CEVA on its way to Purchasing Excellence

The implementation of a Vendor Rating Model

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PREFACE

This thesis is performed for the Technical University Delft for the Msc. Transport, Infrastructure & Logistics. This Msc. Thesis presents work of research in the field of transport, logistics and decision making. The subject is Transport Management and the Msc. Thesis is carried out at CEVA Logistics for the client KPN.

First of all I would like to thank a few people that supported me in various ways. I want to start with my family, who have always supported me over the years. In good times and bad times they were there for me.

Next I would like to thank my Commission members. I would like to thank Hans van Ham for qualitative input in our discussions and his patience. Next, Hans Veeke for sharing his view on large organizations and in particular for his mental support, which I valued high. Last but not least, I would like to thank Lori Tavasszy for his knowledge on the subject and his good suggestions during our formal meetings.

Special thanks go to Roy van der Pijl, who became my supervisor at CEVA Logistics after a few months. Together we tackled many problems and continued working around Christmas. I would like to thank Willy Hopman for the opportunity to perform my master thesis at CEVA and helping me to get started. Then, Jos Breedveld for believing in me and giving me various opportunities to excel.

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SUMMARY

This Msc. Thesis evaluated the selection process of distribution carriers in the Netherlands, for the Technical University of Delft. The research was performed at CEVA Logistics The Hague. CEVA Logistics is a worldwide logistic service provide active in the field of contract logistics and freight management. In The Hague a dedicated CEVA site is located for the client KPN.

The scope of the Msc. Thesis is on the outbound logistics and are focused on consumer distribution of telecom products for the client KPN. As KPN has outsourced its logistical activities to CEVA Logistics, CEVA in turn has outsourced the consumer distribution to various carriers. These carriers have to be selected and monitored. The main research question of this Msc. Thesis is:

How should the selection process of distribution carriers of CEVA Logistics be designed?

First of all it was investigated what the current situation is and how distribution carriers are currently selected at CEVA (Part I). Next, possible improvements were researched from various literature and practice sources (Part II). Then, the results and lessons learned form Part I and II were compared and used in the final part of this Msc. Thesis: Design (Part III). Ideas of improvements to the current selection process were transformed in solutions that could be implemented by CEVA to improve this selection process.

Introduction
As this Msc. Thesis is performed at a company active in the field of contract logistics, this has a major impact on the results. As a third party logistics provider CEVA takes care of the logistical activities for its clients, in this case the Dutch telecom company KPN. CEVA core activity in The Hague is the warehousing part of the supply chain. CEVA outsources in turn the consumer distribution to various distribution carriers. Therefore outsourcing and supply chain optimization reflect the context of this Msc. Thesis.

As the distribution carriers have to be sourced for the last part of the supply chain, this is a vital activity for CEVA. Sourcing is defined in this Msc. Thesis as:

Sourcing is the activity to identify, evaluate and choose between different alternative suppliers to satisfy the wishes of the final customer and thereby obtaining a competitive advantage

The most often used technique for the sourcing is tendering. Sourcing of complex services – like consumer distribution of telecom products – is a time consuming and complex activity. The result of a tender process is a choice made by the decision makers to select one or a few carriers. The aim of this Msc. Thesis is to improve the selection process at CEVA The Hague and increase the efficiency of this process.

Selection Criteria

The selection of a certain distribution carrier depends on many criteria. It can therefore be described as a multi criteria decision problem. In CEVA' sourcing methodology that it uses worldwide, it is not specified how selection criteria are to be derived. Therefore, technical literature was researched to find out which selection criteria are used in other cases. Next, two business cases and other sources from practice were consulted. This resulted in three criteria that are always valid in consumer distribution: Quality, Price and Process.

In most cases the selection criteria have to be defined according to the specific goal of the required process. Together with the client CEVA has to determine the valid criteria, define them and communicate them in a clear and consistent way to potential carriers for the required distribution service. The tender process in which this is done, should be designed in such a way that this is possible.

Selection Process

As CEVA is a large company communication is an important factor for the company. CEVA support its client KPN through – amongst others – the facilitation of selection processes. In selection processes the goal must be defined together with the client. Next, the required service from the potential distribution carriers must be designed. The main factor of a selection process is information sharing. Therefore four functions were defined that resulted from the research of this Msc. Thesis.

These following functions can be distinguished in a selection process:

- Information Giving: Set up structured Tender document
- Asking for Structured Information: Standardized format of Tender responses
- Analyzing: Scoring potential carriers based on responses
- Decision: Choose the preferred Carrier base on Analysis

In practice it became clear that the first function (Information Giving) is best done in a presentation format, like Microsoft Powerpoint. Information should be structured and clear from the point of the potential distribution carriers. For the other three functions a Vendor Rating Model was designed.

Vendor Rating Model

The multi criteria problem of the selection of distribution carriers was in the former process at CEVA not handled efficiently. Double work was done, as information was structured twice. Previously the carriers were left free in the format the could use to respond to the tender and present themselves. As a solution, a Vendor Rating Model was designed in Microsoft Excel for the three remaining functions.

Asking information (second Function) in a structured way and obligate potential carriers to provide their information in a specified structured format, will reduce the time required for analyzing the responses. Analyzing can then be done in the same format as the model calculates the preferred carriers after scores and weights are put in by CEVA and the client.

These scores represent how well carriers will perform (ex ante) and the weights represent the relative importance of the selection criteria. This way the Vendor Rating Model compares the potential distribution carriers and ranks them. Then the final Function is fulfilled as decision makers now have insight in the result from the analyzing phase of the selection process.

Conclusion and Recommendation

It can be concluded that the developed Vendor Rating Model can help to make the selection process more efficient. It makes sure that double work is eliminated as much as possible, by structuring information. Ideally a Vendor Rating Model answers to the following properties:

Property	Max. or Min.
Completion Time	Minimized
Confidence in Decision	Maximized
Ease of use	Maximized
Transparency	Maximized
Adaptability	Maximized
Objectivity	Maximized
Level of Detail	Min./Maximized

The developed Vendor Rating Model is a decision support tool that is built upon the Analytical Hierarchy Process, first developed by Saaty. This technique constructs a hierarchy and so adds structure to the selection problem. The model is in particular transparent, easy to use and adapt. Because of these properties the completion time of the selection process can be minimized and the confidence of decision makers in the final outcome will be maximized.

The main recommendation is to add structure to the selection process, so that the process is done efficiently. High commitment from all stakeholders involved is vital for a qualitatively good selection process. A good way to do this is by implanting a Vendor Rating Model. Implementing the recommendations of Msc. Thesis will bring CEVA closer to Purchasing Excellence.

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CHAPTER 1. INTRODUCTION

In this chapter the subject of the selection of distribution carriers are introduced. The problem is descripted and the context and external factors that influence the selection process. The scope of this Msc. Thesis is explained and research question are formulated in paragraph 1.4. A reading guide is presented in paragraph 1.5. After the introduction the involved companies are introduced in the next Chapter.

1.1 CONTEXT

This Msc. Thesis focuses on distribution of telecom products. Telecom is a dynamic volatile market as new technology enters the market rapidly. The focus is on distribution to consumers (B2C) as this is the largest share in most cases and delivery can take place in the evening or weekend. Some companies outsource their logistical activities including transport as this is not their core business.

Outsourcing

As a logistics service provider, CEVA takes care of the logistical activities of many middle and large companies. One of these companies is KPN, active in the market for Fast Moving Consumer Goods (FMCG) and more specific mobile and fixed telecom services. CEVA in turn outsources the distribution to the (final) consumer. For outsourcing there can be many reasons. Outsourcing can have the following advantages according to Quinn and Hilmer (1995):

- Maximum Return On Investment for internal resources
- Introducing barriers for competitors
- Maximal use of investments from external suppliers
- Increasing flexibility
- Reducing and spreading risks

Which of the above mentioned reasons for outsourcing are applicable, differs from company and sector. In the telecom market, mainly increasing flexibility, quality improvements, reducing and spreading risks and external expertise are most important (Quinn and Hilmer, 1995).

A possible disadvantage of outsourcing is the lack of control for the outsourcing entity: the customer (Emmett and Crocker, 2009). To counter this disadvantage costs accounting is often based upon an 'open book policy' (DHL, 2012), as is the case for the relationship KPN – CEVA. Outsourcing is a crucial element in contract logistics and determines for a substantial part the context of this thesis.

CEVA Logistics operates as a logistic service provider and is active in warehousing and physical distribution. The logistics services provided by CEVA are governed by a contract between the client (in this case KPN) and CEVA. "Contract logistics is completely different

from a transaction-based business relationship that can be discontinued at any time" (DHL, 2012). A strategic partnership is formed and governed by a medium to long term contract (1 to 5 years), in which the client KPN outsources their logistical activities to CEVA.

Supply chain management
According to the Whitepaper 'The Outsourcing Enterprise – The CEO guide to selecting effective supplier' from Willcocks in 2007, cooperation in the logistic value chain is vital: "Those providers who demonstrate they can work well with other providers will gain a competitive advantage over those that cannot" (Willcocks et al., 2007). Part of the management of KPN and CEVA acknowledges this importance and aims to develop relations with other parties in the logistic value chain as we will see later.

Sourcing or purchasing is a vital activity for logistics companies. According to Wynstra one of the earliest definitions (1972) on 'purchasing and supply management' is from Webster and Wind : "The decision-making process by which formal organisations establish the need for purchased products and services and identify, evaluate and choose among alternative brands and suppliers" (Wynstra, 2006). Wynstra and Axelsson formulate their definition as "managing the external resources of the firm, aimed at acquiring inputs, at the most favourable conditions" (Wynstra, 2006).

For consumer distribution a combination of the previous definitions is preferred. Distribution can be described as a specific service that delivers the products to the final customers. Therefore the definition in this Msc. Thesis is defined as:

Sourcing is the activity to identify, evaluate and choose between different alternative suppliers to satisfy the wishes of the final customer and thereby obtaining a competitive advantage

As can be seen the wishes of the final customer are added to highlight its importance. The telecom market is highly competitive and a high speed to market is required. Being able to provide new – innovative – distribution services earlier than competitors can help to increase market share for companies in the telecom market.

Decision making
In this Msc. Thesis the aim is to improve the sourcing process at CEVA Logistics for its client KPN. The focus is on the selection of carriers. An often used technique for sourcing is tendering: "Tendering is generally the most common and effective strategy to select suppliers. Joint decisions involving the CEO, business executives and IT are the most effective" (Willcocks et al., 2007). In this thesis it will be researched whether it is an efficient technique for CEVA and how this should be used.

Comparing carriers in a tender process can be a difficult, subjective and an elaborate task. Carrier selection depends on many different criteria. This report presents a model to compare suppliers both qualitatively and quantitatively, focusing on complex sourcing decisions, to aid managers in making decisions. Suppliers each have their own capabilities

and competences, and there is usually not one carrier that outperforms all other on all aspects (Brans and Mareschal, 1994 – 2005).

Definitions and relations

Client	**KPN**
Shipper	**CEVA**
Carrier	**Supplier of Distribution services like Post NL**
Consumer/ Customer	**End/final consumer: the client' customers**

1.2 SCOPE

In this graduation project the selection process will be evaluated that is used by CEVA Logistics to source their distribution carriers. The requirements and wishes from the final customers of the client KPN are researched and used to improve this selection process. Market opportunities for both new and existing technologies and improvements will be evaluated and the performance of carriers will be analyzed and evaluated.

The scope of this thesis is on the outbound distribution for the client KPN in the Netherlands. The products and services of KPN are telecommunication, internet and television. For the delivery of the products CEVA uses distribution carriers and the delivery sometimes requires value added services (VAS). The delivery process should be designed to answer to the wishes of the final customer (end consumer). The internal activities of CEVA are out of the scope of this thesis and comprise inbound logistics, storage, VAL like kitting and expedition and outbound logistics to retailers by DDN (see the next chapter).

The scope of this master thesis is on achieving better performance from distribution carriers through sourcing. The focus of this research in on the strategic sourcing of new carriers. This usually involves complex selection problems for the mid to long term (1 to 5 years). Other means to improve performance are cooperating more with the current carrier or negotiate higher standards. A sourcing process – including new potential carriers – can be the highest pressure means and achieve a major step in the level of performance.

Sourcing of complex problems is often done through tendering (Willcocks et al, 2007). Alternatives methodologies exist mainly for more simple problems and involve direct negotiation and comparing bids/proposals; or buying existing – no tailor-made – services. It is suggested that comparing proposals is done in a Vendor Rating Model that is based on a multi criteria decision methodology. A Vendor Rating Model is an often used technique in logistics and supports the decision making process.

Different products – with different characteristics – require the services of different carriers. New technologies and developments make the distribution market dynamic and

complex. Consumers demand more and different services. In this thesis the current situation of how carriers are selected will be evaluated and recommendations of how this can be improved will be discussed.

1.3 PROBLEM DESCRIPTION

Many companies look at sourcing as a major cost item. CEVA Logistics is struggling with issue. Although the strategic importance is understood, trouble is had in finding enough resources to achieve maximum benefits. Responsible managers often don't have enough time to research and evaluate market opportunities for distribution fully. The procurement department is not primarily focused on transport and distribution. Based on experiences at CEVA Logistics the sourcing problem is researched.

CEVA can deliver additional value for KPN by efficient transport management. Improved performance by carriers needs to be realized by negotiating higher performance standards, improved efforts, new contracts and perhaps new services. The process how this should be achieved is not always clear and should be optimized.

The selection process of distribution carriers requires a lot of resources and time. The process should therefore be designed as efficient as possible. In principle the selection process itself is a cost item, although a lot of valuable knowledge is usually gained. Information on market conditions and on the required process should be acquired, and relationships build with potential carriers. Consensus must be reached by decision makers on many dimensions and criteria. Whether this process can be improved by choosing a standardized or structured approach is researched.

KPN operates in a very volatile market, and is constantly looking for new services, improvements and innovation. New technologies enter the market constantly. In the case of CEVA additional services have to be negotiated with the existing and perhaps new carriers. How and when carriers should be selected and what selection criteria to use is researched in this thesis.

1.4 RESEARCH QUESTIONS

The research question of this thesis is formulated as follows:

How should the selection process of distribution carriers of CEVA Logistics be designed?

To answer the main research question, this Msc. Thesis is divided into three parts: 1) Current situation, 2) Research, 3) Design and implementation. Each chapter has its own sub research question, apart from the first two introductory chapters:

Current situation: Selection Process (Chapter 3)

1. *How is the selection process of distribution carriers designed at CEVA Logistics?*

Research: Selection Criteria and Process (Chapter 4 - 5)

2. *Which criteria are applicable for supplier selection and how can they be derived?*
3. *Which improvements and additions to the selection process at CEVA can be found in literature?*

Design and implementation: Vendor Rating Model (Chapter 6 – 8)

4. *Should a Vendor Rating Model be implemented in the selection process at CEVA and if yes, how?*
5. *How can the Vendor Rating Model be verified and validated?*
6. *How should a Vendor Rating Model be implemented in the selection process at CEVA?*

1.5 READING GUIDE

This Msc. Thesis starts off with two introductory chapters. In the second chapter the context of this Msc. Thesis is elaborated on, describing the relations between the companies involved and the type of products and services. Then, Part I of this Msc. Thesis explains the current situation how distribution carriers are selected at CEVA Logistics in chapter 3. The second part consists of two chapters and researches possible improvements and additions to the current situation at CEVA. Chapter 4 researches which selection criteria are to be found in technical literature, practice and other sources. Chapter 5 focusses the selection process. The possible improvements are compared to the current situation.

In Part III the lessons learned from the earlier chapters are taken further in the design of an improved selection process for distribution carriers. A Vendor Rating Model that is able to support decision makers is set up in chapter 6. In chapter 7 the model is verified and validated and in chapter 8 advise is given how this model and other improvements can be implemented. Chapter 9 is used for discussion of the various improvements. The Msc. Thesis is concluded in chapter 10 and recommendations are given. The final chapter is used for reflection.

CHAPTER 2. COMPANY PROFILE AND RELATIONS

This Msc. Thesis is performed at CEVA Logistics, a worldwide logistics service provider in the field of contract logistics. A dedicated site for the client KPN is located in The Hague. KPN has outsourced their logistical activities to CEVA Logistics and CEVA in turn has outsourced their transport activities for the main part.

According to a report from TLN most logistic service providers are active in the field of contract logistics in the market for physical distribution (TLN, 2011). CEVA focuses on warehousing and value adding activities and freight management. The physical distribution to the final customer is outsourced; however, transport and inbound and outbound flows of the warehouses are managed by CEVA.

The report mentions that the market for contract logistics grew 19% from 2006 to 2008 and still shows perspective. This market is the most innovative of all researched markets. The main reason for this is that companies in this market see that innovation is crucial in the capital intensive market. Next, companies seek more cooperation with competitors (Dutch: *concullega's*). Attention for lean as a tool to decrease operational costs is still increasing, which can be seen as an opportunity for companies to perform value added logistics (VAL) and value added services (VAS) activities. Furthermore, sustainability will become more and more important in tender processes (TLN, 2011).

2.1 TRANSPORT SERVICES

Transport management services are performed for the products of KPN. The outsourced services by CEVA include collection, sorting and distribution of packages. The transport services that are described in this thesis include the last mile of distribution to the final customer. The supply chain of KPN for which CEVA is the logistics service provider is shown in the figure below. The services of the carriers start at collection, after CEVA has picked and packed the orders and the shipments are ready for distribution.

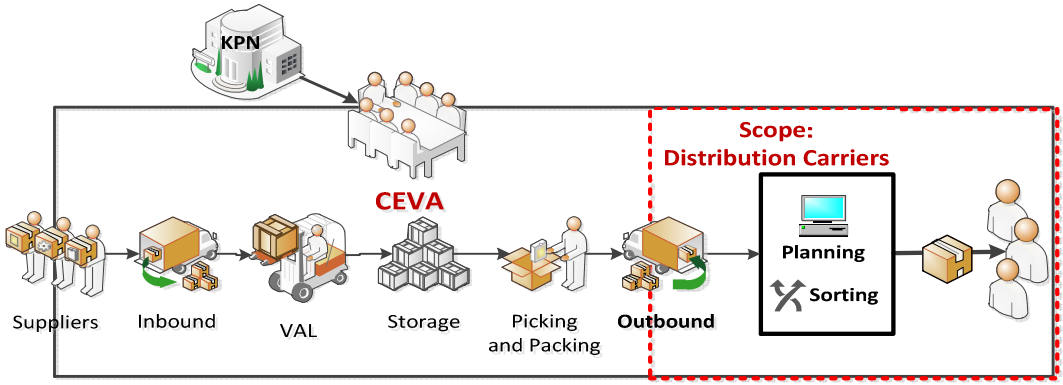


Figure 1 Simplified Supply Chain of KPN

For consumer distribution there is a tendency for later cut-off times and pickups of packages are performed in the evening. The consumer should be able to choose when and in which *small* time window delivery takes place. Studies from ING: Fysieke distributie en e-commerce (June 2011) and DeliveryMatch: Webwinkellogistiek, Onderzoek 2011 (2012), Kassa (2011) and Thuiswinkel Markt Monitor (2011) have therefore been studied.

