Ltd; (Wholly Foreign Enterprise). Take the full risk during the process of sourcing from China. Customers are operating in the metal and plastic industry (OEM's)

3. Do you use different revenue models and if yes; what variables influence this decision?

No, one revenue model is used; the sales price towards the European customer incorporates the margin (which can differ from product to product).

4. What is the added value of your company towards the customers (buyer)

- Product quality (meeting the specifications) is guaranteed and managed in China by executing field inspection and 100% before the products are shipped to the customer.
- On time delivery is guaranteed as logistics is also managed. In addition, deliveries can be spread over time-period.
- Payment only done when product are meeting the expectations of the customer. Payment is also done to Dutch bank account (which saves procedures of international payments) without any pre-payments.

5. How does your process look like from begin to end?

- Product inquiry comes in and drawings are inspected or made (based on sample)
- The product is broken down and spread over various suppliers.
- Quality is checked continuously during the process using field inspections
- After final check the product are shipped to Rotterdam (orders are consolidated to increase efficiency of the container)
- In most cases the product are delivered to a warehouse (leased) by a preferred transporter.
- From the warehouse the product are transported to the customer.

6. Which process requires the most effort according to you/what is the hardest?

Depends on the product; sometimes the sourcing process but most of the time quality control; from purchasing to purchasing is rather easy but from in-house manufacturing to purchasing is hard and specification phase is crucial.

7. Which process would you like to be seen added?

Currently, Company D is taking over a Chinese assembly facility (which will be under western management) to increase the control over the process.

8. How do you see the future of the position of you company, as intermediary in the future?

As LCC suppliers are remaining an interesting sourcing market there will always be a market for the intermediary to manage the process. The learning curve to start sourcing from China is quite flat and risks are high; the intermediary, taking a cut of the total margin, is worth the money. As doing business with other Western supplier is easier (in case of bad delivery the supplier can take their delivery back) than doing business with China (no possible due distance and culture difference), the whole process should be better arranged.

**INTERVIEW: PURCHASING OFFICE**

Person E Founder, owner and managing director Company E, Brussels	16-03-2011 13h00-14h00
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Company founded in 2001  
Size: 70 FTE over 13 offices

1. How is your company founded, how were the first customers acquired?

The first customers were acquired through personal network, which was established through years of experience in the procurement field and industry of the two founders (15 and 20 years' experience).

2. Could you describe your business model?

Provide buying office service on outsource basis (customers want to source from LCC's but don't want to create their local infrastructure); company E operates on the behalf of the customers.

3. Do you use different revenue models and if yes; what variables influence this decision?

Three business models used:

1. Outsource business model (80%); primary revenue source; dedicated team working for clients based on fixed fee yearly contract (driven by number and level of experience of buyer in team) which is renewed every year.
2. Project basis (10-15%); Very rare new customers starting with this relationship, first testing period on several categories; Company E executes e.g. feasibilities study. Work on project basis; fixed price per category per country. Demonstrate how Company E works with as goal doing the outsource process
3. Trading business model (5-10%), area of growth has two models:
  - ✓ No responsibilities for quality of transaction) – financial role and managing the process – small margin – for decentralized organizations with no central budget to pay the service fee – order from company E, and company E orders from the suppliers.
  - ✓ Take full responsibility – buy the product and sell it to the customer – larger margin

Companies have buying office but not satisfied with performance; Company E takes over the buying office and reorganizes with help of tools and technology developed by Company E. On commission basis or

4. What is the added value of your company towards the customers (buyer)

- *Speed*

Customers with no buying office in China e.g. Company E can start immediately

- *Process expertise*

Processes in place controlling the risks and increasing the chance of success

- *Global footprint*

Company E has global network with buying offices around the world; customers want the best supplier (not the best supplier in China)

Company E runs the whole process end to end, breaking it down in pieces is very hard since no link can be missing, current sourcing cycle:

*Stage 1:*

1. Understanding of client requirements, identification of volumes, destinations, regulations
2. Build supplier databases with potential suppliers



3. Run RFI (Request For Information)
4. Run RFQ (Request for Quotation)
5. Logistic calculations
6. Build business case; summary of previous work

*Stage 2:*

1. Audit the suppliers, is information true?
2. Product development and testing
3. Contract negotiations
4. Pre-manufacturing run
5. Actual manufacturing orders; quality control, logistics management, performance monitoring.

5. Which process requires the most effort according to you/what is the hardest?

Front end is the most difficult and important of the whole process; qualifying the suppliers (selecting the suppliers). The source side of the procurement process and less important is the contracting. Changing supplier from a reliable well-known Western European supplier to new unknown Chinese supplier goes through multiple qualification processes (auditing the supplier, auditing the facility, making sure they have the capabilities, developing and testing the product) to reassure that they can do business with this supplier.

The procurement operation side is, in contrary simple if the sourcing process is well executed.

6. Which process adds the most value according to you?

The front end, the sourcing process, adds the most value. The procurement operation should be simple and therefore doesn't add much value.

7. Which process would you like to be seen added?

Two offerings are interesting for Company E to developing the future:

1. Market intelligence - Feed procurement departments with useful information to make decisions; commodity reports, analysis of trends in categories. Some reports will be a continuous feed (based on membership). Reports can also be made upon request from the customer (this will be price per report)
2. Develop supply capabilities - Prices and currency will continue to increase in the future in China. Companies sourcing heavily from China can do three things; do nothing and prices increase, looking for other countries/remote areas in China or work with existing suppliers to reduce their costs (supply development). Company E provides supply development engineers; they go in the factory and help to reduce costs. The revenue model is not known yet but a service fee is likely based on a combination of time and performance.

8. How do you see the future of the position of you company, as intermediary in the future?

- Adding the previous described processes (wide range of offerings)
- Company E want to become more global (more offices and more countries).

Expand different business models; not all customers are willing to pay a fixed fee for the services, they rather want a commission or buy-seller model. This can result that Company E can take different types of client with different types of requirements.

**INTERVIEW: PURCHASING OFFICE**

Person F Founder, owner and managing director Company F, Shanghai	29-03-2011 13h00-14h00
---	---------------------------

Company founded in 2003

Size: Currently 12 FTE but within 2 months back in the original organization structure of 22 FTE

1. How is your company founded, how were the first customers acquired?

The first customers were former customers of previous business activities. In addition, the founder/CEO has a Chinese wife. A demand from the market resulted in the foundation of the company.