2.2 CEVA LOGISTICS

CEVA Logistics is a large logistics company active in more than 170 countries, employing more than 49,000 personnel. The company was born in 2007 as a result of the merger between TNT Logistics and EGL Eagle Global Logistics. "CEVA Logistics is one of the world's leading logistics companies providing end-to-end design, implementation and operational capabilities in freight forwarding, contract logistics, transportation management and distribution management." (CEVA Logistics, 2011) The revenue over 2010 totaled 6.8 billion Euros worldwide.

Prime values of CEVA Logistics are: Sustainable development, Globalization, Keeping promises, and Saving money. CEVA Logistics is using lean, smart and kaizen techniques. To evaluate Carbon footprint, CarbonView from Quintess is used.

In essence CEVA Logistics is a non-asset based company. Warehouses are often leased in the name of the clients for whom activities are performed and inbound and outbound logistics (distribution) is done by independent carriers. The only exception is the Dutch Distribution Network (DDN) which operates 35 trucks.

2.3 SITE THE HAGUE

CEVA Logistics the Hague is a dedicated site for the logistic activities of KPN. It is here that CEVA Logistics performs inbound, storage, VAL and outbound activities for KPN. Retail delivery is done by DDN, whereas customer delivery is done by subcontracted carriers, like Post NL and Selektvracht. Currently the site is completely renovated (including warehouse design) as a result of the new contract between CEVA Logistics and KPN. Furthermore, CEVA will set up a Best In Class (BIC) operation with KPN in which developments in sustainability, efficiency and technology will be used. Formerly KPN used pallets of 1,00 x 0,80 m, whereas from June 2012 onwards Euro Pallets (1,20 x 1,00 m) will be used (Hartman, 2011).

The site comprises almost 40.000 m2 of which 22.000 m2 are for warehousing activities. The annual revenue was €6.9 billion (2011). In the new situation there will be 12 docks for trucks to load and unload. The site uses green energy, has established a decrease of 14 % in gas usage in the last year and a windmill will be built on the site. The aim is to reduce 20% CO2 emission at a minimum in 2012 as compared to 2007 (Hartman, 2011).

2.4 KPN

KPN is a well-known supplier of telecom and ICT services in Holland. For consumers KPN provides fixed and mobile telephony, internet and television. Business customers have

access to complete telecom and ICT solutions. Getronics was acquired in 2007 and is market leader in the Benelux in the field of infrastructure and network related IT solutions.

As of 31 December 2009 KPN serviced over 41,2 million customers, of which 33,4 million are mobile, 4,7 million fixed and 2,5 million internet and 1 million television connections. KPN employs 33.148 FTE (whole group, Getronics included) in the Netherlands. In 2009 the turnover was 13,5 billion Euros and EBITDA of 5,2 billion Euros (KPN, 2011).

2.5 Distribution Carriers

When outsourcing the logistics to CEVA Logistics, KPN made CEVA responsible for the distribution of products. CEVA will therefore be judged on the performance delivered by the distribution carriers. Selecting the right distribution carriers and improving performance is therefore of vital importance to CEVA.

2.6 Product flows

The main products that are handled by CEVA Logistics for KPN are meant for telephony, television and internet. The most important products that are handled are mobile phones, modems, receivers, and installation boxes (for internet, television and telephony). The products are both delivered to customers (B2C) and businesses (B2B).

PART I SELECTION PROCESS CURRENT SITUATION

In the first part the Selection Process is evaluated as it is currently practiced at CEVA. CEVA' methodology is discussed and two business cases are evaluated. These sources are used for analysis and lacunas are formulated which can be researched in later parts.

CHAPTER 3. SELECTION PROCESS IN PRACTICE

The selection process of distribution carriers is being evaluated in this Msc. Thesis. In this chapter the selection process used by CEVA Logistics is explained. First of all, the selection process as applicable for all sites of CEVA in the world is discussed. In paragraph 3.2 and 3.3 two business cases on selecting carriers that were performed for the client KPN will be analyzed. In paragraph 3.4 the lessons learnt from practice are discussed. Sub question 1 is then answered:

How is the selection process of distribution carriers designed at CEVA Logistics?

3.1 THE FIVE STEP SOURCING METHODOLOGY

First of all CEVA uses a standardized procedure for selecting carriers that is called: The five Step Sourcing Methodology. The aim of the methodology is: "Consolidating our standardized methodology to enhance process efficiency whilst continuing to achieve savings maximization and stakeholder satisfaction" (CEVA, 2011). CEVA aims to fulfill the needs of its customers by continuous improvement with (amongst other) the sourcing methodology.

3.1.1 DESCRIPTION OF THE METHODOLOGY

The selection of carriers is handled by CEVA on a strategic level. Distribution carriers are usually selected for a contract period of one to three years. Similar types of orders are often combined to achieve volume bonuses and this also happens on national/international level. The methodology is used in principle by all CEVA sites in the world. The steps are shown in figure 2.

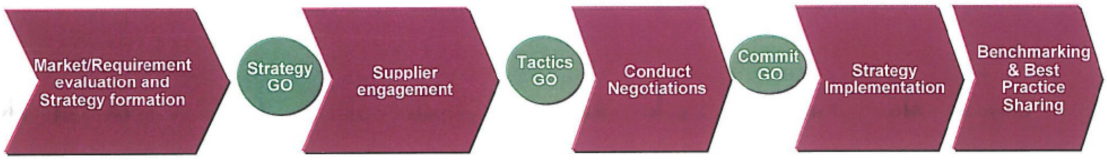


Figure 2 CEVA' five Step Sourcing Methodology

For confidentiality, the methodology will only be described on a high aggregation level and for instance deliverables within the steps will not be discussed.

The selection process of carriers starts with a market evaluation on what is available. Strategy is formulated how market opportunities can satisfy the need of CEVA' client, in this case KPN. Next, potential suppliers are engaged and information is gathered. Tactics are then formulated and negotiations to achieve the 'best' price are held. In case the negotiations have led to satisfaction the desired distribution process is implemented in cooperation with the carrier. During the operation of the contract by the carrier, monitoring and benchmarking takes place, for instance through Carrier Assessment Reviews.

Step 1: Information
In this first step market information is gathered on various subjects. For instance possible carriers, new techniques and an indication for prices are researched. This can be done through a formal RFI (Request For Information), but also informal via various other techniques, like publicly available information. Next, the desired process for some specific products is described and this is compared to market opportunities.

As the desired process is clear, selection criteria should be determined. Possible carriers from market research can be compared on these criteria and a list of qualified carriers is made. This can be compared with making a long list. Next, the necessary strategy is formulated and an RFP (Request For Proposal) is developed.

Step 2: Engagement
As it is decided what strategy to follow, a tender (RFP/RFQ) should be set up and send to the carriers on the long list. At this step new information can be used to improve the selection criteria and/or their definitions. The subscriptions of the tender will next be analyzed and the carriers are short listed. Tactics and strategy for negotiations with the carriers can then be formulated.

Step 3: Negotiations
During the third step the desired services from the carriers is negotiated. Objectives should be satisfied at the right price. If the desired result is obtained, the next step can be entered.

Step 4: Implementation
Here the preferred carrier is chosen and notified. An implementation plan will be set up in cooperation with the carrier – and in case necessary with the client KPN – so that the whole supply chain is involved. During this step a contract will be written and signed in which all necessary aspects that are negotiated are laid out. In these contracts that are usually active for one to three years measuring performance and benchmarking are not uncommon. Service levels that were agreed during negotiation and the way of measuring are registered.

Step 5: Benchmarking
During the final stage the carrier' performance is measured on service levels (SLA) and key performance indicators (KPI). Furthermore, the carrier is checked whether they operate according to the agreements. The actual operation after implementation is out of scope of this Msc. Thesis. CEVA further aims that stakeholders involved share their experience obtained during this process, so that for instance other sites can benefit as well.

3.1.2 STAKEHOLDERS
During the whole process the right stakeholders should be involved. During the first stages involvement from the client, in our case KPN, is vital. Next, CEVA does not allow individual sites to make complex decisions in the selection process. Hence, the Procurement department is aligned during the whole process. Advantages of this setup, is first of all the additional experience and negotiating skills of this department. Next, the process can be

structured and overseen. Third, the total cost of ownership (TCO) is leading in strategic decisions.

TCO is for any procurement department considered (most) important (Rijswijk, 2011). Due to the structure of Contract Logistics and multiple sites, TCO is very important for CEVA. It is possible that the different sites of CEVA might be able to negotiate a lower price on a service from carrier A than carrier B. In case carrier B operates, however, for other sites of CEVA as well, the total price that CEVA pays for the services can go down. This happens as total volume increases, it leads to discounts and a lower price per shipment. CEVA will then prefer to buy the service from carrier B, and this is controlled through the total cost of ownership.

To make the process even more complicated – in line with the structure of CEVA with its dedicated sites for Contract Logistics – the size of CEVA is valuable. Consolidating the amount of shipments from different dedicated clients leads to additional volume discounts. This is why CEVA has so called 'preferred suppliers'. National or international agreements are applicable that provide even larger discounts on distribution prices. A complicating factor is that there is more than one 'preferred supplier', since CEVA does not want to be too dependent on one supplier.

The essential stakeholders involved in the most common tender projects at CEVA are:

- Responsible Contract Manager (representing client)
- Site Manager
- Procurement (in our case Benelux)
- Client KPN
- IT (role depends on the scope of the project)
- Legal (In particular in step 4: Contracting)

The role of the client is determined by the level of outsourcing. When it comes to sourcing, the client KPN wants to be in control to make sure that the wishes of the final customer are satisfied. The final decision is made by KPN in cooperation with CEVA.

3.1.3 Limitations CEVA' Methodology

The methodology seems to encompass the whole spectrum of sourcing. However, there are some limitations. First of all in Step 1 the methodology mentions that Criteria should be established. How this should be done is not explained. This Msc. thesis therefore aims to fill this gap.

Another obstacle is that in the first step there is no explicit formulation of the goal or objective. The future process should be mapped and a strategy should be formulated. Strategies, a long list and perhaps the required service will look different when the goal is for instance to reduce costs compared to the current situation, or when the highest possible quality should be sourced from the market. The goal/objective should be agreed with the client which might be complicated and takes time.

In the next two paragraphs two business cases will be discussed, how the sourcing process is carried out in practice at CEVA. Further obstacles might come to light and improvements are researched in Part II of this Msc. Thesis.

3.2 Business case Delivery Plus

In this paragraph a business case is discussed to explain the process of carrier selection at CEVA Logistics in practice. Carrier selection can be done in different ways. In this business case a RFQ tender was used to select the right distribution carrier because of the complexity and innovativeness of the required process. First of all, the product 'Delivery Plus' will be introduced to give the reader more feeling about the subject.

Delivery Plus – main characteristics

- Mostly mobile phones with an accompanying contract
- Highly innovative: Contract in digital format
- Focus on consumer market
- Small packages which don't fit standard mail boxes
- Highly innovative: Delivery time window of 2 hours at order intake
- Address of choice customer
- Online real time track & trace information
- Value Added Services: Identification and credit checks at delivery
- Digital autograph

As can be seen in the characteristics described above, the required service is not a standard delivery service where packages are transferred from A to B. In the case of Delivery Plus the consumer must identify him-/herself and sign at delivery. The products (mobile phones) are most of the time in stock and have to be delivered within a few days. The second stated characteristic has the highest impact on the required service as this is the drive of the client KPN to start this process.

3.2.1 Delivery Plus – Introduction

Delivery Plus is a relatively new product stream that involves high value products: for the greater part mobile telephones, sim-cards, 'dongels' (internet modems for laptops) and accompanying contracts. Delivery Plus was first developed for the consumer market (B2C) and later for the business market (B2B, small percentage). Due to the high innovative character of the technology for the distribution of Delivery Plus, the possible suppliers are mainly niche players in distribution as was revealed by market research. The most important characteristics of niche players are their domain knowledge and the fact that "suppliers have more vested interest in the relationship, because they cannot absorb or afford failures" according to (Willcocks et al, 2007).

Time windows
The customer will be able to plan the delivery of his/her order in a time window of only 2 hours, which can be seen as a major innovation. Apart from special courier deliveries, for which the consumer pays a lot of additional money, this is a state of the art delivery service. Orders are accompanied by a contract that is signed by the consumer at delivery. For this service the identity of the customer is checked and the bank account of the customer is verified. This is done to make sure that possible fraud with telecom contracts is minimized and there is a higher chance that KPN will receive its money that the customer is obliged to pay during his/her contract period.

Fraud prevention
Since the products are accompanied by a contract, these checks have to be performed. In case a part of the contract is not filled in correctly, the contract is often not juridical valid. As a result the conversion – a measure for the performance of delivery (see Appendix 1) is heavily influenced by these checks that take place at the doorstep of the customer. KPN has set rules in which cases it is allowed that a part of the contract information can be adjusted at the doorstep of the customers. For instance, when only some of the initials are incorrect, the contract is adjusted manually and the product can still be delivered. Because of possible mistakes in contract information, the conversion is lower than the distribution of other deliveries without contracts.

Conversion
CEVA strives to continuously improve its service and quality for KPN. In case of the distribution the main factor is conversion. This is the amount of successful deliveries divided by the total amount of delivery attempts as explained in Appendix I. New technologies are developed to increase conversion. KPN has become aware of these promising technologies which they would like to use for their own distribution process.

A visualization of the goal and the criteria of the business case Delivery Plus is shown in appendix V.

Technology
Technology is a crucial element in this RFQ process and stresses the innovative character. To identify a customer and his/her bank account various techniques are needed. These technologies make the distribution process more complicated than general delivery of a package, since additional services are needed. These added services take place at the doorstep of the customer. To be able to do this, the driver that delivers the package will need access to specific technology.

First of all the accompanying contract is digitalized. The driver that delivers the package needs to have the customer information digitally so that errors can be corrected at the doorstep of the customer. To do this the driver needs a tablet pc with internet connection. Checking and validating customer information has to be done in a short period of time, since

the customer will not be willing to wait and the driver has to do more than a few deliveries in his route.

Modern ID documents have a RFID chip, which can be read by certain hardware. This way the information provided by the customer can be compared to the actual information in his/her ID document. Other ID documents can be read using for instance a flatbed scanner that is capable of handling OCR (Optical Character Recognition) that is placed on a special Machine Readable Zone on many travel documents. The result of the read is compared to the information that was provided by the customer when he placed his order. In case an error is found – for instance the customer forgot to provide some of his initials, or the customer would like to identify himself with a different type of ID document – this can now be adjusted by the hardware and the delivery process can still be continued.

The next step in the delivery process is to check whether the provided bank account number by the customer is correct and valid so that fraud is prevented. Either a connection is made with the bank of the customer by letting the customer make a pin-transaction of €0.01 or by connection to a commercial company that registers stolen and falsified bank accounts. For this a transportable pin-terminal is needed with an internet connection.

When the identification and validation of the bank account are completed the actual delivery can take place. The customer can check all contract information in which possible corrections are shown. In case all information is correct, the customer signs the contract digitally so that all documents can be bundled digitally. The customer receives his contract by email and a message is send to KPN, which will then activate the simcard of the customer.

Implications CEVA

In case a new carrier wins a tender this will impact CEVA. The scope of the projects is most of the time clear: the carrier should only perform distribution services. No temporary storage is placed at the carrier. However, CEVA employees will have to start working with new people from the new carrier. Some processes may have to be redesigned and tuned. Therefore supporting design requirements are added to tenders so that is done successfully.

Advantages

The most important advantages of the described process that is supported by the right technology are:

- Increase in conversion: The amount of successful deliveries compared to the attempts taken to reach the customer will increase
- Decrease in fraud: Drivers no longer carry activated simcards for which the activation had to be reversed which was a lengthy and expensive process

The increase in conversion is achieved by two important aspects of the process. First of all the customer is much more in control in the new situation. The customer can now plan the

moment of delivery in a time window of only 2 hours, instead of a morning, afternoon and evening delivery (4 hours). Next, errors in personal information – for instance forgetting to provide all initials – can now be corrected at the doorstep of the customer. These aspects together will increase the amount of successful delivery attempts by an estimated 8%, which in turn leads to cost reduction, lower emissions and less returns. Last but least, customer satisfaction will increase, because the chance increases that a first-time-right KPN order is delivered successfully.

3.2.2 Delivery Plus – Process

KPN had seen new technology in the market for the delivery of these products. CEVA was asked to research whether it was possible and beneficial to acquire this technology for the product stream Delivery Plus. The technology was based on tablets that enable the carriers to handle contracts digitally. The goal for CEVA therefore was to perform a market research which carriers were able to provide this new technology for KPN.

The first steps of CEVA' methodology were not taken in a structured way and the start of the process experienced quite some delay.The market research led to a long list of 7 carriers that might be able to perform the process so as KPN had in mind. Furthermore, information was acquired on possible technologies. The process received the title: "Innovatie bezorgproces pakketten met aanvullende services Nederland", which marked the goal of the process.

Table I Criteria long list Delivery Plus

Criteria	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Contract adjustments	++	++	++	--	++	--	++
Adjustment at doorstep	+	++	++	--	++	--	++
Time windows	2 h.	2 h.	4 h.	3 h.	2 h.	4 h.	4 h.
Credit checks	+	++	++	+	++	--	+
Implementation	++	++	++	-	+	--	-
Digital autograph	++	++	++	--	++	--	--
Biometrical autograph	--	++	--	--	++	--	--
Own network	-	-	-	-	-	++	++
Operational	+	++	++	+	--	+	+

As can be seen in table I, the carriers were scored on 9 criteria with information that was available at that time (end of September 2011). Most information was available from the current carrier, as present performance was known. For the other carriers information was gathered via their websites, telephone calls and technical news articles on telecommunication, e-commerce and distribution.