2. Could you describe your business model?

Company F act as a consolidator (An agent who brings together a number of shipments for one destination to qualify for preferential rates); the customer outsources the whole purchasing process to Company F and is fully responsible for deliveries, outsourcing, financials, quality checks, transport and sometime warehousing at the customer. The only thing the customers does is paying the bills of Company F. Company F is fully transparent towards customers; suppliers are known and information considering raw materials, labor costs, machinery costs are shared.

The strategy for higher revenues is applying variations in margins so the amount of projects per customer are maximized. The consolidator has competition from purchasing offices; when it comes down to merely price the consolidator works better.

3. Do you use different revenue models and if yes; what variables influence this decision

The above described revenue model is the main source of revenue, there is some online sales. 80% of the customers are operating in the cooling industry. There are reasonable amounts of orders, which can be handled almost in a standardized way by the administrative employee (weekly orders arrive, making price and deal is closed). But this is merely a different business model; the main revenue model is based on the role of the consolidator.

4. What is the added value of your company towards the customers (buyer)

When working with 1 or 2 suppliers from China it can be relative easy to manage for foreign countries (non-Chinese); a purchaser can fly to the suppliers and do random quality checks and manage the relationship. In case of dynamic sourcing from China and always seeking for the best quality and price possibilities a good contact in China is necessary in the form of a purchasing office, a very good agent or a consolidator. Sourcing directly from China for a foreign company is in the long run not the best option; seizing of capital and sourcing expertise.

5. How does your process look like from begin to end?

First there is an agreement of the price, and sample is delivered and approved. When an order for a series is then placed by the customer and confirmed, Company F orders the product from the Chinese supplier. Company F executes quality checks during and after manufacturing. In case of full containers the products are directly delivered to the customers, in case of not full container delivery the products are delivered at the warehouse of Company F. When the products are on the boat, the invoice is send to the customer.

6. Which process adds the most value according to you?

The most added value for the customer has a financial background; the customer want the product to be delivered their warehouse and will pay after 30 days. So the whole sourcing process will have no financial impact for the customer. Large companies see this as a large advantage.

On the other hand, the added value has also to do with internal costs; the purchasing department of the customer will have to do less work (since the purchasing process is fully outsourced).

The last added value is the efficiency of the process; the consolidator is better informed on the local market and its developments than a foreign situated company. The consolidator can select better supplier and trains them better.

Conclusively the sourcing process adds the most value.

7. Which process would you like to be seen added?

The costs in China are rising, as intermediary you have to work better and more efficiently to make it beneficial to source from China. As the offered services are already quite extended; providing sourcing, manufacturing, warehousing facilities in China and Europe, assembly in China, financial support, legal support and logistics support. Company F can offer currently the whole package to the customer.

The goal for the future is increasing the efficiency of the company; an increase of 200% in sales will be managed with the same headcount. This decrease in cost per product is calculated to the end price of the customer, which hopefully orders more in the future.

8. How do you see the future of the position of you company, as intermediary in the future?

The credit crunch in 2008 has resulted in many liquidations of trading companies and intermediaries in China. Company F has intense communication with other consolidators, and they are all doing well. The large companies are cautious with money; if they can work with a consolidator in China, which takes care of the whole financial process they will do it. However, if solvability of these companies improves it is possibly that things will change. Company F has a long term strategy but if fully aware of this together that having a business in China is having a business in extreme dynamic market (the business can be over tomorrow).

### INTERVIEW: INTERMEDIARY

Person G Founder, owner and managing director Company G	19-04-2011 10h00-11h00
---	---------------------------

Company founded in 2008  
Size: 1 FTE

#### Services:

Company G can offer various services depending on the customer request:

1. Found a company
2. Partnership: own target
3. Partnership: no target

Company G operates as a mediator/matchmaker between the buyer and seller and can work from both starting points (the initiators pays for the services which are based on day tariffs)

#### Partner selection:

On country level the need for creativity and manufacturing costs are leading. The area analysis based on the requirements of the buyer (requires smart staff or rather repetition work) is made.

Partner selection is based on:

- Company size
- Way of working
- Importance IP

#### After match

- Culture training
- Project management and virtual team training
- Customs
- In- and export guidance

The first project between the parties the entire procedure is managed with help of PGS

#### Approach to internet

- Solves many issues and makes some processes easier.
- However personal contact is important; first deal close with dinner in most cases
- E-tendering is a good alternative for short term one-off wins when the project is well described and complete specifications.
- However, e-tendering doesn't pay attention on long term, fit between the two parties (culture and way of working) and collaboration (thinking with the other party beyond specification)

#### Notes:

- First purchasing than more chance on sales; chauvinistic nature of countries.

**INTERVIEW: PURCHASING OFFICE**

Company H	15-04-2011
Vice president sales	10h00-11h30
Person H	

Company founded in 2006

Size: 100 FTE

1. How is your company founded, how were the first customers acquired?

Founded in the Netherlands in 1987 (1957 in France) and merged with large group; this resulted in a changed mission statement from delivering standardized products to custom-made items. In 2005 the group was acquired by a large multinational (but is still operating under the same name and using facilities of this multinational).

2. Could you describe your business model?

Trading company that adds value from design to logistics; taking full responsibility of the entire process focusing on product category (premium, packaging and POS) vs industry focus (various B2C companies).

3. Do you use different revenue models and if yes; what variables influence this decision?

Depending on customer size (including forecasted size), two revenue models are used:

1. Transparency model – used for large clients (economies of scale); information is fully transparent (including sourcing partner, TCO and possibly margin).
2. Fixed price model – a fixed price given to customer includes TCO and margin. This option is only used when contractual is agreed that it will generate business over a time-period.