The results of the market research were presented to the responsible managers of KPN and it was agreed that four companies should be researched further. In other words, a *short list* was constructed, with carriers A, B, C and E. Within a week carrier E withdrew itself because they had just stopped the desired service for all their current clients. Three companies remained: the current carrier and two other companies. Meetings were set up with the remaining companies to see what possibilities existed and to start building a relationship.

The meetings that were held became more important than just getting to know each other. In meetings and visits the future process was discussed which resulted in valuable information for CEVA and KPN. In the meantime, the cluster manager of CEVA convinced KPN to send out a RFQ tender to the three companies. In one month time CEVA gained a lot of knowledge and it turned out that a formal RFI was therefore not required. Instead it was agreed with KPN to perform a RFQ which should be send out to the three potential carriers at the end of October 2011.

Due to many factors the RFQ was completed one month later. The most important factor for the delay was internal changes and lack of commitment. Communication and cooperation with other departments of CEVA was not sufficient, and agendas of stakeholders were filled.

Finally the RFQ document was send out on the 2nd of December and the three potential carriers were given two weeks to send in their application. A formal Q&A (Questions and Answers) possibility was not included, which resulted in a lot of time and effort that was required from CEVA. The carriers send mails and called multiple times asking for clarification and further information that could help with their responses.

After two weeks the applications of the carriers were analyzed by CEVA in a few days and just before Christmas the carriers were invited to explain and elaborate on their applications. These meetings required a lot of time but turned out to be very valuable since any uncertainties could be explained. Furthermore, the meetings could be seen as a first negotiating round. After the meeting the carriers were given the ability to update their proposal and CEVA finalized their analysis.

It was also during this process that a Vendor Rating Model was developed. A Vendor Rating Model is a graphical representation in which the different carriers are listed and scored on selection criteria.. This will further be explained in Chapter 6 (Part III - Design).

In the first week of 2012 CEVA achieved internal consensus on the scoring of the criteria and gave their final advice to KPN. The Vendor Rating Model was discussed in an elaborate

meeting with 3 responsible managers from KPN. CEVA defended their motivation of the scores and some adjustments were made to satisfy the wishes of KPN. The Vendor Rating Model proved to be a very helpful tool as an aid for discussion and credibility was achieved of the analysis of CEVA.

Timeline and delays

At the start of the process a timeline was set. Market research for possible carriers and techniques was done in September 2011. After that, the following timeline was formed:

31/10	Send out RFQ tender to potential carriers
15/11	Deadline responses of carriers.
31/11	Recommendation CEVA to KPN
15/12	Decide which carriers to negotiate
31/01/'12	Final decision KPN

In total the selection process was planned to take up 3 months up till implementation. Due to many circumstances the timeline was not achieved. The most important reasons for delays were the full agendas of CEVA and KPN management and consensus within KPN. Commitment and involvement was in particular in the beginning of the process not high. Finally, the following time as was actually run is shown:

02/12	Send out RFQ tender to potential carriers
16/12	Deadline responses of carriers.
22/12	Face to face motivation of carriers
26/12	Carriers send in their final responses
28/12	Recommendation CEVA to KPN
16/01/'12	Final decision KPN

As can be seen in the overview above, there was no time reserved for a formal Q&A session. Also, the carriers were given an opportunity to motivate and explain their responses. Including the setting up of the RFQ tender, the process took approximately 2 months (without market research).

Implementation

After KPN made their final decision a contract with the winning carrier was set up and implementation could start. This implementation is not the focus of this Thesis, but a few lessons were learned during the process. For instance two activities were planned, but not carried out explicitly: negotiation and detailing of the required process. Setting up a new contract – for a service that is new to CEVA – takes quite some time and the Legal department is added to the process.

Obstacles

The main obstacles that were encountered during the business case: Delivery Plus were:

- Lack of commitment from the client (at the beginning of the process)

- Criteria are dynamic over time
- Difficult communication with other CEVA departments
- Unclear what the roles and responsibility of the different departments was
- A formal Questions and Answers session was not held (resulted in additional work)
- Highly innovation services that were new to CEVA – KPN

How to tackle these obstacles is researched in the next Part of this Msc Thesis.

3.3 BUSINESS CASE SERVICE POINTS

Service points is a business case that was dealt with in the first months of 2012. KPN announced that they would like to give the final customer more control and options where he/she can receive or return his products. An introduction to service points is given in the first paragraph. In the second paragraph the accompanying process is analyzed.

Service points – main characteristics

- Alternative for home/ work address delivery
- Pick up, Drop off, or Swapping of products for consumers
- Possible as first choice of customer
- Customer able to choose which service point
- Two carriers almost qualitatively equivalent
- Often located in various retail businesses
- Track & Trace for improved customer experience

3.3.1 SERVICE POINTS – INTRODUCTION

In contrast to the previous business case, the Service point case involves 'broad suppliers' and not niche players. The carriers have plenty of capacity in the Netherlands and have a lot of market power. With 'broad suppliers' it is harder to contact top management compared to working with niche players and a more formal design of the process is more important, according to Willcocks et al. (2007).

Until 2011 it is common practice for home delivery services that when a customer is not at home and therefore not able to accept his delivery, the product is send to a service point of the carrier. The next day the customer is then requested to pick up his product at the service point that is closest to his home address.

KPN would like to improve customer satisfaction by giving the customer more choice alternatives. At a service point a customer can *pick up*, *drop off* or *swap* a product. A visualization of the goal and the criteria of the business case Service Points is shown in appendix VI. The processes will now be described.

Pick Up
Customers that use a service point to pick up products can be divided in mainly two categories. First, the customer can be a new customer and second an existing customer can receive new products in case the current products malfunction. Before an order can be picked up by the customer an appointment has to be made by the KPN call center or on the website of KPN. The customer will be notified when he/she can pick up his order and will have to show the correct identification at the moment of pick up.

Drop off
Dropping off an order at a service point is designed for when the customer has terminated the specific service of KPN. The customer does not need to make an appointment, but is free to drop of the remaining hardware at a service point. At the service point registration has to take place that the order is received and will be returned to KPN.

Swap
A relatively new service is swap. In case the customer has requested to receive new products, since their current hardware is malfunctioning for instance, the products can be swapped at a service point. Swap is in fact a combination of picking up and dropping off. For this service a KPN call agent makes an appointment with the customer so that CEVA can make sure that the new products are at the right place at the right time.

The above processes have to be possible at an address chosen by the customer (not necessarily his/her home address) and at a service point. For the services to be performed at a service point, a KPN call agent has to know the locations and opening hours of all possible service points. This way the customer can be provided with a high level of service so that he/she can choose the time and the place that suits him/her best.

Currently in 2011 the processes were mainly done at the doorstep of the customer. This resulted in lots of kilometers driven for KPN and so relatively high costs. Next, customers sometimes have to stay home during business hours for their products, which can lead to the customer not being home. Again, like the Delivery Plus case, the conversion is very important in this aspect. To facilitate these processes at a service point, additional information is needed on logistics, information, systems, and reporting. To acquire this information a program of requirements was set up and send out to two possible carriers.

Massen and van Woerden (2011) found in their research on logistics of e-commerce that 60% of Dutch consumers had experience with the collection of products at a service point from either Post NL, DHL, or Kiala. From these consumers 68% is satisfied with the provided service, which is the green part in figure 3 (Massen & van Woerden, 2011).

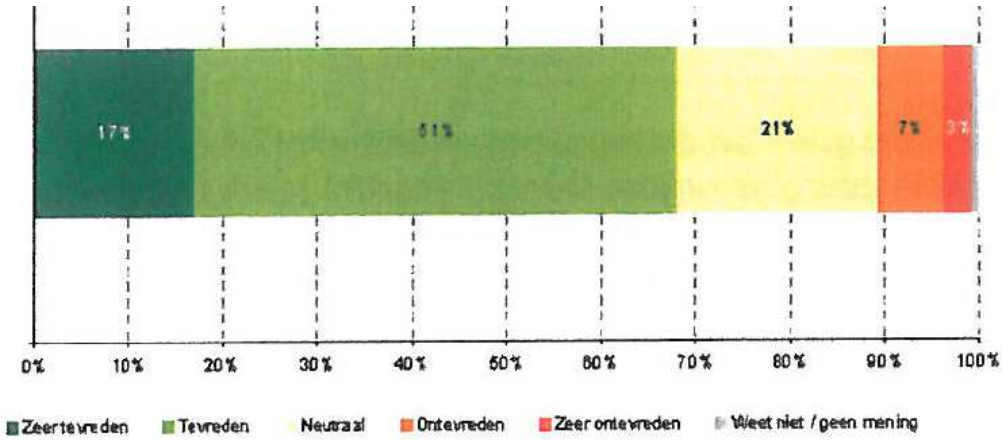


Figure 3 Satisfaction Service Points, taken from Massen & van Woerden (2011)

Advantages

The goal to achieve with this business case is first of all to improve customer satisfaction by giving the customer more choices. For the customer the main advantages are:

- Possibility to receive/deliver/swap products at a service point instead of at home
- Address of choice
- Time of choice
- Ability to change (delivery) appointments

For KPN the advantages can be summarized as follows:

- Improved customer satisfaction through additional choices
- Increase in conversion
- Less kilometers driven
- Lower price

Return logistics

A possible disadvantage for KPN is that unpredicted returns (spontaneous) might increase. Formerly KPN customers had to make an appointment for the collection of their malfunctioning or old products (at the home address). Due to these appointments KPN could predict the amount of products that were to be returned in a certain time period. In case the customer is no longer required to make an appointment since he/she can now drop off the products at any point in time at any service point, the amount of returns becomes more unpredictable. KPN has to decide in this case whether unpredicted returns are allowed and so balancing between service and costs.

3.3.2 Service points – Process

The process of the business case Service points started rather complex. The contract with the current carrier ended on December 31st. The current carrier send a new proposal for extension, but included more services and product streams than just service points. Another

carrier was asked for a proposal, for just the services of service points. This made the process and the way these proposals could be compared difficult.

Improvements in the process were discussed with the current carrier in two workshops according to a program of requirements. At the end of 2011 negotiations between KPN and the current carrier, without the direct involvement from CEVA, led to a status quo. CEVA then took the initiative to send out the program of requirements to a second carrier so that the two carriers could be compared.

Due to the complex relations between the stakeholders with different stakes and interests the process did not follow the five Step Sourcing Methodology from CEVA exactly (paragraph 3.1). This is because a program of requirements was already available and it was decided to continue to work with the program. The main steps of the Methodology are still applicable and will be explained shortly.

Step 1: Information
The service of giving the customer the ability to exchange products and services at a service point is not that different from exchanging products at the home address of the customer. The main difference is to be realized by IT to make it possible to use the addresses of service points for the customer. Also, the service points need to have some space to store products (temporarily) and process agreements have to be made.

For the service of service points there are not many different companies that can facilitate this. Therefore it was not required that an RFI was set up and the process was directly started with a short list.

Step 2: Engagement
The same program of requirements that was used in discussions with the first carrier was also used with the second. This led to some new insights in the process and possible improvements. KPN had engaged the first carrier and CEVA engaged the second carrier. Although this might seem to be able to speed up the process, aligning the different views and information can be a hard and lengthy task.

The program of requirements was divided in six subjects, together explaining the scope and the desired solution. The results from the workshops that were held with the first carrier were compared to the answer of the second carrier to the program of requirements. To create a level playing field, the second carrier was also invited to explain their submission in a workshop. Some further questions and uncertainties were answered by mail and telephone contact.

The goal was to compare the two carriers as objective as possible. The difficulty here was the different approach used with the carriers.

Step 3: Negotiations
In February 2012 CEVA had the two proposals from the carriers and completed their analysis. In the meantime negotiations were held to get a better priced deal. Analyzing the responses from the different carriers led to an interesting and somewhat disturbing discovery. Respondents (the carriers) have the tendency to say "yes" to any question or service they are asked, which is a risk in any tender project. When asked whether certain services can be provided to the final customer, the answer is "no problem", but during implementation it becomes apparent that their IT departments are not ready or different information formats were assumed. This aspect is very hard to eliminate in the process as carriers try to sell their services and decision makers should always keep this in mind.

Step 4: Implementation
In March 2012 KPN chose one of the carriers. The proposal of the winning carrier was converted into a contract. After some adjustments from CEVA and legal advice from the corresponding department, the contract was signed. After this the implementation could start. Most changes to be implemented to the existing process were IT related.

Step 5: Benchmarking
When the implementation is completed the process will be evaluated. To do this, Service Level Agreements and Key Performance Indicators have been agreed on in the contract.

Timeline and delays
At the end of 2011 some negotiations took place with the current and new carrier. In 2012 the carrier were compared according to the following timeline.

Jan '12	Send out Program of Requirements to potential carriers
Jan '12	Analyzing responses
Feb '12	Face to face motivation of carriers
Feb '12	Negotiations with potential carriers
March '12	Recommendation CEVA to KPN
March '12	Final decision KPN

Obstacles
The main obstacles that were encountered during the business case: Service Points were:

- Two different approaches and points in time that carriers were consulted
- Complex analysis because of the different approaches
- Existing relations can have a big impact on the selection process
- Tendency to say 'yes' by carriers on any question asked
- Unclear communication between all stakeholders involved

3.4 Discussion Selection Process in Practice

In this chapter the following sub research question is answered: *How is the selection process of distribution carriers designed at CEVA Logistics?* To do this lessons learned from two business cases were discussed and the standard methodology that CEVA uses.

3.4.1 The five Step Sourcing Methodology

Worldwide CEVA uses a standardized approach that is shown in figure 4. Within the steps of the methodology responsible managers have quite some freedom as the methodology does not provide an answer to all details. The document is extensive about what action to take and when this should be done. How certain steps or tasks should be done is not elaborated.

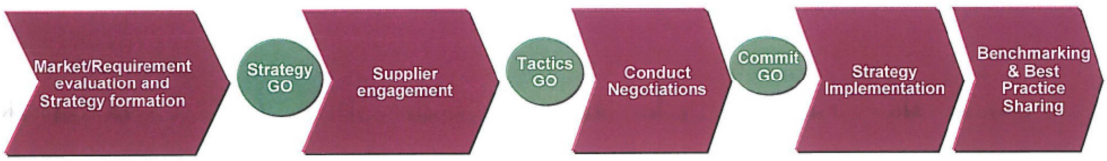


Figure 4 CEVA' five Step Sourcing Methodology

The most important limitations are the omission of how criteria should be derived and how these criteria will lead to the selection of a supplier. Next, the methodology does not mention the goal or objective to be formulated at the beginning of the process. Further, the responsible managers have quite some freedom and need to have quite some knowledge on the required process that is designed together with the client.

The essential stakeholders involved in the most common tender projects at CEVA are:

- Responsible Contract Manager (representing client)
- Client KPN
- Procurement (in our case Benelux)
- Site Manager
- IT (role depends on the scope of the project)
- Legal (in particular in Step 4: Contracting)

In paragraph 3.4.4 the interest of the most important stakeholders are elaborated, with the experience from the business cases included.

3.4.2 Lessons learned from Delivery Plus

The business case Delivery Plus had a highly innovative character, as the required process was for quite a large part new to CEVA and the client KPN. The delivery of mobile phones is often accompanied by a contract, which has to be signed by the receiving customer. In case an (minor) error is found in the customer's information (identification, bank account, etc.) the delivery had to be aborted, mainly to prevent fraud. In the earlier process the delivery attempt would have had to be aborted, which resulted in a lower conversion and increased

costs. In the newly requested process the contract is handled digitally by the carrier to be able to make (minor) adjustments to the contract and this results in a successful delivery.

The other innovative aspect are time windows of only two hours at order intake. At the moment the final customer places an order – and his/her desired mobile phone is in stock – he/she is able to choose a date from the next workday onwards, in a time window of only 2 hours.

From the business case Delivery Plus multiple lessons can be learnt. First of all management involvement from the client KPN is essential. To achieve involvement and commitment the supplied information and argumentation from CEVA should be of sufficient quality (van der Pijl, 2012). This particularly counts for the start of the process where the problem and goals are formulated. Problem formulation was not done explicitly, which made the start of the process more difficult.

Interestingly selection criteria can change over time, due to more insight in the process, which makes the process dynamic and more complex. Delivery Plus experienced a delay of 1 to 2 months, but the client was pleased with the quality of the analysis by CEVA on the responses from the potential carriers.

The main obstacles that were encountered during the business case: Delivery Plus were:

- Lack of commitment from the client (at the beginning of the process)
- Criteria are dynamic over time
- Difficult communication with other CEVA departments
- Unclear what the roles and responsibility of the different departments was
- A formal Questions and Answers session was not held (resulted in additional work)
- Highly innovation services that were new to CEVA – KPN

3.4.3 Lessons learned from Service Points

In this business case the best carrier for the client KPN was searched, who could deliver the service of Service Points. Customers should have the opportunity to pick up, drop off or swap a product at a Service Point, that is usually located in a retail shop. Most important was that the customer is able to choose his time and place of delivery.

The selection process started off rather complex, which resulted in loss of time. Existing relations and contract negotiations played a role in the selection process. In particular the analyzing phase was hard, since different information from the potential carriers was available at different times (a few months apart) and different formats. Given the circumstances expert judgment was the best solution to compare the carriers objectively, due to time constraints.

In contrast with the other business case Delivery Plus, no tender procedure was followed. In fact two proposals/bids were compared with each other that were based on a program of requirements. CEVA and KPN were already quite familiar with the required technology and

service, as the desired process was not a major step away from the process in the current situation. Therefore it took less time to obtain the required information and a complex tender procedure was not needed. The financial comparison was evaluated separately.

The selection process in this business case was completed within 3 months, which is much faster than the previous described case. The main reasons for this were time pressure and the fact that there was already a program of requirements available that was used to compare the carriers. Also, the type of service was comparable to the current operation, instead of the highly innovative character of Delivery Plus.

The main obstacles that were encountered during the business case: Service Points were:

- Two different approaches and points in time that carriers were consulted
- Complex analysis because of the different approaches
- Existing relations have an impact on the selection process
- Tendency to say 'yes' by carriers on any question asked
- Unclear communication between all stakeholders involved

3.4.4 INTERESTS OF STAKEHOLDERS

The stakeholders that are involved in tender processes at CEVA have different interests. In practice the different departments of CEVA operate as one entity in a tender process, as much as possible. From the point of view from the different companies in the supply chain the interests are summarized in table II. Their interests are explained according to the steps in the CEVA's methodology. The column on the far right, seems to provide a black-and-white picture, but represents in fact a continuous scale. The most important cells of the table are explained shortly.

Table II Interests of stakeholders through the Selection Process

	Interests CEVA	Interests Client	Interests Carrier	Conflicting Interests
Step 1 Information	Efficient market research	Effective market research	Clear information on required services	Minor
	Clear information on possibilities	Choice	Invite to RFI	Minor
Step 2 Engagement	Derivation of criteria and goal of tender	Clear formulation of goal and criteria	Clear information on required services	Minor
	Commitment of client	Resources from CEVA	Fit with required services	Major
	Short list of client to lower amount of repsonses	Best carriers in short list	Invite to RFP/RFQ	Major
	Efficient analyzing of responses	High quality of analysis	Ability to present own strengths	Minor/Major
Step 3 Negotiations	Best services at the right price for clients	Best services at the right price	Max. benefits from own operations	Major
	Clear understanding of goals	Clear insight in charging details	Fair price for standard services	Major
Step 4 Implementation	Clear understanding of SLA and KPI	High performance standards	Achievable performance standards	Major
	Efficient and smooth start up	Smooth start up	Efficient and smooth start up	Minor
Step 5 Benchmarking	Clear measurement of performance	Clear measurement of performance	Clear measurement of performance	Minor
	Good performance by carrier	Good performance by carrier	Max. benefits from reaching performance standards	Major

CEVA's interests

The main interest of CEVA in a tender process is to work efficiently. The client should be convinced and become committed to the process. To do this the quality of the information provided by CEVA in any step of the process should be high. From an economic point of view not too much time and resources can be spend to deliver the required quality. Communication with the client should be good as the goals and criteria of the required service from the distribution carriers are to be understood by all decision makers.

Client KPN's interests

The client's main interest is to find the 'best' distribution carrier. What the best carrier is depends on the criteria and goal of the process. In some cases price is the main factor, but in others a high quality is of vital importance. These goals must be communicated and crystal clear for CEVA, as CEVA turns this information on the client's wishes into a tender document. CEVA delivers value to its clients – amongst other activities – by Carrier sourcing and management.

Carrier's interests
In short, the goal of a distribution carrier is to make profit from a tender process. Therefore, the carriers hopes to win the tender by being invited to the various steps in a tender process. By presenting itself in the best possible way, the carrier hopes to win the tender. After implementation profit can then be made. The higher the performance standards negotiated in step 4, the harder it is for the carrier to make profit.

Conflicting interests
When sending out a tender it is always good to evaluate the document from the point of view from the receivers: the carriers. Therefore the conflicting interests are described from their point of view. CEVA and its client KPN act as one entity when a tender is send out.

First of all, information is very important in tender processes and it goes both ways. It is CEVA's (and KPN) job to provide the necessary information that CEVA-KPN requires from the potential carriers. This information should be clear, so that the carriers can check whether their own operations are suitable and of the right quality. Then, in step 2 they want to present their services as good as possible and should be able to do so. However, all responses must be analyzed by CEVA and processing additional information requires time.

During the last steps of a selection process the carriers negotiate contract terms and performance standards. This can be considered a natural conflict as all companies try to maximize their own benefits. In most cases the carrier cannot ask its highest price, since in that case the tender would not have been won. Since it still wants to make profit, a fair price and performance standards should be negotiated.

3.4.5 Selection Process
With the help of the previous paragraphs sub question 1 is answered:

How is the selection process of distribution carriers designed at CEVA Logistics?

CEVA has a standardized methodology that it uses worldwide. The most important stakeholders are the client KPN and the distribution carrier, next to CEVA itself. CEVA is represented by the Contract Manager, Site Manager and the departments: Procurement, Legal and IT. The stakeholders have different interests and the main obstacles that were experienced during the business cases were described.

Lacunas
Now that the current practice situation is elaborated, several lacunas have come to light. First of all CEVA's Methodology – although extensive – lacks detail is various phases of the process or important parts are left to responsible managers. One of these omissions is the derivation of selection criteria.

The business cases give a good example of how this process is tackled at CEVA The Hague. For both business cases different carriers were compared and sourced. To do this, selection criteria had to be derived. In the next chapter selection criteria that are found in literature

are compared with those used in the business cases. This will also result in more understanding of the topic transport management and distribution.

Next, improvements and additions to the current selection process are researched in Chapter 5. Different sourcing techniques exist and are compared with CEVA's methodology and those used during the business cases. Lessons can then be learned how to improve the current selection process.

PART II RESEARCH

The second Part consists of two Chapters, which research the lacunas or possible improvements that resulted from Part I. In Chapter 4 Selection criteria are researched in literature and then compared with practice situations at CEVA Logistics. Chapter 5 searches for additions and improvements for the Selection Process of distribution carriers. The selection criteria and lessons learned on selection processes will be used as input for an improved selection process later on in Part III.

CHAPTER 4. SELECTION CRITERIA

Criteria play a vital role in any selection process. Without knowing so, in daily live people use all kinds of criteria for all their decision, although the criteria are often left implicit. In this Msc. Thesis the supplier selection process of distribution carriers is discussed. The selection of carriers involves many different dimensions, aspects or criteria and can help to gain insight and to develop more feeling for the subject of carrier selection. How these selection criteria can be derived and how this was done in practice at CEVA The Hague will be researched in this chapter. In paragraph 4.1 selection criteria from literature are researched as a starting point. Selection criteria from the practice situation are described in paragraph 4.2 and recent consumer wishes are researched in paragraph 4.3. The sub research question 2 will be answered:

Which criteria are applicable for supplier selection and how can they be derived?

4.1 SELECTION CRITERIA IN LITERATURE

In this paragraph literature is studied for selection criteria so that lessons can be learned and more feeling is developed for the subject. Also, by studying literature sources the wheel has not to be re-invented again. According to Yahya and Kingsman (1999): "Selection criteria have been researched for many decades and this is often the first step in a carrier selection process" (Yahya & Kingsman, 1999). Whether this should be the case is further discussed in the next chapters. It depends on where the process is started. The result from literature studies is compared in the following paragraph to selection criteria in practice.

4.1 METHODOLOGIES

Supplier selection and accompanying criteria is an often discussed topic in technical literature. The work of many authors will be discussed later in paragraph 4.1. First, the most common methodologies to derive selection criteria will be described shortly.

4.1.1 EXPERT JUDGMENT

An often used methodology to research selection criteria is to send out surveys to responsible managers or experts in various fields. For instance logistics or procurement managers can be asked for their opinion on the relative importance of selection criteria. Dickson (1966) is seen as a pioneer in his field and asked in 1966, 170 purchasing agents and managers to assess criteria on a 5 point scale from 'extremely important' (score: 4) to 'no importance' (score: 0). He then calculated the mean score from the responses of the managers and ranked 23 criteria. His results will be discussed in the next section.

In more recent years, several authors (Tuna & Silan, 2002; Kent & Smith, 2005; Guo et al, 2006; Watt et al, 2010) send out surveys and then analyzed the responses. The study of Tuna and Silan was relatively small (37 shippers were asked), where for instance Kent and

Smith received 420 usable responses from 2.132 companies that were asked. The work of these authors is discussed in the next paragraph.

According to Murphy and Daley (1997) the most important limitations with expert judgment are low response rates and "potential for non-response bias" (Murphy & Daley, 1997). Next, it turns out to be difficult to compare the results from expert judgment with other researches because of different characteristics between respondents groups.

4.1.2 LITERATURE REVIEW

Another methodology to research selection criteria is by literature review. For instance a study (Weber, Current & Benton, 1991) based their research on the existence in academic/technical literature. This methodology was also used in two other studies (Yahya & Kingsman, 1999; Thanaraksakul & Phruksaphanrat, 2009). The authors counted the number of times 'existing' criteria were discussed in academic/technical literature. Research that uses this methodology is therefore dependent on the work of previous authors. For instance, the criteria from Dickson and Weber et al. are taken as a starting point. By counting the number of occurrences in literature, researchers try to say something about the relative importance in respect to other criteria.

Different authors use different keywords and some use more than one in their research. The most often used keywords are:

- selection criteria
- vendor rating
- supplier evaluation
- contractor selection
- tender evaluation criteria

As can be seen, the keywords are more or less synonyms of each other. 'Supplier' can be replaced by 'vendor', 'contractor' or 'carrier'. In some cases it can also be replaced with 'partner', depending on the subject. The word 'criteria' is sometimes not mentioned explicitly, since the keywords are understood in technical literature. Selection criteria are often used in tenders and so the last shown keyword can also be used. 'Selection' and 'evaluation' are used as synonyms. The meaning of the words might seem to represent different parts of business processes: selecting is done before a relationship is build (ex ante) and evaluation (ex post) after. In both cases suppliers/contractors/partners are scored on criteria and can therefore be a valuable source for this research.

The most important limitations of literature studies are the understanding and explicit mentioning of the definitions of the criteria. Next, as not all researchers agree on the relative importance of certain selection criteria, discussion increases. As discussion increases, appearance of the criterion in literature sources will increase. The number of appearances in literature are used by researchers (Yahya & Kingsman, 1999; Thanaraksakul

& Phruksaphanrat, 2009), as an indication to its relative importance, but this is not necessarily correct.

4.1.3 COMBINED METHODOLOGIES

Both surveys and literature studies are valid methodologies to research selection criteria. Watt et al. on the other hand compare results from a literature review with that of survey results in one research. Watt et al. researched key factors in the evaluation of tenders in 2009.

Different literature studies or expert judgments are carried out in different times, which can result in alterations of relative importance of criteria. A combination of the two methodologies is therefore preferred, since the two can be compared on one point in time. Another advantage is that the naming of criteria or categories can be synchronized, making comparison easier, more consistent and the response group larger.

4.1.4 CATEGORIES OF CRITERIA

Different managers and experts in different fields use different formulations for selection criteria. In this paragraph first an overview will be given, which shows examples of formulations how suppliers can be evaluated in supplier selection. To get an idea of possible formulations and their relations the research from Watt et al (2009) will be discussed.

Watt et al combined the methodologies described in the previous section and found 472 different naming of criteria in literature and 429 criteria by exploratory surveys, in total 901 criteria. From a much larger set, 80 journal articles and other literature from 1978 till 2006 were used for the literature study and then narrowed down to 31. “Each source used predefined criteria, presumably based on the author or researcher’s experience to investigate various aspects of contractor selection” (Watt et al, 2009). The criteria were first grouped in 16 categories and the result can be seen in the figure 5.

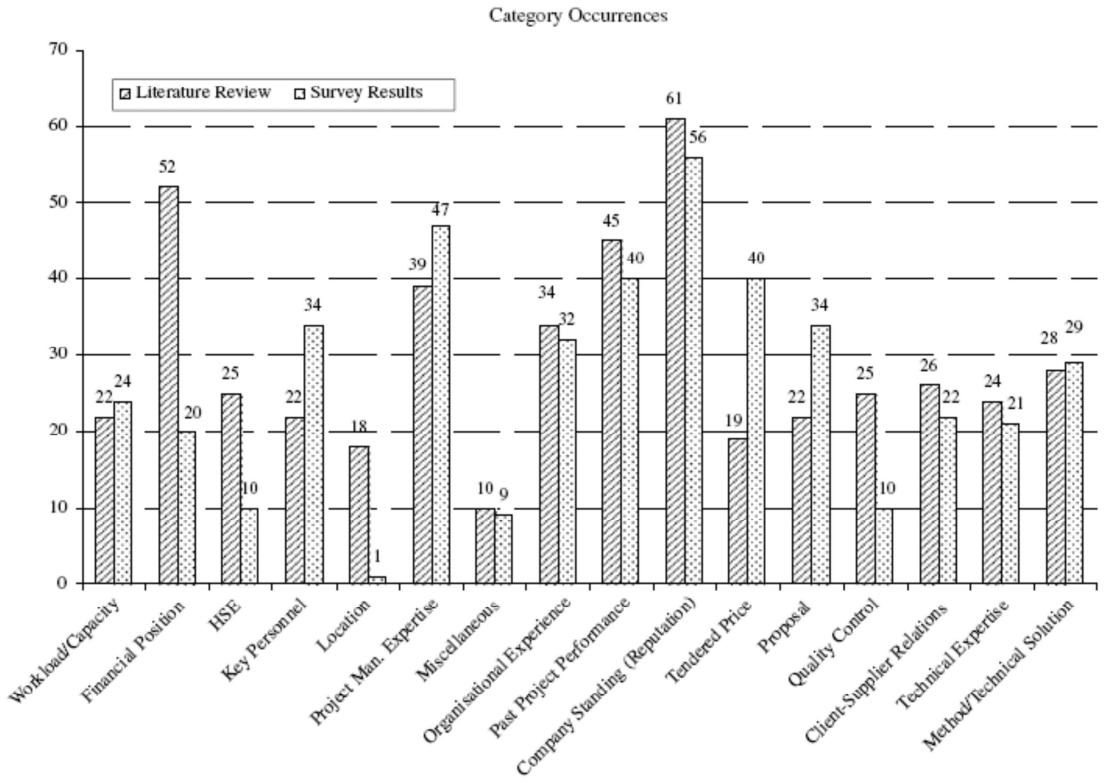


Figure 5 Literature and Surveys combined. Reprinted from: Watt, D.J. et al. (2009), "Identifying key factors in the evaluation of tenders for projects and services" *Elsevier: International Journal of Project Management* 27 (2009) 250–260

In their research in 2009 Watt et al asked senior management and field experts who had experience in tender evaluations for a definition on how tenders should be evaluated objectively. Mainly managers and field experts in the fields of construction, defense and transportation were asked. They found that "the evaluation should provide an objective assessment of a supplier's ability to deliver across all value dimensions of a project subject to constraints; cost, quality and schedule" (Watt et al, 2009).

These constraints are consistent with previous research, as will be explained later on. Cost is often also referred to as Price and Schedule evaluates how well a supplier can perform according to delivery times. The criterion Schedule is equivalent with what other researches call 'Delivery'. Watt et al then asked their respondents to state relevant criteria on a more detailed level. In total 472 criteria from literature were found and 429 from the exploratory survey. The results can be seen in the table III (Watt et al, 2009). The table was used as the authors suggested: "These categories can be used as guiding factors for Junior or less experienced project managers whilst they are being trained, mentored or coached to ensure evaluations are based on the broadest possible range of criteria and not a select few they may have focused on due to inexperience" (Watt et al, 2009).

Table III Categories of Criteria

Categories of criteria

Category	Literature Review	Exploratory Survey
Workload/Capacity	Current Resource Workload, Equipment Resources, Contractor Capacity, Capacity for Assuming New Projects	Current Commitments, Available Manpower, Plant and Equipment Capacity
Financial Position	Analysis of Accounts, Bank, Reference or Arrangements, Credit Rating, Liquidity Ratio	Financial Soundness, Financial Capacity, Insurances, Business Turnover-Cash Flow
Health Safety Environment	Corporate Environment Policy, Safety Plan, Safety Incidents, Occupational Health Safety Assurance (OHSA), Incident Rate	Environmental Compliance, Health Safety Environment (HSE) Record, Safety Performance
Key Personnel	Key Personnel Experience and Qualifications, Key Personnel Years in Company	Key Personnel Experience, Key Personnel, Credibility of Key Staff
Location	Business Location, Area of Catchment (Local/National), Facilities Location	Location
Project Management Expertise	Management Structure, Project Management Organisation and Skills, Qualifications, Project Management Monitoring and Controls	Controls Cost, Project Management Ability, Management Competencies, Management Structure, Scope and Risk Control
Miscellaneous	Desire for Business, Time of Year, Tourism, Political, Social	Management Systems Implemented, Contractor's view of Relative Importance in Providing Services, Politics-Is it our turn yet, Competitiveness
Organisational Experience	Related Experience, Size and Type of Projects Completed, Yrs in Similar Projects	Past or Similar Experience, Market Familiarity, Commercial Experience, Understanding of Regulations
Past Project Performance	Cost Outcomes or Overruns, Past Failures, Performance History, Schedule Performance, Results from Previous Projects	Ability to Deliver, Demonstrated Performance, Track Record, Past Performance, Reliability
Company Standing (Reputation)	Amount of Past Business, Company Image and Size, Trade Union Record, Litigation Tendency, Reputation	Company Reputation, Organisational Maturity or Stability, References, Responsiveness, Business Ethics
Tendered Price	Capital Price, Labour Rates, Operating Costs	Tendered Price, Through Life Cost
Proposal	Degree of Compliance with Request for Tender (RFT), Return and Benefits, Project Specific Criteria, Form of Contract, Rationality of Estimates	Program Methodology, Sub-contractor Management, Post Delivery Support
Quality Control	Quality Control (QC) Policy, Work Quality Records	Capability Maturity Model Integrated (CMMI) Certification, Implemented Quality Systems
Client–Supplier Relations	Client/Customer Attitude and Relations, Trust, Commitment to Support, Responsiveness	Ability to Work as Team, Stakeholder Management, Customer Focus/Relationship
Technical Expertise	Experience of Technical Personnel, Technical Competence and Ability	Availability and Experience of Technical Design Experts, Availability of Technical Experts, Key Technical Staff Experience
Method/Technical Solution	Proposed Design, Technology Base, Functionality, Life Cycle Requirements, Growth Capability	Compliance with Stated Needs or Requirements, Proposed System Solution, Plant/Equipment Type, Viability of Technical Solution

Reprinted from: Watt, D.J. et al. (2009), "Identifying key factors in the evaluation of tenders for projects and services" *Elsevier: International Journal of Project Management* 27 (2009) 250–260

Watt et al made an effort to clean the responses for synonyms and to categorize the criteria. For manageability they performed an occurrence test and a difference test. For the occurrence test, only if criteria were named in 5% of all 901 mentioned criteria (45), the criteria were characterized as a main category. Next, a difference test of 10% was applied to see whether the different master lists (literature review and exploratory surveys) showed consensus. In case the difference in the amount criteria were mentioned was greater than 10%, the criteria did not qualify for a main category.

This methodology shows the key dimensions of supplier evaluation and selection that are generally applicable. The further reduction techniques provide a manageable set, with some significant observations. A significant result is that Tendered Price is excluded as a principal category by the difference test. Watt et al conclude on this aspect: "Tendered Price is not a principal category and suggests that choice of supplier or contractors is considered on the basis of overall value, rather than in terms of pure cost" (Watt et al, 2009). The criterion price will be elaborated on later.