4. What is the added value of your company towards the customers (buyer)

Depends on the customer but in general the following three values are most appreciated:

1. Quality assurance (meeting the specifications); possible by vendor management (risk assessment and using external independent audit bureau like SGS, ITS, Bureau Veritas or Eurofins), onsite quality control, quality check before shipping using military standard AQL and defining levels of importunacy of specifications.
2. Financial strength (reliable partner, doesn't go bankrupted easily)
3. Design (re-active and pro-active)

5. How does your process look like from begin to end?

1. Design
2. Specification + briefing from purchasing department
3. Sourcing; where and from whom?
4. Target price to customer
5. Request for quotation to potential suppliers (3-5)
6. Offer quotation to customer
7. Logistics quotation
8. Delivery to customer (from own warehouse or directly to customer)

6. Which process requires the most effort according to you/what is the hardest?

1. Designing the product; remaining objective as design is highly personal/relations depended (by telling the whole story except only the end product this increases the change on success)
2. Vendor management

7. Which process adds the most value according to you?

1. Design (sometimes for free to get the order)
2. Quality; managing and holding supplier to agreements and framework conditions.

8. Which process would you like to be seen added?

No concrete process but three point of attention for the future of the company:

1. Sustainability; internally (organizational) and externally (product+logistics)
2. Market; currently the market focus is on the European market, in the future Asia can become next to sourcing market become a sales market.
3. E-commerce; creating web shops but also keeping in mind that the interaction with the customer is important. More research has to be done by investigate the opportunities. Possibilities are e-tendering and e-auctioning.

9. How do you see the future of the position of you company, as intermediary in the future

The businesses are still growing but BRIC countries are emerging fast (prices are increasing and buyers' market can evolve in sellers' market); this can result for the intermediary in more transparent business models. Partnerships will therefore be even more important in the future position of the intermediary in the international value chain.

## Appendix **ADDITIONAL MOTIVATION ITEMS**

### IV

This appendix motivates the choosing items, which are based on the literature framework and tested using the described interviews and case-studies.

Derived from the problem statement analyzed in chapter two, young and small companies working with increasing importance and urgency with the trade-off between fast (efficiency) en effective (ultimate value supplier) supplier selection.

As described in paragraph 1.4 this research focuses on relation of supplier selection strategy on effectiveness, efficiency and satisfaction. Derived from this main relation, effects like organizational, personal, market, purchasing and supplier have a mediating character.

Investigating the relationships of these mediating effects on main relation results in the following identification of variables:

#### Organizational characteristics

Scholars generally characterize large MNE's with economies of scale and efficiency advantages (Ramamurti, 2004). On the other hand, start-ups have less bureaucratic structures and entrepreneurial spirit (Di Gregorio, 2009; Chetty S. C., 2004). The size of the company has a influence on the efficiency of general operations, question arises what the impact of the company size is in this particular context.

The place in the value chain is the second organizational characteristic that could well have a mediated effect on the performance indicators (Gelderman, 2010).

#### Personal characteristics

The first personal characteristic influencing the performance indications identified is the gender and age of the employee responsible of the search for suppliers. Compared to men, women perceived more risk to buying online both in terms of probability and in terms of likelihood (Garbarino, 2004). This could indicate the women rather choose the "do in self" strategy in order to find and allocate suppliers.

Education of the employee, field of expertise and level, could also well mediate the above described relation. Purchasers are generally high educated to be able to reach high efficiency and effectiveness goals to ultimately come to a high satisfaction.

#### Market characteristics

Specific markets have their own game rules and procedures. The effect of the market in which the organization is operating in and the performance indicators could therefore have a significant impact (although hard to adjust). The satisfaction of outsourcing in the high tech product/services and automotive is the highest in the industry (68% and 67%), according to a study by EquaTerra (Boot, 2010). This research was executed under larger companies across Europe, question arises what the satisfaction of supplier selection is in relation to markets.

Second, the yearly Procurement Leaders forum in London<sup>25</sup>, which discusses the latest procurement trends, indicated the increasing role of local purchasing. Large companies as Heineken and Kraft Foods purchase more often locally close to the market and operations, motive behind this is the better collaboration with the

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<sup>25</sup> Procurement Leaders Forum 24 May 2011 - London

local government and local trading organizations. This could indicate that purchasing spent origin is related with market origin and that in general purchasing spent is done in the Netherlands.

#### Purchasing characteristics

General purchasing characteristics of the firms, specifically importance of purchasing defined as purchasing spent compared with turnover, indicates indirectly the level of experience. In addition, the supply base location, origin of sourcing spent, gives an indication of the level of experience in sourcing from specific geographic regions.

#### Supplier characteristics

The first supplier characteristic, as for the purchasing characteristics, influencing the performance characteristics is the supplier location. Some markets have potentially more competent suppliers but are rather harder to find due infrastructure or due network externalities. However, if the supplier is selected the potential effectiveness, evaluation of the supplier, is potentially higher.

Second, the purchasing spent specifically for the new supplier, can be an indication of level of effectiveness and satisfaction. A high grade of these performance indicators could correlate with a high purchasing spent.

Finally, the place of the supplier in the portfolio of the firm potentially effects the efficiency (positive relation effectiveness and importance supplier in portfolio), effectiveness (positive relation evaluation and importance in portfolio).



## Appendix SURVEY

# V

This appendix describes all the communication considering the survey. Starting with the pre-announcement to the sample. Second, the invitation and the reminder is described. Finally the actual survey is shown.

### SURVEY: PRE-ANNOUNCEMENT PARTICIPATION SURVEY

Send by communication manager Syntens to sample Translated from Dutch to English in this report	12-07-2011
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### New connections, new businesses

#### Pre-announcement: Participation study

Dear ...,

Soon you will receive an invitation to participate in an important study which is executed by Syntens, Brabant Center of Entrepreneurship (BCE) and the University of Technology Eindhoven (TU/e). We ask you, as entrepreneur, to give information considering the strategy and business model of your company. On basis of the results of this research better advice to companies and entrepreneurs like you can be given.

We do our very best to make your participation as easy and convenient as possible. This research can only become a success with contributions of several entrepreneurs. We hope you are willing to invest 10 minutes of your spare time for filling in the questions.

#### **Within a few days you will receive an invitation for participation in the survey**

To show our gratitude and appreciation we are raffling 35 books under the participants who have completely filled in the survey. The results will be presented during a (free) workshop. You will receive an invitation for this event if you participate in the survey.

Thanks in advance for your cooperation,

Kinds regards

Sjoerd Keijser, Project leader

**SURVEY: INVITATION PARTICIPATION SURVEY**

Send by Qualtrics survey software to sample  
Translated from Dutch to English in this report

20-07-2011

July, 2011



Dear ...<sup>26</sup>

U have had contact for your company ...<sup>27</sup> with entrepreneur coach ....<sup>28</sup> of Syntens/LiveWIRE

The summer is a perfect time for reflection! Therefore we would like for your participation in a important study executed by Syntens, Brabant Centre of Entrepreneurship (BCE) and the University of Technology Eindhoven. We ask you as an entrepreneur for information considering you company strategy and business model. On basis of the results of the research better advice can be offered to companies and entrepreneurs like you.

Your advantages for filling in this survey:

1. Free workshop in which the results are presented and a network possibility
2. Chance on 1 of the 35 top qualified book which have a large chance helping companies forward
3. Possibility to formulate an intern/graduation project and steering theoretical research at the end the of the survey

We hope you are willing to invest 15 minutes of your time for filling in the questions:

**[To the survey](#)**

Or copy and paste the URL below into your internet browser:

[https://europe.qualtrics.com/WRQualtricsSurveyEngine/?Q\\_SS=e4kX3UbgWczw7Q0\\_0BuDbiMyKuuAOzy&=1](https://europe.qualtrics.com/WRQualtricsSurveyEngine/?Q_SS=e4kX3UbgWczw7Q0_0BuDbiMyKuuAOzy&=1)

Thanks you sincerely in advance for you corporation,

Follow the link to opt out of future emails:

[Click here to unsubscribe](#)

Ir. Sjoerd Keijser  
*Syntens project leader*

Dr. Ksenia Podoyunitsyna  
*TU/e Project leader*

Prof. Dr. Geert Duijsters  
*Scientific director of BCE*

<sup>26</sup> Dynamic field

<sup>27</sup> Dynamic field

<sup>28</sup> Dynamic field

**SURVEY: REMINDER**

Send by Qualtrics survey software to sample  
Translated from Dutch to English in this report

01-08-2011 & 26-08-2011

LAST REMINDER!

August, 2011

Dear ...<sup>29</sup>



LAST CHANCE TO SHARE YOUR OPINION

Recently, you have received an invitation to participate in an entrepreneur-survey because you have had with you company ...<sup>30</sup> contact with entrepreneur coach ...<sup>31</sup> of Syntens/Livewire

It is possible that this invitation has slipped your attention, therefore we would like to ask for your participation by this reminder. Without your participation the execution of the study is impossible, therefore your input is highly appreciated. Besides your advantages for filling in this survey are the following:

1. Free workshop in which the results are presented and a network possibility
2. Chance on 1 of the 35 top qualified book which have a large chance helping companies forward
3. Possibility to formulate an intern/graduation project and steering theoretical research at the end of the survey

We hope you are willing to invest 15 minutes of your time for filling in the questions:

**[To the survey](#)**

Or copy and paste the URL below into your internet browser:

[https://europe.qualtrics.com/WRQualtricsSurveyEngine/?Q\\_SS=e4kX3UbgWczw7Q0\\_0BuDbiMyKuuAOzy&\\_=1](https://europe.qualtrics.com/WRQualtricsSurveyEngine/?Q_SS=e4kX3UbgWczw7Q0_0BuDbiMyKuuAOzy&_=1)

Thanks you sincerely in advance for your corporation,

Follow the link to opt out of future emails:

[Click here to unsubscribe](#)

Ir. Sjoerd Keijser  
*Syntens project leader*

Dr. Ksenia Podoyntsina  
*TU/e Project leader*

Prof. Dr. Geert Duijsters  
*Scientific director of BCE*

<sup>29</sup> Dynamic field

<sup>30</sup> Dynamic field

<sup>31</sup> Dynamic field

## SURVEY: CONTENT SURVEY

Questions survey as been send out to sample (part of entire survey relevant for this research)

Translated from Dutch to English in this report

### Introduction

Dear entrepreneur,

Thank for you participating in this survey.

Our goal is investigating relations between business model innovation, purchasingstrategies en performance of companies.

Filling in the survey will take approximately 15 minutes and responses will be handled completely anonymously. Please fill in the survey according to reality as there is no such thing as bad answers.

For a complete survey you will get the following in return:

1. Free workshop and network meeting with the results
2. Chance on a top qualified book
3. Possibility to formulate intern-assignment and/or formulate academic research

Thanks in the advance for you input,

ir. Sjoerd Keijser (Syntens)  
dr. Isabelle Reymen (TU/e)  
dr. Ksenia Podoynitsyna (TU/e)  
ing. Jeroen Scherders (TU/e)

If you have any questions considering this survey you can contact Jeroen Scherders:  
Email: ent.survey@tue.nl

### General information

1. When is your company established (MM/YYYY)

2. How would you characterize your company (you can select more than one)?

**OEM**

*Producer of end products like PC or trucks*

**Supplier of integrated modules**

*Supplier of complete modules supplied to the OEM*

**Component supplier**

*Supplier of components as part of modules*

**Jobber**

*Customer specific electro-mechanical treatments of parts*

**Supplier of technical services**

*Offer services such as maintenance*

**Distributor**

*Receiving good over one channel and sending it through several channels*

- Retailers**  
*Offers services and/ or good to consumers*
- Engineering firm/ consultant**  
*Offers technical support/ advice*
- Other role, namely:**

3. Do you work in your primary market the majority with consumers (B2C) , businesses (B2B) or government (B2G)?

4. What are the main markets in which your company is operating (you can select more than one)?

- |  |   |
|--|---|
| <input type="checkbox"/> Aerospace                               | <input type="checkbox"/> Food_beverages_tobacco         |
| <input type="checkbox"/> Construction                            | <input type="checkbox"/> Wood_and_furniture             |
| <input type="checkbox"/> Chemical_industry                       | <input type="checkbox"/> Metal_treatment                |
| <input type="checkbox"/> Computers_and_office_equipment          | <input type="checkbox"/> Driven_vehicles                |
| <input type="checkbox"/> Design                                  | <input type="checkbox"/> Pharmaceuticals_and_biotech    |
| <input type="checkbox"/> Printing                                | <input type="checkbox"/> Rubber_and_plastics_treatments |
| <input type="checkbox"/> Sustainable_and_green_products          | <input type="checkbox"/> Boot_ships_construction        |
| <input type="checkbox"/> Electronic_and_communication_(hardware) | <input type="checkbox"/> Textile_and_clothing           |
| <input type="checkbox"/> ICT_(software)                          | <input type="checkbox"/> Transport                      |
| <input type="checkbox"/> Electronic_machinery_construction       | <input type="checkbox"/> Scientific_instruments         |
| <input type="checkbox"/> Nonelectronic_machinery_construction    | <input type="checkbox"/> Different market, namely       |