Another interesting result according to Watt et al. is the increased attention over the last year in the Client-Supplier Relations category. Companies are more aware that not only a service is bought, but see that performance from their contractors can increase as the relationships gets better. Ho agrees with this finding and state: “The contemporary supply management is to maintain long term partnership with suppliers, and use fewer but reliable suppliers” (Ho, 2009).

After the reduction techniques were applied the result of Watt et al (2009) is shown in table IV. The most important categories that are generally acceptable are shown in the left column. Examples of criteria are specified per category and can be used as a starting point in a supplier evaluation.

Table IV Principal categories of Criteria

Category	Specific criteria
Organisation Experience	Past or Similar Experience, Market Familiarity, Commercial Experience, Understanding of Regulations, Related Experience, Size and Type of Projects Completed, Yrs in Similar Projects
Workload/Capacity	Current Commitments, Available Manpower, Plant and Equipment Capacity, Current Resource Workload, Equipment Resources, Contractor Capacity, Capacity for Assuming New Projects
Project Management Expertise	Controls Cost, Project Management Ability, Management Competencies, Management Structure, Scope and Risk Control, Project Management Organisation and Skills, Project Management Qualifications, Project Management Monitoring and Controls
Past Project Performance	Ability to Deliver, Demonstrated Performance, Track Record, Past Performance, Reliability, Cost Outcomes or Overruns, Past Failures, Performance History, Schedule Performance, Results from Previous Projects
Company Standing (Reputation)	Company Reputation, Organisational Maturity or Stability, References, Responsiveness, Business Ethics, Amount of Past Business, Company Image and Size, Trade Union Record, Litigation Tendency, Reputation
Client–Supplier Relations	Ability to Work as Team, Stakeholder Management, Customer Focus/Relationship, Client/Customer Attitude and Relations, Trust, Commitment to Support, Responsiveness
Technical Expertise	Availability and Experience of Technical Design Experts, Availability of Technical Experts, Key Technical Staff Experience, Experience of Technical Personnel, Technical Competence and Ability
Method/Technical Solution	Compliance with Stated Needs or Requirements, Proposed System Solution, Plant/Equipment Type, Viability of Technical Solution, Technology Base, Proposed Design, Functionality, Life Cycle Requirements, Technological Growth Capability

Reprinted from: Watt, D.J. et al. (2009), "Identifying key factors in the evaluation of tenders for projects and services" *Elsevier: International Journal of Project Management* 27 (2009) 250–260

The research of Watt et al show that many different examples and definitions can be formulated for supplier selection criteria. The high amount of examples make this a very usable source for defining criteria. Watt et al suggest that these 8 categories can be weighted or structured for individual organizations. "In addition, individual companies could include other categories to those provided in this article to tailor the tender

assessment process to meet their individual organizational needs", according to the authors (Watt et al, 2009). This will be done in practice and show in appendix IV.

Price

Price is an often discussed criterion. It is usually buildup of acquisition cost, operation cost and implementation cost. Working together with low cost carriers will often lead to lower service levels, more disputes on performed services and measurement conflicts. Savings in a lower price are often depleted by additional work and disputes that are required (Willcocks et al, 2007). It is usually more difficult to give the carrier incentives to improve its service and increase service levels and to go the extra mile.

It can happen that a bidding carrier lowers his price to cost price. When after implementation the carrier is executing the contract it will not have any incentive to perform well except to cut its own costs and so lowering its cost price. On the short term this might lead to some cost reductions, but at a certain point in time there is no more room for improvement, as margins decrease. Another problem that can occur when carriers bid too low is called 'the winners curse', which is explained in Part III.

In short, it is very important in tenders that the required service is beneficiary for the shipper, but also for the bidding companies, or carriers in our case. According to Emmett and Crocker the carrier wants to receive a 'fair price' for its services (Emmett & Crocker, 2009). When the carrier can make additional profit (to plain operating profit) when winning the tender, like through economies of scale, image improvement, entering new markets, development of new technologies, etc. it will have more incentives to participate in the tender project and when executing the won contract to improve performance (Willcocks et al, 2007).

Quality

Quality is one of the most important criteria and is often hard to define. Quality says something about the performance delivered by the carrier. For existing carriers performance can be measured and service levels and key performance indicators can be agreed. For new carriers on the other hand, as is the case in sourcing, this is not an option. Future carriers can be asked to deliver performance records from their other clients but two problems arise. First of all, information on other clients is often sensitive and second different processes cannot be compared easily with each other.

Next, the final consumer can be asked on their opinion and experiences. This, however, often takes a lot of time since a response group is preferred to be quite big. Again, this is only possible for existing carriers, or for new carriers in a pilot. According to Weele, IBM's definition on quality is: "the degree in which customer requirements are met" (Weele, 2010). How to measure and secure quality is subject to discussion.

Delivery

Delivery can be compared to what Watt et al. call Schedule. Where the criterion Quality says something about how well the specifications are met, delivery says something about whether or not specifications are met at all. A high score on delivery would give a reliable carrier as the shipper is sure that the shipment will be delivered to the recipient.

4.1.5 CRITERIA AND THEIR RELATIVE IMPORTANCE

In 2010 Watt et al performed a follow up research. The goal was this time not to explore all possible criteria and provide an objective means to evaluate suppliers, but to research the relative importance of the categories that were described previously. The authors received a lot of feedback stating that Tendered Price as a principal category should not be excluded. As mentioned, this criterion was excluded based on a difference test of 10%, but did show up in 19 literature reviews and 41 surveys. In the research of 2010 Tendered Price was included in a discrete choice experiment. The results are shown in figure 4.

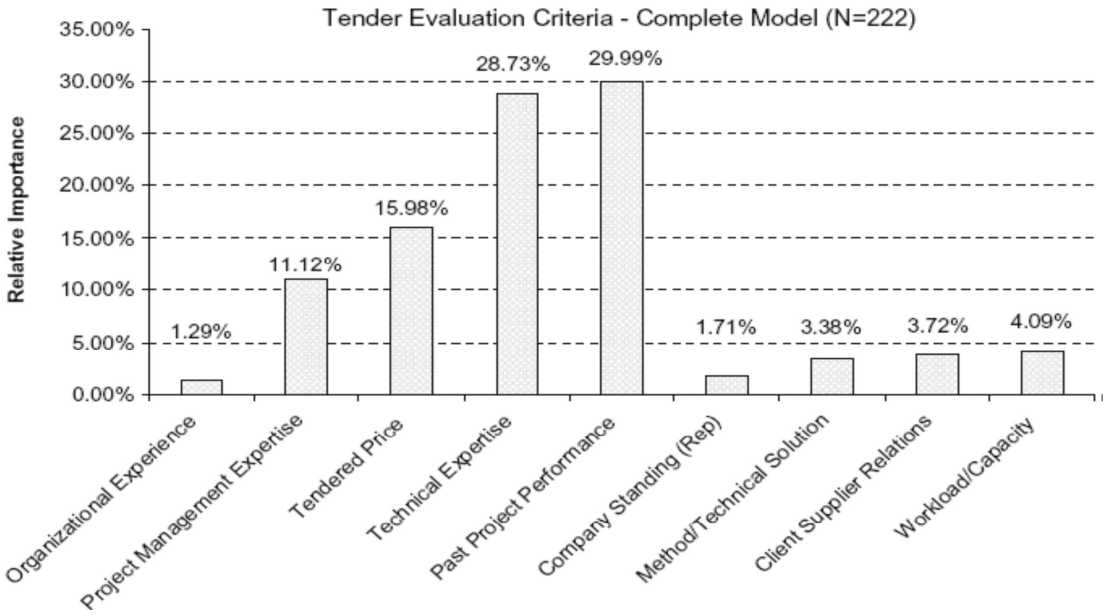


Figure 6 Tender Evaluation Criteria. Retrieved from: Watt, D.J. et al. (2010), "The relative importance of tender evaluation and contractor selection criteria." *Elsevier: International Journal of Project Management* 28 (2010) 51-60

According to the results from Watt et al. (2010) can be concluded that Tendered Price is relatively important (15.98%), but not as important as Technical Expertise (28.73%) and Past Project Performance (29.99%). Technical Expertise has to do with the extent a supplier is capable of performing the service and whether it has the required knowledge. Project Management Expertise is somewhat important (11.12%) compared to the other criteria. These four criteria together account for 85% importance of the tender evaluation criteria as Watt et al. found.

Price is less important than in earlier years, which is consistent with other recent work: “This is, however, consistent with more recent research by Lopes and Flavell [17], Waara and Brochner [26] and Watt and Willey [27], advocating that contractor selection mustbe derived from value across a range of key project dimensions,of which cost should be a component” (Watt et al, 2010).

On previous work of other authors Watt et al (2010) state: “In terms of importance in evaluating and selecting contractors, these studies showed that no individual criteria or group of criteria are consistently reported as being more important than others” (Watt et al, 2010). In other words, the relative importance of criteria can be case or organization specific.

The authors state that many previous researches mainly rely on attitudinal surveys, which rate the perceived importance of specified criteria. And further: “Ranking studies, whilst useful in identifying relevant criteria do not represent an actual tender situation… An actual choice of contractor requires evaluators to consider each contractor simultaneously as a function of all specified criteria and their assigned weightings” (Watt et al, 2010). The relative importance of criteria can be dynamic and case specific.

Therefore Watt et al (2010) used a discrete choice experiment in which respondents evaluate fictitious suppliers at the same time. “The main advantage of the approach is that respondents do not rate the importance of specified criteria directly” according to the authors (Watt et al, 2010). A further remark that Watt et al make, is that literature reviews for a relative large part have been based on the construction industry. The authors base their set up of DCE on Louviere et al (2000) which is derived from mathematical psychology and largely used within the disciplines marketing and transportation (Watt et al, 2010).

Risk

After studying the many resources in this chapter some interesting remarks can be made. Risk, as a criterion, is not mentioned in literature and practice. It is only stated once in the research from Watt et al in 2009 in ‘Scope and risk control’ in table IV (Watt et al, 2009). One can argue that risk is (partly) incorporated in other criteria – like: financial stability, organizational stability, capacity or technical exploitation – but it is not stated explicitly.

Reason for not treating ‘risk’ as a (individual) criterion can be that it might be too hard for companies to qualify and quantify. Perhaps a separate research should be carried out to make a judgment on different levels of risk for specific services provided by specific carriers.

Another reason might be that risk aversion is considered as an essential requirement for engaging in a tender process. For instance in case there is any doubt that one of the possible carriers is not financially stable or not able to provide a minimum level of performance, the carrier is not invited to tender. In (out) sourcing processes some organizations “see outsourcing as an opportunity to pass on risk, in practice such risk displacement is largely

illusory" (Willcocks et al, 2007). This would imply that risk is treated somehow – perhaps implicitly, however, it is absent in most literature on selection criteria.

4.1.6 HISTORIC DEVELOPMENTS

How different criteria developed over the last decades is interesting and is described in this section. Dickson (1966) is seen as a pioneer on the subject of selection criteria (Thanaraksakul & Phruksaphanrat, 2009; Yahya & Kingsman, 1999). Dickson found 23 selection criteria and ranked these in order of relative importance. Since then many researchers have used the work of Dickson as a reference.

As Dickson's work is seen as the base for selection criteria, his work is evaluated here. Dickson asked purchasing agents and managers to assess criteria on a 5 point scale from 'extremely important' (score: 4) to 'no importance' (score: 0). Yahya and Kingsman have included a repetition exercise in 1991. Next to the repetition exercise the work of Weber et al (1991) is included. In total 74 scientific papers were reviewed by Weber, Current and Benton in 1991 and they researched the number of times a criterion was mentioned in scientific papers. Yahya and Kingsman presented the results in the last column of table IV (Yahya & Kingsman, 1999).

Table IV Ranked Selection Criteria from 3 sources

Table 1 Dickson's criteria for assessing vendors

	Dickson's 1966 Study[a]			*1991 exercise*		
Criteria	*Mean*	*Rank*	*Evaluation*	*Mean*	*Rank*	*Number of articles*[b]
Quality	3.51	1	EI	3.6	1	40
Delivery	3.42	2	CI	2.9	4=	44
Performance history	3.0	3	CI	3.4	2	7
Warranties and claim policies	2.84	4	CI	2.9	4=	0
Production facilities/capacity	2.78	5	CI	2.8	6	23
Price	2.76	6	CI	3.1	3	61
Technical capability	2.55	7	CI	2.4	10=	15
Financial position	2.51	8	CI	2.5	8=	7
Bidding procedural compliance	2.49	9	AI	2.5	8=	2
Communication system	2.43	10	AI	–		2
Industry reputation and position	2.41	11	AI	2.4	10=	8
Desire for business	2.26	12	AI	2.6	7	1
Management and organisation	2.22	13	AI	2.3	12	10
Operating controls	2.21	14	AI	1.9	14	3
Repair service	2.19	15	AI	1.6	15	7
Attitude	2.12	16	AI	–		6
Impression	2.05	17	AI	1.4	17	2
Packaging ability	2.01	18	AI	–		3
Labour relations record	2.00	19	AI	1.1	18	2
Geographical location	1.87	20	AI	1.5	16	16
Amount of past business	1.60	21	AI	2.1	13	1
Training aids	1.54	22	AI	–		2
Reciprocal arrangement	0.61	23	SI	–		2

[a] *Source*: Dickson (1966: EI = extreme importance, CI = considerable importance, AI = average importance, SI = slight importance.
[b] Number of articles in Weber, Current and Benton 1991 review of 74 papers mentioning criterion.

Reprinted from: Yahya, S. and Kingsman, B. (1999) "Vendor Rating for an Entrepreneur Development"

As can be seen in the table, the criteria that are considered to be most important have not been changed in almost 50 years as Yahya and Kingsman conclude as well. The most noticeable change is that 'price' has moved up from the 6th position to the 3rd and that

'delivery' has become slightly less important. 'Delivery' is the performance to be expected from vendors. After the criterion 'price' (appears in 61 articles) 'delivery' is most discussed (44 articles), followed by quality (40 articles).

A more recent study was performed by Thanaraksakul and Phruksaphanrat in 2009. Like Yahya and Kingsman, they compared criteria from Dickson (1966) and Weber, Current and Benton (1991). Some important differences in the way the criteria are ranked should be considered though.

First of all, the names of some criteria have been changed or updated, of which 'Price' is probably the most important one and is now called 'Cost' (CST). Second, Thanaraksakul and Phruksaphanrat (2009) rank the criteria from the work of Dickson and Weber et al. according to the number of articles in which the criteria were mentioned, where Yahya and Kingsman rank the criteria according to stated scores. Third, the authors researched whether environmental and social responsibility issues (ENV) were included in supplier evaluation, as this was one of their objectives. The result of their study is shown in table V (Thanaraksakul & Phruksaphanrat, 2009), where the criteria are shown by an abbreviation. Source [6] in this table represents Dickson's study, whereas source [2] represents the work of Weber et al (1991)

Table V "Comparison of selection criteria"

Abbr	[6]	[2]	New Rank	Abbr	[6]	[2]	New Rank
QLT	1	3	1	REP	11	8	18
DLV	2	2	2	PKG	18	13	19
CST	6	1	3	PSB	21	22	20
PFC	5	4	4	CTR	-	-	21
FLX	23	19	5	WCP	4	23	22
TCS	7	6	6	PCC	9	16	23
RSF	15	11	7	CSI	17	20	24
ITC	10	18	8	ATD	16	12	25
FNS	8	9	9	LRR	19	17	26
INV	-	-	10	ECN	-	-	27
OPR	14	14	11	DFB	12	21	28
QTS	-	-	12	ENV	-	-	29
MGT	13	7	13	SFT	-	-	30
PTD	22	15	14	DPS	-	-	31
PRT	-	-	15	CTC	-	-	32
PMH	3	10	16	TRR	-	-	33
GEO	20	5	17				

Note: Abbr : Abbreviation
[2] : Criteria ranking from [2]
[6] : Criteria ranking from [6]

Reprinted from: Thanaraksakul, W. & Phruksaphanrat, B. (2009). *Supplier Evaluation Framework Based on Balanced Scorecard with Integrated Corporate Social Responsibility Perspective*

The new order of criteria of Thanaraksakul and Phruksaphanrat is ranked according to the number of occurrences in a total of 76 literature reviews. It is assumed that the definition – at least were the name has not changed – of the criteria is kept the same as from the

previous authors. The three most important criteria appear in 72 to 74 papers (95-97%) and are: Quality, Delivery and Cost (Thanaraksakul & Phruksaphanrat, 2009).

Next, the criteria that are ranked 4 to10 appear in 50-68% of the reviewed papers. Of those, 'Flexibility and reciprocal arrangement' (FLX) has gained much more importance over the last decades, since it increased from the 23rd rank in 1966, to the 19thin 1991 and the 5th rank in 2009. "That might be resulting from a shorten product life cycle, obsolescence speed, change of production system, and emergence of supply chain management (SCM)" according to the authors.

Transportation services

Other valuable sources for selection criteria that are from recent years are for instance Kent and Smith (2005) and Watt et al (2010). Kent and Smith state that the prioritization of selection criteria has often been researched per transport mode or industry sector. Kent and Smith researched the importance of carrier selection criteria across 5 truckload motor carrier offerings: Dry Van, Temperature Controlled, Tank, Intermodal, and Flatbed, from the shipper's point of view the most mentioned criteria are – as can be seen in table VI (Kent & Smith, 2005) – 'Consistent dependable transit times', 'Billing accuracy' and 'Competitive pricing'. The first one can be compared with, or is often part of, the criterion 'Quality' from Dickson and Yahya and Kingsman and 'Competitive pricing' with 'Price'. 'Billing accuracy' on the other hand is a new criterion that was not mentioned by the previous authors.

All carrier types have in their top 8 for the relative importance of criteria: 'Billing accuracy', 'Communications of service disruptions', 'Competitive pricing, 'Consistent dependable transit times', and 'Quality of drivers characteristics'. All but one (Intermodal) carrier type further rank: 'Action and follow-up on service complaints', 'Competitive pricing', and 'Equipment availability' the highest (Kent & Smith, 2005).