**Purchasing strategy**

5. Does your company have suppliers?

 Yes/No

6. Where were you suppliers and customers based over 2010?

	<b>Suppliers</b> Origin purchasing spent relative to total purchasing spent	<b>Customers</b> Origin turnover relative to total turnover
Netherlands	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>
Western Europe	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>
Northern Europe	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>
Eastern/central Europe	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>

	<b>Suppliers</b> Origin purchasing spent relative to total purchasing spent	<b>Customers</b> Origin turnover relative to total turnover
Northern America	<input type="text" value="0"/>	<input type="text" value="0"/>
Southern America	<input type="text" value="0"/>	<input type="text" value="0"/>
Asia	<input type="text" value="0"/>	<input type="text" value="0"/>
India	<input type="text" value="0"/>	<input type="text" value="0"/>
Rest of the world	<input type="text" value="0"/>	<input type="text" value="0"/>
<b>Total</b>	<input type="text"/>	<input type="text"/>

**7. What was the purchasing spent relative to turnover in 2010?**

*Referring to product related purchasing: turnover + purchasing + costs + margin*

**\* Focus on the last supplier which you have found in the last 12 months for the following questions**

**8. How did you found this last supplier**

- Myself**  
*Without any interference of paid services of intermediaries*
- Through a professional internet based paid intermediary**  
*Like Alibaba.com*
- Through a non-paid advisor/intermediary**  
*A non-profit matchmaker like Syntens/Enterprise Europe Network*
- Through offline paid intermediary**  
*A compensation is paid to the intermediary for finding a contact*
- Purchasing office**  
*Products are bought through a purchasing office which is responsible for the entire delivery*

**9. Where is this supplier located?**

- Netherlands
- Western Europe
- Eastern/central Europe
- Northern America
- Southern America
- Asia
- India
- Rest of the world

**10. How do you classify this supplier?**

	Very low	Low	Neutral	High	Very high
Impact on profit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supply risk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**11. What is the cut (in %) of this supplier compared to the total purchasing spent over the last 12 months?**

[Percentage between 0 en 100%]

**12. How do you evaluate this supplier on the following points?**

	Very bad	Bad	Neutral	Good	Very good
<b>Quality</b>					
<i>Level of meeting product specifications</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Logistics</b>					
<i>Level of meeting delivery specifications</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Technology</b>					
<i>Level of supplier driven innovations</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Costs</b>					
<i>Level of total costs of products and delivery (TCO)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**13. How many hours did you spent on finding this supplier?**

**Allocation**

*Making a list of potential suppliers*

**Pre-qualification**

Suppliers are eliminated from list (quotations are requested e.g.)

**Selection**

*Final selection of the supplier*

**14. How do you evaluate the search for this supplier?**

	Totally disagree	Disagree	Neutral	Agree	Totally agree
Very easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very effective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very transparent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Totally disagree	Disagree	Neutral	Agree	Totally agree
Enough information during the search	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trusted the information completely during the search	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The supplier exceeded the expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Appendix VI SAMPLE CHARACTERISTICS

This appendix shows the frequencies of company (in blue) and personal (in red) in the sample. The respondent could fill in more possible answers for “position in supply chain” and “market”.

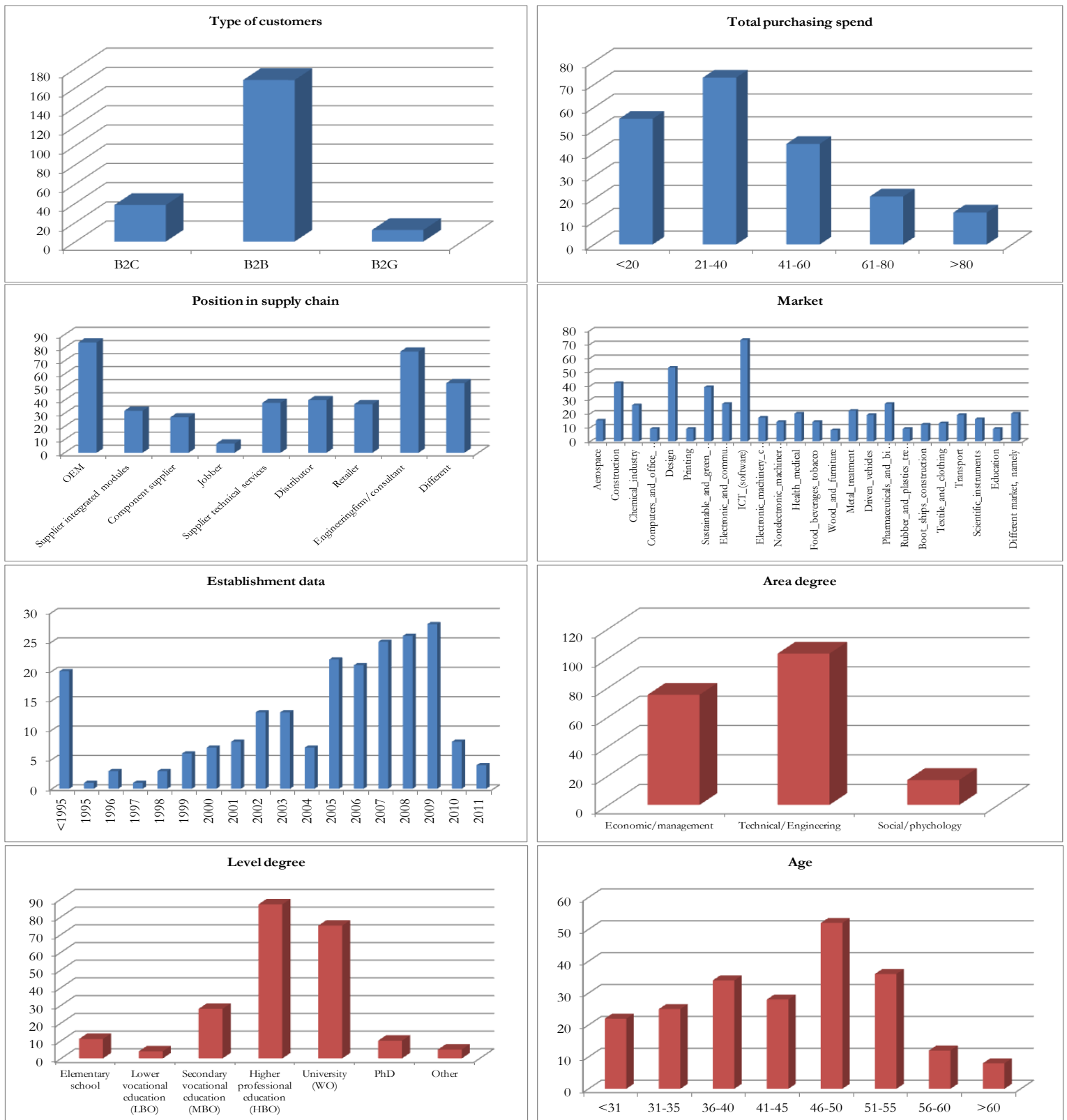


Figure A-3: Graphical representation sample characteristics

**Appendix VII**

**CORRELATION MATRIX**

This appendix shows the correlation matrix and descriptive statistics before and after factor analysis is performed.

	Construct	Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Kraljic	Impact_on_profit															
2		Supply_risk	,437														
3	Effectiveness	Quality	,114	-,153													
4		Logistics	,046	-,190	,522												
5		Technology	,251	-,105	,489	,367											
6		Costs	,087	-,152	,306	,277	,234										
7	Satisfaction	Very_easy	-,119	-,193	,010	,108	-,063	,094									
8		Very_efficient	-,005	-,266	,239	,308	,145	,255	,520								
9		Very_transparent	,010	-,257	,190	,311	,130	,143	,489	,680							
10		Enough_information	-,025	-,211	,117	,230	,108	,224	,480	,496	,548						
11		Dummy_Loc_Sup	,297	,207	,114	-,034	,143	,092	-,193	-,147	-,141	-,070					
12		Trustfulness_information	-,015	-,214	,074	,161	,058	,136	,452	,361	,370	,439	-,104				
13		Supplier_exceeded_expectations	,085	-,133	,338	,365	,235	,278	,266	,514	,427	,363	-,007	,414			
14	Selection	Dummy_Selection	,037	,068	,030	,016	,066	-,054	-,020	,082	,089	-,013	-,022	-,047	-,001		
15	Efficiency	Log_efficiency	,340	,262	,105	-,024	,118	,013	-,461	-,180	-,232	-,174	,358	-,312	-,123	,021	

Table A-1: Pearson correlations (N =218) before factor analysis with in red the correlated variables

		Mean	s.d.	1	2	3	4	5	6	7
1	Impact_on_profit	3,082	1,082							
2	Supply_risk	2,555	,983	,437						
3	Dummy_Selection	,055	,228	,037	,068					
4	Dummy_Loc_Sup	,377	,486	,297	,207	-,022				
5	Fac_effectiveness	,000	1,000	,170	-,205	,026	,106			
6	Fac_satisfaction	,000	1,000	-,016	-,290	,025	-,152	,321		
7	Log_efficiency	1,269	,662	,340	,262	,021	,358	,076	-,331	

Table A-2: Descriptive statistics and Pearson correlations (N =218) after factor analysis

## Appendix VIII FACTOR ANALYSIS

This appendix shows the factor analysis performed for effectiveness and satisfaction.

### Factor effectiveness

First, the underlying factors considering the effectiveness, measured using four 5-point likert scales, are analyzed starting by checking general assumptions (Hair, 2006):

- Conceptual:
  - ✓ Dependent and independent variables are not mixed
  - ✓ Sample homogeneous
- Statistical:
  - ✓ Bartlett’s test of sphericity is significant (0,000), this statistical significance shows that the correlation matrix has significant correlation among at least one of the variables.
  - ✓ The measure of Sample adequacy (MSA) is 0,719 which is good, this measure indicates that the items are highly correlated.
  - ✓ Reliability of scales: The four scales have a Cronbach Alpha value of 0,686, which indicates according to Field (2005) that the scales are reliable.

The factor analysis can be performed, the next question arises what the method of extraction, rotation method and number of factors is appropriate.

- *Component extraction* is chosen as method of extraction since primary objective is data reduction with minimum of factors and there is knowledge about specific effort.
- *Direct oblimin rotation* is chosen since factors are allowed to be correlated using this rotation method.
- *Number of factors*, analyzing the output table of data reduction of one factor we find a total variance explained of 53% with differences between Costs and the other metrics. Therefore, the factor analysis is run again with fixed two factors resulting in no improvements. This together that only one dimension has a higher initial eigenvalue of 1, one factors is extracted.

Communalities		
	Initial	Extraction
Quality	1,000	,685
Logistics	1,000	,584
Technology	1,000	,531
Costs	1,000	,321

Extraction Method: Principal Component Analysis.

Total Variance Explained							
Component		Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension0	1	2,122	53,038	53,038	2,122	53,038	53,038
	2	,805	20,117	73,155			
	3	,630	15,761	88,916			
	4	,443	11,084	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix <sup>a</sup>	
	Component
	1
Quality	,828
Logistics	,764
Technology	,729
Costs	,567

Extraction Method: Principal Component Analysis.

- a. 1 components extracted.

Table A-3: Factor analysis effectiveness output table SPSS

*Factor satisfaction*

Second, the underlying factors for satisfaction, measured using six 5 point likert scales, are analyzed starting with checking general assumptions.

- Conceptual:
  - ✓ Dependent and independent variables are not mixed
  - ✓ Sample homogeneous
- Statistical:
  - ✓ Bartlett’s test of sphericity is significant (0,000), this statistical significance shows that the correlation matrix has significant correlation among at least one of the variables.
  - ✓ The measure of Sample adequacy (MSA) is 0,926 which is extremely good, this measure indicates that the items are highly correlated.
  - ✓ Reliability of scales: The four scales have a Cronbach Alpha value of 0,833, which indicates according to Field (2005) that the scales are reliable.

The factor analysis can be performed, the next question arises what the method of extraction, rotation and number of factors is appropriate.