Table VI "20 Service Characteristics"

Item	Description	Dry Van	Temp. Ctl.	Tank	Intermodal	Flatbed
1.	Consistent dependable transit times	6.48[1]	6.50[3]	6.46[1]	6.36[5]	6.34[2]
2.	Billing accuracy	6.46[2]	6.29[8]	6.15[6]	6.50[2]	6.36[1]
3.	Competitive pricing	6.45[3]	6.12[9]	6.31[4]	6.50[2]	6.09[5]
4.	Action and follow-up on service complaints	6.31[5]	6.69[2]	5.92[9]	6.76[1]	6.15[4]
5.	Communication of service disruptions	6.31[4]	6.75[1]	6.0[8]	6.36[5]	6.28[3]
6.	Equipment availability	6.11[6]	6.33[6]	6.46[1]	6.00[10]	6.0[6]
7.	Knowledge and problem solving skills of contact personnel	6.04[7]	6.38[5]	5.92[11]	6.43[4]	5.81[8]
8.	Quality of drivers	6.03[8]	6.30[7]	6.31[4]	6.21[7]	5.96[7]
9.	General reputation for quality and integrity	5.95[9]	6.09[10]	6.33[3]	5.93[11]	5.72[9]
10.	Financial Stability	5.85[10]	5.77[13]	6.08[7]	5.29[13]	5.55[10]
11.	Proactive monitoring of delivery appointments	5.70[11]	6.40[4*]	5.92[10]	6.07[9]	5.38[12*]
12.	Ability to provide expedited service	5.53[12]	5.94[11]	5.62[12]	6.14[8]	5.41[11]
13.	Ability to handle all transportation needs	4.91[13]	5.08[14]	5.33[13]	5.93[12]	5.11[13]
14.	Satellite tracing and communications	4.88[14*]	5.83[12*]	5.15[15]	4.79[14]	5.02[14]
15.	Traditional EDI capabilities	4.43[15]	4.58[15]	4.83[16]	4.64[15]	4.28[16]
16.	Internet tracking	4.42[16]	4.44[16]	4.23[20]	4.64[16]	4.51[15]
17.	Internet POD	4.06[17]	3.49[18]	4.50[18]	3.64[19]	4.23[17]
18.	Ability to implement fuel surcharge	3.76[18]	4.19[17]	5.33[14*]	2.93[20*]	3.60[18*]
19.	Internet freight posting services	3.25[19]	2.91[19*]	4.54[17*]	3.79[18*]	3.17[19]
20.	Internet pricing	3.14[20]	2.66[20*]	4.38[19*]	3.86[17]	3.02[20]

Retrieved from: Kent, J.L. and Smith, C.D. (2005), "CARRIER SELECTION CRITERIA: DIFFERENCES AMONG TRUCKLOAD MOTOR CARRIER OFFERINGS". In: *Journal of Transportation Management* (48-63).

How the relative importance of criteria has developed is shown in table 7. The most important 8 to 10 criteria were taken from the results of the various authors described in this section. The highest ranked criteria are marked green. According to the respective authors these criteria have a very high importance, compared to all researched criteria. In yellow criteria that have a high relative importance and the other criteria are quite important in carrier evaluation as well.

Table V Historic Development of the relative importance of criteria

	1966 Dickson	1991 Yahya	2005 Kent and Smith	2009 T&P	2009 Ho	2010 Watt et al
1	**Quality**	**Quality**	**Consistent del times**	**Quality**	**Quality**	Past project performance
2	Delivery	Performance history	Billing accuracy	Delivery	Delivery	Technical expertise
3	Performance history	**Price**	**Competitive Pricing**	**Cost (Price)**	**Price/Cost**	**Tendered Price**
4	Warranties & claims	Delivery	Comm of service disruptions	Prod facilities/capacity	Manufacturing	Project man. expertise
5	Prod facilities/capacity	Warranties & claims	Action+follow up complaints	*Flexibility*	Capability	Capacity
6	**Price**	Prod facilities/capacity	Equipment availabilitiy	Tech capability	Service	Client Supplier Relations
7	Tech capability	Desire for business	Knowledge contact personnel	*Repair services & follow up*	Management	Technical solution
8	Financial position	Bid set up compliance	Quality of drivers	*Information and commun.*	Technology & R&D	Company reputation
9	Bid set up compliance		Fin. Stability	Financial status	Finance	Org. expertise
10				*Innovation & R&D*	Flexibility	

Table VII starts off with the work of Dickson (1966) and Yahya and Kingsman (1991). Yahya and Kingsman used the same criteria as Dickson, but found a new ranking. In more recent years authors renamed some of Dickson's criteria and/or used their own definitions. In the work of all authors the criteria Quality and Price (Cost) are visible and Delivery is mentioned explicitly in 4 out 6 literature sources.

The criteria are ranked according to their relative importance, where the green can be described as 'high importance' and yellow as 'relative high importance'. The white criteria are still considered important by the specific authors, which usually means that at least 50% per cent of all considered sources by the author(s) mentioned the criterion.

Price

Price has first increased in importance compared to the work from Dickson (1966), but is nowadays usually considered to be ranked 3rd. As Ho et al. state: "The traditional single criterion approach based on lowest cost bidding is no longer supportive and robust enough in contemporary supply management" (Ho, 2009).

A reason for the higher importance of for instance quality and delivery of the criterion Price can be that criteria enter the decision making process for managers in case of complicated processes. Many researchers analyze business cases that are complex, rather than relatively simple transactions. For simple transactions an offer or proposition can be asked from suppliers, in which case Price is the most important criterion. In case the process is more complicated, suppliers are evaluated on many more criteria, as described in this chapter and costs alone are no longer the sole determinant.

Price is also the most discussed criterion and is sometimes called Costs. The criteria Flexibility and Repair services and Follow up, have increased a lot in relative importance. Innovation is a relatively new criterion. Environment and Social responsibility has entered the selection criteria rankings, but is still seen as relatively unimportant. It is important to be aware that the number of occurrences in literature can, but not necessarily does, say something about the relative importance of a criterion. For instance the recent financial crisis has made companies more aware on their costs and thus increasing the importance of this criterion.

Environmental and social criteria

Environmental criteria and Corporate Social Responsibility have entered the list of selection criteria. As Thanaraksakul and Phruksaphanrat (2009) state: "Corporate Social Responsibility (CSR) aspects are rapidly emerging as a substantial issue for business and management." Therefore more and more organizations include CSR in their supplier evaluation.

The subject CSR in the 'environmental and social responsibility' criterion appears only in 7.89% of the researched papers from the 1990s and 2000s by the authors. The authors state in this respect: "Although the CSR perspective contains the low level ranking, it cannot be

eliminated because of expanding realization of environmental and social responsibility aspects as well as civil and legislative enforcements" (Thanaraksakul & Phruksaphanrat, 2009). Since their papers are fairly recent, this indicates that CSR and other aspects of the ENV criterion still have low importance or are not acknowledged by responsible managers.

Despite the absence of CSR as a criterion in most papers on selection criteria, Thanaraksakul and Phruksaphanrat include CSR in a balanced scorecard, as is shown in figure 7 (Thanaraksakul and Phruksaphanrat, 2009). According to Emmett and Crocker (2009) "The balanced scorecard (BSC) enables organizations to clarify their vision and translate them into action." A balanced scorecard originated from Kaplan and Norton (2005) and is often used in Total Quality Management. It incorporates three essential skills: management, information technology, and measurement skills (Emmett & Crocker, 2009). The BSC exists of four perspectives: learning and growth; business process; customer; and a financial perspective (Kaplan & Norton, 2005).

Figure 7 Balanced Score Card. Reprinted from: Thanaraksakul, W. & Phruksaphanrat, B. (2009). *Supplier Evaluation Framework Based on Balanced Scorecard with Integrated Corporate Social Responsibility Perspective*

The authors allocate the selection criteria to the 5 (including CSR) perspectives of the BSC framework. They observe that the Internal Business Process perspective contains most of the criteria and all high level ranking criteria. Whereas the other criteria are all allocated to the four known perspectives, the CSR perspective contains only the low level ranking criterion 'environmental and social responsibility' (ENV). This means that although companies are taken an effort to incorporate CSR in their selection processes, but they still have trouble implementing these aspects.

Not stated by Thanaraksakul and Phruksaphanrat, but part of the relative low importance of the environmental criterion can be explained. This is that due to the fact that the authors take studies from an earlier and relatively long time period (1990s and 2000s). If for instance a time period of 2005 to 2011 will be chosen, the percentage of the environmental criterion will increase. It is therefore advised when researching how difference in relative importance has developed over the years, to take a moving timeframe. A disadvantage of this solution is that the amount of available sources will go down, as fewer years of research are available.

4.2 Selection Criteria in Practice

In this chapter selection criteria that are used in practice are researched. Criteria can first of all be derived from ex ante and ex post studies. The criteria from literature that were researched in the previous paragraph will be used for comparison. Selection criteria that are used by CEVA Logistics are analyzed with the help of the two case studies described in chapter 3. Some information on the process is repeated as this explains how selection criteria are derived and on what point in time.

4.2.1 Ex ante evaluation

In this paragraph the way that selection criteria are determined at CEVA will be described. In cooperation with the customer KPN the valid criteria are determined. First of all, selection criteria that can be derived from ex ante evaluations are discussed.

As the logistics service provider for KPN, CEVA should be able to translate the wishes and requirements of KPN into actions. CEVA is responsible for selecting distribution carriers that comply best with the wishes of KPN at the best price. A general process by which carriers can be selected is shown in the figure below and was taken from de Boer (2001).

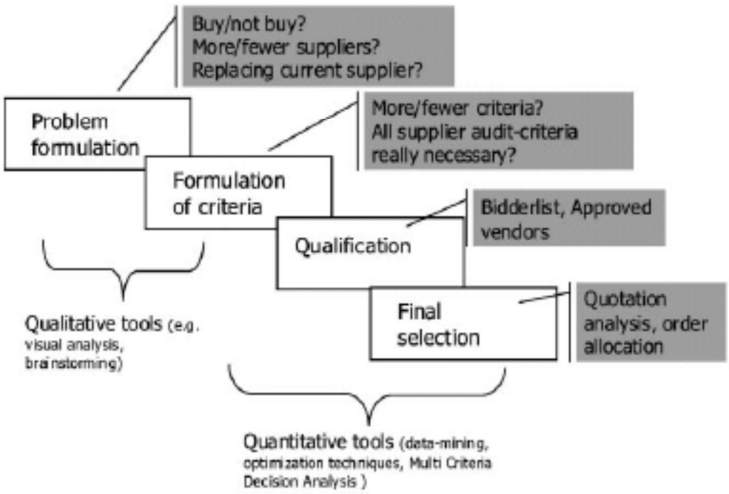


Figure 8 Formulation of criteria in a general selection process. Retrieved from: de Boer, L. (2001). "A review of methods supporting supplier selection". *European Journal of Purchasing & Supply Management* 7 (2001) 75-89

Figure 9 (de Boer, 2001) is taken as an example to show the basic steps in a selection procedure. In this paragraph the focus is on the formulation of criteria and will be discussed based on the business cases from chapter 3. The figure from the Boer is shown to illustrate where in the process the selection criteria are derived.

Business case Delivery Plus

This business case is an example of an ex ante evaluation and its characteristics were explained in chapter 3. The process for the business case Delivery Plus started with the discovery of potential new technology by KPN managers. They became aware of a carrier

that was able to process contracts digitally which could lead to higher customer satisfaction and numerous advantages. KPN asked CEVA to research whether this technology could be set up for KPN as well and which carrier should be selected for this service.

CEVA was confronted with an ill structured problem. The innovative technology had to be researched and it should be decided whether it should be acquired. CEVA decided to research whether the current supplier was able to provide the new technology in the short term, or whether a different supplier should be sourced. CEVA formulated the problem as follows (Dutch): "Innovatie bezorg process zendingen met aanvullende services Nederland".

In October 2011 CEVA convinced KPN to send out a RFQ tender to decide which carrier should be selected. According to Yahya and Kingsman a selection procedure is often started by defining the applicable selection criteria (Yahya & Kingsman, 1999). De Boer (2001) claims that the process start with the problem formulation. In appendix V a generalized list of criteria is defined based on various sources, from this whole Msc. Thesis. As a viewpoint the final customer was taken, so that the process would be designed to satisfy the final customer. The most important sources were:

- Lessons learnt from literature
- Knowledge obtained during both formal and informal meetings with carriers
- Contract with current carrier
- Service Level agreement current carrier

Commitment from responsible KPN managers was relatively low in the beginning of the process, but CEVA was supposed to set up a RFQ. After some time the list of criteria including definitions was reviewed internally at CEVA and send to the three responsible managers of KPN for validation. The KPN managers were instructed that they were allowed to make adjustments as much as they preferred. Not only the criteria could be changed, added or removed, but also the definitions could be altered. The result can be seen in the table VII.

Table VI Criteria Delivery Plus

Subject	Criteria	Weight	Definition
Quality			
	Consumer experience		Customer experience and conformaty to requested process
	Conversion		Predicted conversion based on references
	Service		Real-time communication to customer and quick response
Price			
	Budget		Budget calculated for the predicted volume
Process			
	Technology		Technological solution and its maturity
	Time windows		Time windows 2 hours at order intake, 6 days / week
	Capacity		% of volume form the client
	National coverage		Exceptioned areas from coverage
Organisation			
	Continuous improvement		Vision statement and argumentation
	Implementation time		Maturity of the concept
	Financial stability		Financial statements and annual reports
	Environment and CSR		CO2 emissions, paperless process and CSR activities
	Management		Managerial capacity

Management of KPN made only minor alterations to the list and definitions of the criteria. The definitions of the criteria are given in Dutch for maximum clarity and understanding and will now be explained further.

Quality

Quality is often hard to define. For this business case 3 main drivers are applicable for KPN. Consumer Experience is valued very high in general and was an important part of the goal of this business case. Conversion is the amount of successful delivery attempts as a percentage of total undertaken delivery attempts, and was defined in multiple KPI' later in the process. Carriers were asked for references of comparable business cases on conversion. Service is a criterion that was added to get an idea of the service level that the carrier is able to provide for both KPN and CEVA as the final customers.

Price

For this business case both qualitative and quantitative criteria were researched. The aim of a procurement process is to get a clear view of the required quality of the process and the specifications. In the process the volume (Q) is set off against the offered price (P) of the carrier. The financial manager of CEVA stated that a Budget should be calculated for each carrier, multiplying Q and P.

Process

For the process the following criteria were defined: Technology, Time windows, Capacity, National coverage. Possible new Technology was the trigger for the business case and carriers were compared on the degree of maturity of their technical solution. Time Windows is a case specific criterion and is a main driver for customer experience, which is confirmed by the report of Delivery Match (2011). In figure 10 (Delivery Match, 2011) the results are shown of an enquiry in which consumers were asked on the preferred size of time windows.

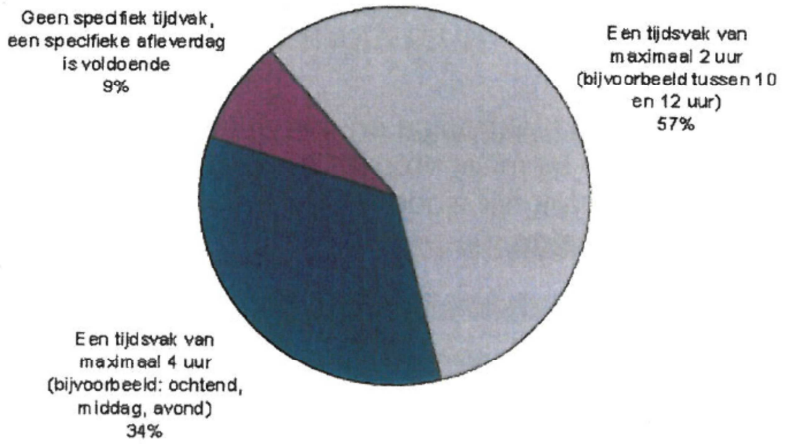


Figure 9 Customer preferences of time windows. Retrieved from: Delivery Match, (2011). *Webwinkellogistiek Onderzoek 2011*. Ruigrok NetPanel

The criterion Capacity is to make sure that the future carrier has enough capacity for the volume from KPN. With National Coverage a distinction can be made between carriers on for instance the process on the Wadden islands where there is not always reception of telecommunications.

Organization

Both CEVA and KPN find it important that partners actively aim to continuously improve the quality of provided processes and services, hence the criterion Continuous Improvement. Implementation Time says something on the speed with which a carrier is able to provide a (new) solution and Financial Stability of partners is a requirement for KPN in general. Management is a criterion which provides a possibility for judgment of the quality of management of the potential carriers and their actions. Carriers are further

distinguished on the basis of their efforts to reduce emissions, corporate social responsibility (CSR) and their ability to provide the distribution process paperless.

Further analysis
The criteria and their respective weights were left intact during the process. Criteria were subdivided into subcategories and three potential carriers were scored. The way this is done is described in the next part of this thesis.

Service Level Agreements and Key Performance Indicators
KPIs play a more prominent role in ex post evaluation, whereas SLAs play a more prominent role ex ante. This is partly because SLAs are more applicable on a strategic level, whereas KPIs are more applicable at a tactical level. As an example some SLAs and KPI from practice examples at CEVA is shown in table VIII.

Table VII SLA and KPI

SLA	**Definition**
% Successful appointments	Delivery appointments made / Orders taken in
% Successful deliveries	Delivered orders / Delivery appointments made

KPI	
% On Time delivery time window	Orders delivered in agreed time window/ All appointment in time window
% On Time delivery according to ETA	Amount of orders delivered within 1 hour around the promised delivery time
% Deliveries compliant to acceptance policy	Amount of Deliveries that are allowed by the acceptance policy

The SLAs in this example are on all orders that were to be distributed by the carrier. KPIs on the other hand zoom in on one detail level lower since all orders are divided per part of the day (morning in the example) or on specific characteristics of the service.

Conversion
In customer delivery a recurring criterion is conversion. From the example from Table VIII, the conversion is made up of the two SLA' together. Conversion has a big impact on the costs of delivery and customer satisfaction. Therefore it is one of the criteria that should be improved and is used as a control and design measure. Many different factors influence conversion and these factors are explained in this Appendix I. First of all, as stated a definition of conversion that CEVA-KPN uses is:

% successful conversion = Delivered orders / Order take ins

To make this term more clear the following causal relationships are drawn.