- *Component extraction* is chosen as method of extraction since primary objective is data reduction with minimum of factors and there is knowledge about specific effort.
- *Direct oblimin rotation* is chosen since factors are allowed to be correlated using this rotation method.
- *Number of factors*, analyzing the output table of data reduction of one factor we find a total variance explained of 55% with high values in the component matrix, and one dimension with a initial eigenvalue higher than one. Therefore one factor is extracted.

Communalities		
	Initial	Extraction
Very_easy	1,000	,524
Very_efficient	1,000	,672
Very_transparent	1,000	,653
Enough_information	1,000	,568
Trustfulness_information	1,000	,443
Supplier_exceeded_expectations	1,000	,433

Extraction Method: Principal Component Analysis.

Total Variance Explained							
Component		Initial Eigenvalues			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
dimension0	1	3,292	54,873	54,873	3,292	54,873	54,873
	2	,757	12,613	67,486			
	3	,732	12,199	79,685			
	4	,522	8,704	88,389			
	5	,404	6,739	95,128			
	6	,292	4,872	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix <sup>a</sup>	
	Component
	1
Very_easy	,724
Very_efficient	,820
Very_transparent	,808
Enough_information	,754
Trustfulness_information	,665
Supplier_exceeded_expectations	,658

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table A-4: Factor analysis satisfaction output table SPSS

## Appendix **DATA ANALYSIS**

### IX

This appendix shows the data analysis in the form of assumption checks and output tables from SPSS divided in sub-questions.

#### Sub-question 1

##### Method of analysis

Logistic regression. Dummy of supplier selection strategy as dependent variable. Kraljic matrix (supply risk and impact on profit) variables together with location are the independent variable.

##### Most important assumptions based on Field (2005)

- ✓ Outcome must be discrete
- ✓ No perfect multi-collinearity; VIF values around 1 which is between 0,2 and 10

##### Result

As the independent variables have possible interaction effects this is firstly calculated using Dawson (2006). This suggests inserting new variables A (var1\*var2), B(var1\*var3), C(var2\*var3) and D (var1\*var2\*var3) and checking the significance.

As variables A, B, C and D are not significant, the calculation of the 3-way logistics interaction effects is not necessary.

Eliminating the interaction variables and executing the standard logistic regression with the above described independent variables results in the following table:

		Variables in the Equation					
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Dummy_Loc_Sup	-,408	,662	,379	1	,538	,665
	Impact_on_profit	,112	,346	,106	1	,745	1,119
	Supply_risk	,291	,341	,729	1	,393	1,338
	Constant	-3,841	1,146	11,234	1	,001	,021

a. Variable(s) entered on step 1: Dummy\_Loc\_Sup, Impact\_on\_profit, Supply\_risk.

Table A-5: Logistic regression sub-question 1 SPSS output table

As the table above shows, no significant relation can be found. A likely reason behind this result is the lack of variation the dependent variable, supplier selection strategy (12 against 207).

#### Sub-question 2

##### Method of analysis

Linear regression. Log of sum of hours spent as dependent variable. Dummy\_supplier\_selection strategy, Kraljic matrix (supply risk and impact on profit) variables together with location are the independent variable.

##### Most important assumptions based on Field (2005)

- ✓ No perfect multi-collinearity; VIF values around 1 which is between 0,2 and 10
- ✓ Linearity and Homoscedasticity; quite randomly and evenly distributed scatter plot. Computation using a “log” function improved the linearity
- ✓ Normally distributed errors; quite linear plots of standardized regression residuals but after computation using a log dramatically improved

**Result**

The 3-way interaction effects analysis of Dawson (2006) does not support the presence of interaction effects. The first appropriate analysis is, based on the characteristics of the independent and dependent, linear regression analysis. The distribution of the dependent variable was not normal. This was, analyzing the data distribution of the total hours spent, caused by the many observed data lower than 20 hours. Inserting a dummy variable (0=<20hrs, 1=>21hrs) did not solve this problem. The computation into using a “log”, however, solved the distribution problem and improved the predictability. Therefore linear regression is run with above described variables:

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,441 <sup>a</sup>	,194	,177	,60340

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16,416	4	4,104	11,272	,000 <sup>a</sup>
	Residual	68,085	187	,364		
	Total	84,502	191			

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit

b. Dependent Variable: Log\_efficiency

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,552	,145		3,814	,000
	Dummy_Selection	,034	,196	,011	,174	,862
	Dummy_Loc_Sup	,354	,094	,262	3,753	,000
	Impact_on_profit	,130	,045	,216	2,886	,004
	Supply_risk	,068	,049	,102	1,390	,166

a. Dependent Variable: Log\_efficiency

Table A-6: Linear regression sub-question 2 SPSS output table

**Sub-question 3**

**Method of analysis**

Linear regression. Factor of effectiveness as dependent variable. Dummy\_supplier\_selection strategy, Kraljic matrix variables (supply risk and impact on profit) together with location are the independent variable.

**Most important assumptions based on Field (2005)**

- ✓ No perfect multi-collinearity; VIF values for both factors around 1 which is between 0,2 and 10
- ✓ Linearity and Homoscedasticity; randomly and evenly distributed scatter plot for both factors
- ✓ Normally distributed errors; both plot of standardized regression residuals are linear

**Result**

Again Dawson (2006) does not show presence of interaction effects, therefore the regression analysis is run for the factor measuring the effectiveness:

Model Summary <sup>b</sup>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,365 <sup>a</sup>	,133	,117	,94348949

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit

b. Dependent Variable: Fac\_effectiveness

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28,956	4	7,239	8,132	,000 <sup>a</sup>
	Residual	188,717	212	,890		

Total	217,672	216		
-------	---------	-----	--	--

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit  
 b. Dependent Variable: Fac\_effectiveness

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,002	,219		-,010	,992
	Dummy_Selection	,176	,281	,040	,625	,533
	Dummy_Loc_Sup	,183	,139	,089	1,318	,189
	Impact_on_profit	,275	,068	,295	4,056	,000
	Supply_risk	-,361	,073	-,352	-4,948	,000

a. Dependent Variable: Fac\_effectiveness

Table A-7: Linear regression sub-question 3 SPSS output table

### Sub-question 4

#### Method of analysis

Linear regression. Factor of satisfaction as dependent variable. Dummy\_supplier\_selection strategy, Kraljic matrix variables (supply risk and impact on profit) together with location are the independent variable.