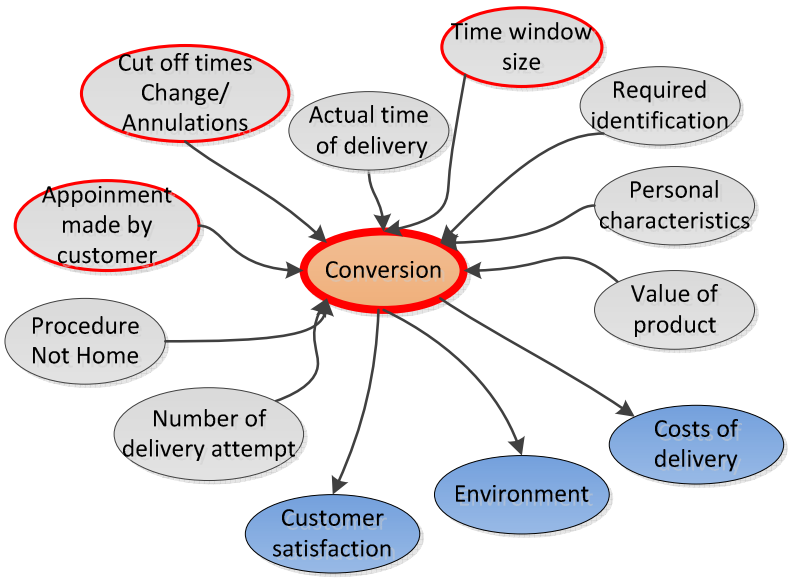


Figure 10 Conversion explained

4.2.2 EX POST

In the previous paragraph approaches and techniques to analyze the relative importance of criteria were described. In this paragraph the way that selection criteria are determined at CEVA will be described. In cooperation with the customer KPN the valid criteria are determined. Selection criteria can be derived from both ex post supplier evaluation and ex ante evaluations.

One of the lessons from the previous paragraph is that specific circumstances or product characteristics determine an important part of the selection criteria and their relative importance. The difficulty here lies in the commitment of responsible managers. In case a certain business process in on the agenda of higher management, they are willing to cooperate and devote resources to the process. Therefore most input originated from two business cases that are analyzed in this Msc. Thesis.

The performance of existing carriers needs to be monitored and evaluated. Service Levels and KPIs that were agreed on during contract negotiations or during business operations need to be complied to. One way that CEVA uses to evaluate existing carriers are Carrier Performance Reviews. Other possible ex post carrier evaluation techniques are to be found in TQM (Total Quality Management. For carrier sourcing ex ante criteria are needed. Ex post techniques and criteria are therefore used as possible input for ex ante evaluation criteria.

Carrier Performance Reviews

These reviews are performed by the responsible (transport) manager and input given by employees is registered. The carriers are evaluated on the following subjects, which was

taken from a form of groupage transport for Milk runs in the Netherlands and Belgium (CEVA, 2010). The subjects for the Carrier Performance Review are shown on the left in table X and their translation into (ex ante) tender documents on the right. As can be read later, selection criteria are divided or generalized into subjects for additional structure.

Table VIII Carrier Performance Review transformed into Criteria in Tender documents

Subject Carrier Performance Review	Subject in Tender document
Operations	Part of Process
Transit Times	Part of Process
Quality	Quality
Invoicing	Part of Financial
Communication	Part of Information
Drivers	Part of Quality
Management involvement	Part of General
Partnership & innovation	Part of Quality
Environmental management	Part of Environment and CSR
Overall summary	

The responsible manager is asked to rate performance indicators in these subjects on the following 5-point scale:

Exceeds **R**equirement (ER) = Carrier performance ***above*** agreed level

Meets **R**equirement (MR) = Carrier performance ***according*** to agreed level

Sometimes **M**eets **R**eq. (SMR) = Carrier performance ***somewhat*** below level

Fails to **M**eet **R**equirement (FMR) = Carrier performance ***far below*** agreed level

Not **A**pplicable (NA) = Question not applicable

Each subject is concluded with an overall ranking and there is space for positive and negative comments. For the Overall summary the carrier is rated on the following question: *How would you rate the overall performance of the carrier?* Carriers are rated on this 5-point scale, including the provided definitions. Next, different carriers can be compared and follow up actions can be decided.

From the Carrier Performance Review evaluation criteria can be derived. First of all carriers need to comply with the specified requirements and process, and have sufficient capacity available. Next, flexibility for special requests is rewarded and communication (for instance in case of delays) is needed. When looking at quality the carrier should perform and report according to agreed SLAs and other measures are: ISO and other qualifications, efficiency and quality of transport equipment. Management should be involved which can be rated according to the amount of time it takes to get any additional resources for instance.

Important for CEVA Logistics is innovation and continuous improvement, as CEVA is rewarded not only on their own performance and efficiencies, but also on that of the distribution carriers. From a procurement point of view the total cost of ownership (TCO) is much more important than the 'price' or the 'costs' of a carrier. According to the procurement manager Rijswijk of CEVA: "We are not looking for the cheapest price, but for the *best* price, which minimizes the TCO" (personal communication, November 2011). Other criteria from a procurement view are mainly on invoicing. Invoices are preferably paid as late as possible (for instance 60 or 90 days after receipt) and contain sufficient detail.

A last category that CEVA takes into account is environmental management. The carrier is asked whether its trucks comply with EURO norms and ISO140001 certification. Also, special equipment to reduce fuel consumption and to reduce sound is rewarded.

In the overall summary the carrier is ranked according to the same 5-point scale. The final score might be based on the scores of the individual subjects, but no weighted scoring is explained. It is unclear on what frequency the carriers are evaluated and this differs per site.

Different views

As CEVA takes care of the logistical activities for KPN, the wishes and requirements of KPN have to be known and satisfied. Carrier performance and selection is an integral part of the logistical services for KPN. However, KPN does not give away total control and important decisions are – after consultation and consensus – decided by the client KPN.

To make the sourcing and selection process of carriers even more complex, carriers might have different views on the service or product to be delivered. Carriers want to win contracts and are often prepared to lower the offered price to beat competition. Next, according to Kindt et al (2011) the tendency is to answer whether certain services can be provided by the carrier is always "yes" (Kindt et al, 2011). Criteria on which the carriers are to be selected are interpreted differently, as was already stated in the previous chapter. Emmett and Crocker summarized the views of the supplier in the following table, where the Supplier represents the potential carrier and the Customer is CEVA/KPN (Emmett & Crocker, 2009, chapter 5).

Criteria	Suppliers want:	Customers want:
Orders	The "business"	Delivered/available goods/services that satisfy a requirement
Information	Clear requirements	Wants clear status information
Performance	Feedback (KPIs that are jointly measured and, benchmarked with other suppliers)	"Feed-forward" (Pre-advice and proactive status/alerts)
Relationship approach	"Fairness" Involvement/"Part of"	Relationships may be a reflection of the procurement portfolio and power positions
Price/Cost	"Fair"	The "best" total acquisition cost, total cost of ownership, life cycle cost, whole life cost (TAC/ TCO/ LCC/ WLC)
Quality	Clarity on what it means and what is "valued" by the customer	"Fit for purpose"
Delivery	On time, in full (OTIF)	On time, in full (OTIF)
Quantity	Large regular orders	Smaller, frequent deliveries
Time	Supplier lead-time	Supply lead-time
Place	Ex Works (International) or Factory Gate Pricing (Domestic trade)	Delivered domicile duty paid or Delivered/Carriage paid
Payment time	Prompt	To negotiate

Figure 11 Different views of Criteria. Retrieved from: Emmett, S. and Crocker, B., (2009). *Excellence in Supplier Management.* Cambridge Academic, Chapter 5

Emmett and Crocker state that during negotiations these different views should be kept in mind to counter possible disappointment (Emmett & Crocker, 2009). The different criteria are consistent with those found in literature in the previous chapter, but the relative ranking is not described by the authors. More importantly, the relative ranking is determined by the customer, as they have the 'business' to offer and will pay for future services provided by the supplier. Even more important is the view of the final consumer. This point of view will be explained in the next paragraph.

4.3 CONSUMER WISHES

In the previous paragraph was stated that CEVA should translate the wishes of its client KPN into the choice for the right distribution carrier. In fact, not the client has to be satisfied, but the client's customers, or the final consumers. Therefore in this paragraph the point of view from the (final) consumer is taken. A study for consumer wishes from Massen and van Woerden (2010) will be discussed on delivery from e-tailers, as more and more consumers order their products online, as is the case for KPN.

At the end of the year 2009 Massen and van Woerden for Ruigrok Netpanel researched the logistical wishes amongst 1000 Dutch consumers commissioned by Delivery Match and Thuiswinkel.org. They researched the preferences for the delivery of products that were

ordered online. The focus was on deliveries that don't fit standard mailboxes, so that the customer has to be at home to receive his/her order.

Customer delivery of products is not that different between retailers and e-tailers, which makes the research from Ruigrok Netpanel a valuable source for recent wishes of consumers. Interestingly consumers do not necessarily demand to receive their online ordered products within 24 hours. For consumer electronics only 11% declares that delivery within 24 hours is very important and 31% important as can be seen in figure 13 (Massen & van Woerden, 2010). Much more important is the availability of information on the moment of delivery. 48% states that this information is very important and 37% thinks it is important.

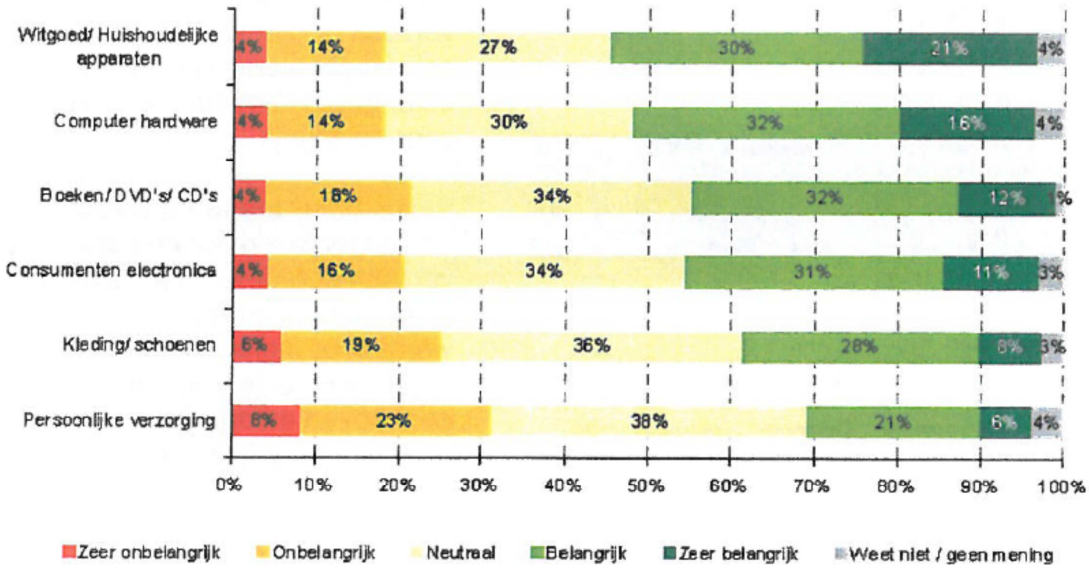


Figure 12 Importance of Delivery within 24 hours. Retrieved from: Massen, K. and van Woerden, N. (2010). *E-commerce & Logistiek*. Ruigrok Netpanel

Other important aspects for the delivery of online ordered products are the visibility of whether products are in stock (46% very important; 44% important) and the ability to choose a delivery day and moment (42% very important; 44% important) (Massen & van Woerden, 2010).

Further conclusions that Massen and van Woerden state, are that customers prefer to receive their products on their home address. Deliveries on service points are satisfactory in general, and the customer would like to have the choice to have his/her products delivered at a service point. 73% Is not prepared to pay more for the delivery in a specified time window of a certain delivery day, whereas 17% is prepared to pay additional charges.

Delivery at the neighbors of the customer shows diversified opinions. Customers who ordered products online have negative experiences with delivery at the neighbors: 19% of the negative experiences. On the other hand 68% of the customers would like to have the

opportunity to have their products delivered at their neighbors, whereas 19% state that this is not desired (Massen & van Woerden, 2010).

Most important for companies in e-commerce is to have an excellent order process. At the moment a customer places an order the following information should be clear:

- Stock information
- Delivery appointment on a specific day and time window
- Alternative options: delivery in the evening or Saterday or at the work address
- Options when first delivery attempt fails: neighbors, service point, alternative address

Choice
From the research of Massen and van Woerden (2010) and a research from Delivery Match on the logistics of e-tailers in 2011 several lessons can be learned. First of all the availability of information is very important and this information should be easy to find for the customer. Not only product and stock information should be available, but also information on available services, like delivery options. Service points are valued positive. Cut off times for the placing of an order for next day delivery shift towards later on the day. A track and trace function has almost become a must have for companies with an online order channel.

Customers nowadays take certain services for granted. Companies can differentiate positively by providing choices for customers. For instance in case a delivery attempt fails, the product is delivered at a service point or at the neighbors of the customer. For this particular customer it would have been better if the product could be delivered the next day at his/her work address for instance. Customers should therefore be given the possibility to make their wishes known and change their preferences till as late as possible (cut-off times).

4.4 Conclusion and Discussion Selection Criteria

In this chapter selection criteria were derived for the consumer distribution of telecom products. Selection criteria were derived in practice at CEVA Logistics and this was compared with valid selection criteria in literature. The sub research question that is researched in this chapter is: *What selection criteria are applicable at CEVA Logistics and how can they be derived?* To do this the main conclusions from the various sources are discussed.

4.4.1 Selection criteria from Literature

As a starting point literature sources were researched for selection criteria. This way CEVA can learn from the results and the wheel needs not to be re-invented. Also, the relative importance of criteria was acquired this way. The selection criteria that occur most often in (recent) literature are: Quality, Delivery and Price. Quality is hard to define and to evaluate ex ante. It measures (perceived) performance on the requested service. Delivery is about

performing as promised and reliability and Price (or Costs) is the quantified value for the delivered service.

In literature different methodologies were used to derive selection criteria. Some researchers ask experts or experienced managers on their opinion (expert judgment), whereas others perform literature studies. In literature studies stated preferences and case studies are examined for criteria and their relative importance. Both methodologies have limitations in the amount of responses and non-response bias and different fields and sectors of the companies involved. In general, a combination of the two methodologies is preferred, so that they can be compared.

First of all, the pioneering work of Dickson (1966) was discussed, whose results are remarkably still applicable for the most part. Some criteria have become more or less important over decennia, but the criteria themselves are still valid in recent selection processes. Perhaps most interesting is the historic development of the criterion Price. After 1966 the relative importance of Price became more and more important from a 6th to a 3rd position. None of the studies that were researched found price as the most important criterion. Although in case carriers are selected on a single criterion, this criterion is usually Price. It might be the case that since the financial crisis the criterion Price has increased in relative importance, but the author of this thesis doubts that this criterion is the most important in complex selection processes. The most common criteria found in literature, ranked according to their relative importance are (amongst others: Yahya & Kingsman; 1991; Ho, 2010; Watt et al, 2010):

1. Quality
2. Delivery
3. Price/Cost
- Technology
- Capability
- Service
- Innovation
- Past Project Performance
- Communication
- Technical solution

The reason that the first 3 criteria are numbered is to show the fact that they are relative more important than the others. In complex selection processes the other criteria are also asked, but are mentioned significantly less often in literature.

The criterion Communication is relatively new as is the criterion. Environment and Corporate Social Responsibility (not in the list). Although environmental consciousness has increased over the years (Thanaraksakul & Phruksaphanrat, 2009), it is still considered relatively unimportant.

Remark Risk

Absent in the list of almost all researched studies, is the criterion Risk. Companies always have to consider risk when working together with other companies whether they are suppliers or any other business. The financial crisis has made people and companies less thrusting towards others and for instance lending money for investments requires higher interest rates to be paid, compared to a few years ago. Possible explanations for the absence of risk is the fact that risk might be too hard to define and quantify for many companies. Another explanation could be that decision makers only start a selection process with carriers of whom they are quite certain that risk is acceptably low, although this might only be based on gut feeling.

Remark Case specific

Many authors state that in individual cases, in different environments and with different personalities the relative ranking of criteria can be different from their results (for instance Sonmez, 2006). Attention should be paid to criteria that are left implicit in certain cases. For instance due to historic relations, carriers are no longer asked for their performance on certain criteria since this is already known. Also, criteria are sometimes eliminated as they are no (longer) discriminating factors between possible carriers. Another reason for elimination of criteria in specific cases can be the transformation of a very important criterion to a prerequisite, before the selection process is entered.

4.4.2 Selection criteria from Practice

Quite some similarities can be found for the selection criteria in literature and practice. The criteria in practice are focused on consumer distribution in the Dutch telecommunication sector. Two business cases are the main source for selection criteria in practice and they will further be explained in the next chapter. To come to a general list that is applicable for all selection processes in consumer distribution of telecom products, categories of criteria were constructed in table X.

Table IX Categories of Selection Criteria

Category	Examples
General	Stability and capacity
Financial	Budget, surcharges and volume bonuses
Quality	Conversion, Technology and communication
Process	Time windows and cut-off times
Environment and CSR	Kg CO2 emitted and paperless process
Information	Redundant IT systems and Privacy
Other	Optional additions/improvements

The categories of criteria: Financial, Quality and Process can be compared with Price/Cost, Quality and Delivery from literature. The Environment and CSR category is present in some literature studies, but is not valued high importance. Information is usually combined with communication in literature and the General category contains some criteria like company information and its stability.

Improving carrier' performance does not stop at the end of a selection process when a decision is made. The performance of the operation carrier is measured as was explained in the paragraph of ex post evaluation. Transport Quality Management techniques therefore provide a good source for selection criteria.

Remark Generalization
The exact definitions of the criteria will differ between different processes, and organizations (Emmett & Crocker, 2009). For instance the criterion Time windows for the category Process is specific for consumer deliveries, and for some products consumers agree to stay at home for an entire day, while for others a time window of 4 hours is maximum. Comparing different lists of criteria can be hard due to case specific criteria. The generalized list presented above can be used as a starting point, but exact definitions and values or measurement scales have to be added for each individual selection process. This will further be discussed in Part III (Design).

4.4.3 Selection criteria from Consumer wishes
An effective selection process is focused on the final customer. It is the final customer that buys the telecom products and therefore his wishes need to be satisfied. A carrier that performs best in fulfilling the customer' wishes is therefore preferred. Researches on (home) delivery were therefore studied.

Interestingly consumers do not necessarily demand to receive their online ordered products within 24 hours. Much more important is the availability of information on the moment of delivery. 48% States that this information is very important and 37% thinks it is important (Massen & van Woerden, 2010). Furthermore, according to the research modern consumers prefer time windows of 2 hours (57%) or 4 hours (34%), instead of having to stay at home for an entire work day. However, most people are not willing to pay additional charges for such improved services. Companies should certainly consider establishing service points where customers can collect their products (Massen & van Woerden, 2010).