#### Most important assumptions based on Field (2005)

- ✓ No perfect multi-collinearity; VIF values around 1 which is between 0,2 and 10
- ✓ Linearity and Homoscedasticity; randomly and evenly distributed scatter plot for both factors
- ✓ Normally distributed errors; initial linear plots of standardized regression residuals.

#### Result

The following tables shows the output of the linear regression on the log of satisfaction variable executed in SPSS:

Model Summary <sup>b</sup>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,344 <sup>a</sup>	,118	,102	,95040562

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit

b. Dependent Variable: Fac\_satisfaction

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25,591	4	6,398	7,083	,000 <sup>a</sup>
	Residual	190,590	211	,903		
	Total	216,181	215			

a. Predictors: (Constant), Supply\_risk, Dummy\_Selection, Dummy\_Loc\_Sup, Impact\_on\_profit

b. Dependent Variable: Fac\_satisfaction

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,497	,220		2,260	,025
	Dummy_Selection	,164	,283	,038	,579	,563
	Dummy_Loc_Sup	-,290	,140	-,141	-2,067	,040
	Impact_on_profit	,159	,069	,171	2,313	,022
	Supply_risk	-,345	,074	-,338	-4,685	,000

a. Dependent Variable: Fac\_satisfaction

Table A-8: Linear regression sub-question 4 SPSS output table

### Sub-question 5

#### Method of analysis

Linear regression with Quality, Logistics, Technology and Costs as independent variable and “supplier exceeded expectations” as dependent variable. Factor analysis shows that two factors are underlying the supplier evaluation metrics, normally these factors are used in further analysis. But to be able to get more insight in the supplier evaluation in relation to general supplier evaluation, and so ranking the metrics, the specific items are used for analysis instead of the factors.

**Most important assumptions based on Field (2005)**

- ✓ No perfect multi-collinearity; VIF values for both factors around 1 which is between 0,2 and 10
- ✓ Linearity and Homoscedasticity; quite randomly and evenly distributed scatter plot for both factors
- ✓ Normally distributed errors; plot of standardized regression residuals are linear

**Results**

The following tables shows the output of the linear regression on “supplier exceeded expectations” variable executed in SPSS:

Model Summary <sup>b</sup>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,434 <sup>a</sup>	,188	,173	,741

a. Predictors: (Constant), Costs, Technology, Logistics, Quality  
 b. Dependent Variable: Supplier\_exceeded\_expectations

ANOVA <sup>b</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27,136	4	6,784	12,341	,000 <sup>a</sup>
	Residual	117,084	213	,550		
	Total	144,220	217			

a. Predictors: (Constant), Costs, Technology, Logistics, Quality  
 b. Dependent Variable: Supplier\_exceeded\_expectations

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,237	,366		3,378	,001
	Quality	,197	,102	,152	1,932	,055
	Logistics	,236	,077	,227	3,077	,002
	Technology	,042	,073	,042	,579	,563
	Costs	,164	,068	,160	2,429	,016

a. Dependent Variable: Supplier\_exceeded\_expectations

Table A-9: Linear regression sub-question 5 SPSS output table

**Sub-question 6**

*What is the relation of the place in the portfolio and the geographical region of the supplier?*

Proposition 6.1: Leverage items (high impact on profit, low supply risk) are sourcing in large sourcing regions like Asia, India and rest of the world.

**Method of analysis**

Statistic descriptive of place on Krajić matrix together with region location of this supplier. The place on the matrix is measured using impact on profit and supply risk on a 5-point scale.



As there are different samples (with different means, variances and sample sizes) the standard t-test cannot be executed since this is assuming that both samples have the same variance. Dealing with this problem, called Behrens-Fisher<sup>32</sup>, the unpaired Welch t-test is executed:

$$t = \frac{X_1 - X_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}, \text{ Welch unpaired t-test}$$

### Assumptions

- ✓ Sample for sub groups  $N > 2$  (for Welch unpaired t-test)

### Results

The table below shows the descriptive statistics of the geographical location and the two Kraljic variables. The Welch unpaired t-test compares the means and standard deviation together with sample sizes of all regions and compares these with the Netherlands.

Impact on profit											
Location supplier	1	2	3	4	5	N	Mean	Std. Dev	Welch unpaired t-test		
	#	#	#	#	#	Statistic	Statistic	Statistic	T-value	Two-tailed P	Significant?
Netherlands	21	22	53	40	0	136	2,83	1,026			
Western/Northern Europe	2	2	8	19	7	38	3,71	1,011	4,728	<0,0001	Extremely
Eastern/Central Europe	0	1	2	4	0	7	3,43	,787	1,934	0,0943	Not quite
Northern America	1	4	3	2	3	13	3,15	1,345	0,835	0,4188	No
Southern America	0	0	0	1	0	1	4,00		N not greater than 2		
Asia	0	6	4	9	2	21	3,36	1,002	2,249	,03320	Yes
India	0	1	0	1	0	2	3,00	1,414	0,169	0,8932	No
Rest of World	0	0	1	0	0	1	3,00		N not greater than 2		
Supply risk											
Location supplier	1	2	3	4	5	N	Mean	Std. Dev	Welch unpaired t-test		
	#	#	#	#	#	Statistic	Statistic	Statistic	T-value	Two-tailed P	Significant?
Netherlands	27	44	50	14	1	136	2,40	,945			
Western/Northern Europe	5	10	10	10	3	38	2,89	1,181	2,356	0,0225	Yes
Eastern/Central Europe	0	2	3	2	0	7	3,00	,816	1,882	0,1089	Not quite
Northern America	3	5	5	0	0	13	2,15	,801	1,057	0,3072	No
Southern America	0	0	1	0	0	1	3,00		N not greater than 2		
Asia	0	5	13	3	0	21	2,90	,625	3,152	0,0033	Very
India	0	0	0	2	0	2	4,00	,000	19,745	0,0001	Very
Rest of World	0	0	0	1	0	1	4,00		N not greater than 2		

Table A-10: Descriptive statistics and Welch test sub-question 6

<sup>32</sup> The problem of calculating the probability of drawing two random samples whose means differ by some specified value (which may be zero) from normal populations, when one knows the difference of the means of these populations but not the ratio of their variances.