In practice CEVA tries to fulfill consumer wishes as good as possible for KPN. Real time insight in the delivery options through information on stock levels, action when a delivery attempt fails, possible addresses, time windows, delivery costs, etcetera, should therefore be provided to the customer. Next, the customer wants to be able to make his/her preferences known and choose between available options.

4.4.4 SELECTION CRITERIA

With the help of the previous paragraphs sub research question 2 is answered:

Which criteria are applicable for supplier selection and how can they be derived?

A general list of category of selection criteria for distribution carriers for telecom products is shown in 4.4.2. This list was developed with the help of two business cases, lessons from literature and researches on consumer wishes. Most important are the categories of criteria: Quality, Financial, and Process. These criteria are consistent in both literature and practice.

Many of the selection criteria from literature that were ranked according to scientists between 4th and 10th most important were used in practice as well. However, in most cases these criteria from literature are rephrased and redefined. This way they become case and organization specific as this best represents the client's wish. Environmental criteria for instance have increased in importance in recent years and the client KPN wants to include this criterion. The category Information is needed as a backbone for any process. Next to case specific criteria, carriers can be asked for their recommendations or additions to the requested service.

Whether the criteria in practice from CEVA are valid, including their relative importance, can best be evaluated afterwards through the impact on sales and customer satisfaction surveys. In other words, after implementation with the winning carrier, performance measurements should tell if in fact the 'best' carrier was chosen.

CHAPTER 5. SELECTION PROCESS IN LITERATURE

In this second research chapter literature is researched on how the selection processes at CEVA might be improved. Different sourcing and decision making techniques exist and will be explained briefly. Next, improvements and additions to the current selection process at CEVA are researched. In paragraph 5.1 different sourcing techniques will be discussed. Tendering is elaborated on in paragraph 5.2. Finally, improvements and additions to the practice situation at CEVA will be formulated in 5.3. The sub research question 3 will be answered:

Which improvements and additions to the selection process at CEVA can be found in literature?

5.1 SOURCING TECHNIQUES

Procurement is a very important department for a company when it comes to sourcing. Procurement can negotiate with operations and other departments and should manage the process. Emmett and Crocker state in their book "Excellence in Supplier Management" to this aspect: "many organizations actually operate procurement sub-optimally. All value, risk, cost, service, etc. are involved in a complex series of trade-offs and these must be examined with all relevant parties to optimize the 'whole' business/supply chain" (Emmett & Crocker, 2009).

The authors distinguish four aspects for different procurement strategies for the pre-order stage. This stage includes all activities from specifying the requirements until selection of a carrier and negotiating a contract with that carrier. It can be compared with the first 2 steps from CEVA's methodology as described in paragraph 3.1. There are many different strategies that companies can consider. Which strategy to follow differs for instance from the nature of the products/services, market circumstances and costs of disruption (Emmett & Crocker, 2009). With market circumstances also existing relationships have to be taken in to account.

According to Rijswijk (2011) the main sourcing technique that is commonly used for strategic decisions is tendering (personal communication, November 2011). Emmett and Crocker (2009) argue that there are different methods to handle tendering methods. For instance carriers can be asked to fill in an elemental questionnaire, or are asked to participate in auctions. Carriers can also be asked to participate in a sourcing process where a RFI (Request for Information) is followed by a RFP (Request for Proposal) or RFQ (Request for Quotation) with accompanying meetings for explanation and relationship building. Independent of the nature of the products and other circumstances tendering is the most often used technique for strategic decisions as the authors argue (Emmett & Crocker, 2009).

According to Willcocks (2007): "Tendering is generally the most common and effective strategy to select suppliers. Joint decisions involving the CEO, business executives and IT are the most effective" (Willcocks et al., 2007). He argues that tendering is supposed to be a structured approach and that with the involvement of the right stakeholders the best decision can be made.

Different sourcing techniques from rather simple to complex are:

- Purchasing an existing service from a carrier
- Negotiating for a better price of existing services
- Asking different carriers for a bid/proposal for comparison (benchmarking)
- RFP/RFQ tender
- RFI followed by RFP/RFQ tender including meetings and negotiations

The first technique is rather simple and does not involve any negotiation. Carriers operate certain services and have stated a universal price for most of their customers. Next, a buying company, can negotiate for a better price (and/or higher quality), for instance through large volumes. According to Willcocks direct negotiation is "only likely to be successful if:

- The client is an informed buyer and knows the market prices and industry norms regarding service definitions, technology and key performance indicators
- The organization knows exactly what it wants and can quickly draw up an effective contract, service level agreement and price schedule
- Speed is more important than cost or exploring alternative solutions comparing service providers. But organizations must be careful not to throw away advantages in speed by poor preparation
- The client is an experience outsourcing manager and can expertly manage the provider and the arrangement
- The client has significantly more bargaining power than the service provider" (Willcocks et al, 2007).

The third step is competitors for a specific bid/proposal for comparison (which can be seen as benchmarking, although benchmarking is most often used for the comparison of the internal process with that of competitors).

The last two techniques are related, but differ in the throughput time and number of phases. Asking for a RFP/RFQ is close to the previous step, but in this case more detail is asked and carriers are notified that they are competing to perform the service. The last technique involves multiple rounds where the required service is first designed according to the information gathered in a RFI. Next the number of carriers is perhaps shortlisted and the remaining carriers are asked to provide more detail in a RFP/RFQ. At the end of this chapter the sourcing techniques are compared with those used by CEVA.

5.2 TENDERING

In their book International Logistics and supply chain outsourcing, Rushton and Walker describe a step-approach for their selection process. "In order to ensure that all of the many different aspects of contractor selection are adequately addressed, it is advisable to adopt a general, step-by-step approach" and the main technique for contractor selection is tendering, according to the authors (Rushton & Walker, 2007). The steps are shown in the figure below and further described in this section.

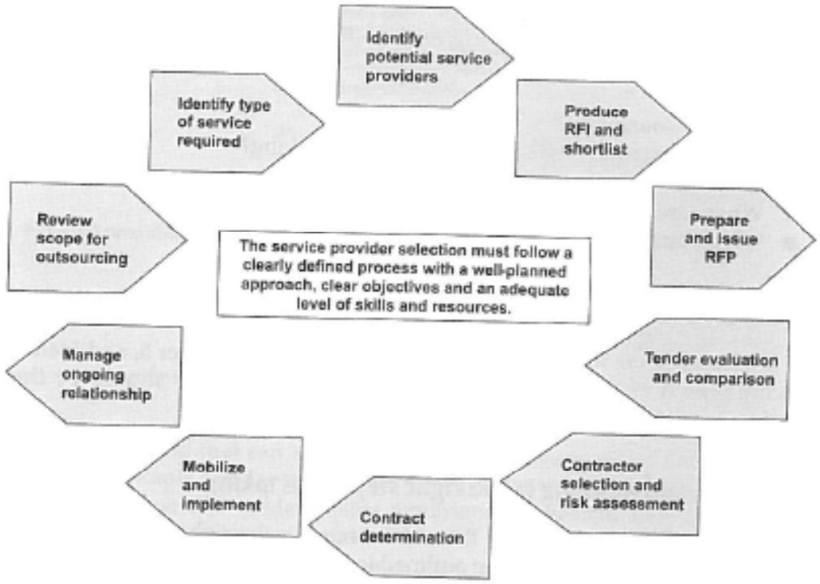


Figure 13 Contractor Selection Step. Retrieved from: Rushton, A. & Walker, S., (2007). "The Selection Processs". *International logistics and supply chain outsourcing*, chapter 7

As can be read in figure 14 (Rushton & Walker, 2007) in the middle, the process should be clearly defined with clear objectives and the right skills and resources should be available. This can be seen as a valuable recommendation for any sourcing process. In the next paragraph the step-by-step approach will be discussed..

Scope

The approach that is presented starts at the left: internal review of the scope for outsourcing. In this respect Rushton and Walker state that "It is important to adopt a clearly defined process that is well planned, has clear objectives and is adequately resourced, so that the many key stages can be successfully completed" (Rushton & Walker, 2007).

As the scope is clear, it should be decided which sourcing approach to adopt. To do this the company should decide whether a multi-user or dedicated user approach is desirable. When the type of sourcing approach is known, a clearer idea can be formed on the main requirements which will become helpful when for instance a tender needs to be prepared. Next, the approach can help with setting up a long list for potential contractors (Rushton & Walker, 2007).

Type of Service
After the scope is clear, the company can now identify the type of service that is required. This follows from the scope of the project and for CEVA Logistics this mainly exists of transportation services. This will be further discussed later on in this chapter.

Identify potential service providers
Next, a market research can be performed which (type of) companies are capable of performing the service with the required scope. From this a long list can be constructed which can be narrowed down to the candidates that express their interest and are able to comply with the most important requirements.

Produce RFI and shortlist
Companies that appear on the long list should be contacted to see whether they are interested and capable of performing the job with sufficient resources and network coverage. This can formally be done with an Invitation To Tender (ITT). The companies that appear on the short list can then be sent a Request For Information (RFI). The main elements of an RFI according to Rushton & Walker (2007) are:

- Introduction and confidentially clause
- Description of the company and products
- Description of the service required
- Description of the selection process, including a timescale and the criteria
- Description of what information to provide by the candidate and in what format

The aim of a RFI is to find suitable companies that are capable and willing to perform the required service. According to Rushton and Walker selection of potential providers is often based on:

- Written response to RFI
- Assessment of supporting documents
- Current client list
- Contact and feeling with provider
- Assessment of broad capability
- Financial probity of the company

Prepare and issue RFP or RFQ
The main aim of a RFP or RFQ is to provide detailed data and information so that the potential providers can provide a plan and costs (Rushton & Walker, 2007). The companies can then be compared based on their responses and it is decided which companies are to be invited for final negotiations. According to the authors "There are four main objectives for the RFP from the user company viewpoint:

- Provide a specification of business requirements to selected vendors in a standard format
- To facilitate objective comparison of proposals
- To maintain an equitable flow of information across all tendering companies
- To establish total confidentiality rules

To reach the above objectives a lot of detailed data and information is needed. Typical parts of a RFP are shown in the following list from Rushton and Walker:

1. Introduction, including confidentiality clause.
2. Background to operating company.
3. Business description.
4. Data provided with the invitation to tender.
5. Physical distribution specifications.
6. Information systems.
7. Distribution service levels and performance monitoring.
8. Assets currently employed in distribution operations.
9. Risk assessment and transfer.
10. Industrial relations.
11. Business relationship: contract type and contract management relationship.
12. Charging structure.
13. Terms and conditions.
14. Environmental issues.
15. The selection process, including key selection criteria.
16. Response format.
17. Criteria for award of contract.
18. Timescale and method of submitting clarification questions regarding the RFP.
19. Deadline for submission of a response to the RFP.
20. The proposed start date for the contract after award.

Retrieved from: Rushton, A. & Walker, S., (2007). "The Selection Processs". *International logistics and supply chain outsourcing*, chapter 7)

Looking more closely at the list a division can be made. Parts 1 to 10 include more or less general questions for any collaboration between companies. Parts 11 to 20 can be asked in a tender procedure and are more case specific.

Tender evaluation and comparison

The previous points on the list largely determine how much time and effort will be needed for this step. Companies should be compared on both quantitative and qualitative criteria. Quantitative criteria are mainly based on costs and most important to remember in this aspect is to make sure that everybody involved agrees on what is included and what is excluded. Also, the lowest price/quotation may not be the best, since the lowest price is often achieved by compromising on quality (Rushton & Walker, 2007).

Qualitative assessment might be more difficult to compare, due to the fact that qualitative criteria are bound to be subjective. Rushton and Walker propose to handle qualitative criteria using an evaluation matrix. Methods for qualitative assessment are discussed in Chapter 3. Most important is that all people involved are aware of the definitions of all qualitative criteria. The comparison will often end in a recommendation with which 2 or 3 providers negotiations can be set up. According to the authors an often made mistake is that the comparison of tenders is seen as the last part of the process: "This is usually perceived to be the major part of the selection process, and is frequently treated as the final stage, but in fact there are still some key steps that need to be taken"

Contractor selection and risk assessment

The steps that have to be taken next are the selection of one candidate, which is often done after one or a few visits. Rushton and Walker argue that "the use of a structured approach for the assessment of the different tenders makes the final selection process a distinctly simpler task because the main points for comparison are much clearer" (Rushton & Walker, 2007).

Emmett and Crocker emphasize that carriers/contractors are selected for a large part on soft issues like attitude as is shown in figure 16. According to the authors: "One very clear reality (and often one not recognized)is that attitudes and feelings will definitely affect the way any service delivery is perceived. Accepting this view will require some flexibility from management…" (Emmett & Crocker, 2009). Only the top triangle in the figure is visible in practice and managers should be aware of this.

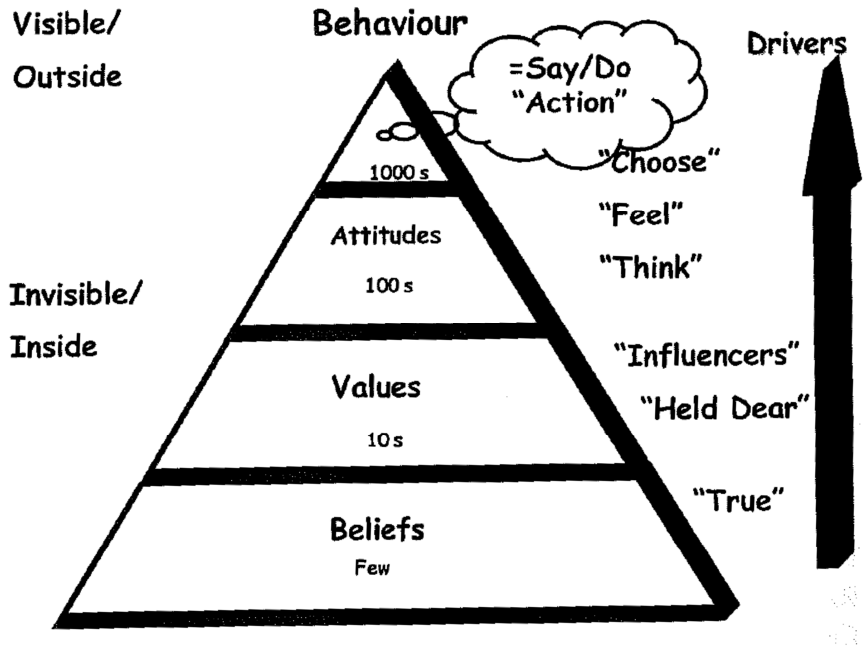


Figure 14 The importance of attitude. Retrieved from: Emmett, S & Crocker, B., (2009). *Excellence in Supplier Management.* Cambridge Academic

In the final stages of the selection process the user company (buyer) is working towards establishing a contract with one of the candidates. Negotiations are often planned with Operations, Procurement, Legal departments and perhaps even an external consultant. Next, although it is often neglected due to time pressure, it is wise to perform a risk assessment (Rushton & Walker, 2007). As the contractor is chosen and a risk assessment is performed, the user company can set up a development cycle which consists of an initial set-up, medium and long term processes.

Contract determination
In the final stages of the contractor selection process a contract will be negotiated. In most cases the contract will be set-up around the tender document together with any adjustments that are the result of negotiations. A Service Level Agreement (SLA) is an often used part of the contract. Important are the tariffs and obligations that the parties agree. Different tariff structures can be used and market power can determine what the pricing structure might look like. Different types of tariffs and contracts are outside the scope of this thesis. It is however vital to agree on the way performance of the carrier is monitored and how this is agreed on in contracts.

Implementation and managing the relationship
These lasts two stages are not further elaborated on by Rushton and Walker, but have a vital impact on the carrier' future performance. The implementation phase is also out of the scope of this thesis.

5.3 PROJECT MANAGEMENT

So far, techniques have been discussed how to select suppliers or in our case distribution carriers. This selection process can be seen as a (temporary) project, which eventually leads to a decision which distribution carrier to select. In this paragraph project management is briefly discussed. Lessons learned from this research field might improve the selection process at CEVA.

The selection process at CEVA The Hague can be initiated by different stakeholders. First of all the process can be started by the responsible manager(s) at the site The Hague. Second, the client KPN can ask for improved performance from the current carrier and suggest some form of sourcing. Third, the (national) headquarters of CEVA can initiate a sourcing project, for instance to achieve a better price. Another possibility might be the specific circumstances, as for instance at the end of a contract year a contract between CEVA and the carrier expires.

During the selection process a lot of time is required from the different stakeholders, in particular the site. A market research is usually performed by the individual site after possible consultation from other sites. Then, the required process – respecting the client's wishes – has to be designed and communicated to possible carriers. As we have seen in

Chapter 3, the process takes several months to complete, structure and analyze all required information.

As Emmitt states: "Projects involve a considerable amount of problem identification, problem solving and definition. Some of this is done in isolation, but most is conducted in disciplinary and multidisciplinary groups, thus the ability to make decisions is influenced by group dynamics, the effectiveness of communication within and between groups, and the level of trust that exists between stakeholders" (Emmitt, 2010). Different (inter)disciplinary groups can be seen as the different stakeholders who have different interests in the project. In all cases the sourcing of carriers is performed for the client of CEVA and their customers.

At CEVA the initiator is usually the one that does the biggest part of the work. To achieve continuous improvement for its client the initiator should in most case be CEVA. Their role is advisory and neutral so that the decision is made – in consultation with – by the client. This involvement can be seen as an interdisciplinary group that aims to achieve the highest performance for the client's customers.

Internal involvement from stakeholders at CEVA is a different story. Different departments and resources are often consulted ad hoc instead of in a structured way. Hence, selecting distribution carriers is observed as a 'process' rather than a 'project', as could be read in chapter 3. Project teams are not formed which would increase involvement.

As most business, the company culture and people employed has a major impact on performance. For instance Emmitt states: "The way in which people interact within the project environment and with their colleagues in their respective organizations will have a major influence on the success of individual projects and the profitability of the participating organizations" (Emmitt, 2010). Only in case there is enough commitment from correct resources, including higher management (Rushton & Walker, 2007) a qualitative process can be run.

5.4 Conclusion and comparison

In this chapter the selection process was researched from literature. Different sourcing techniques were described and tendering was elaborated. Next, lessons can be learned from the perspective of project management. The following research question can now be answered:

Which improvements and additions to the selection process at CEVA can be found in literature?

First of all, the most common technique for selection carriers is tendering. For instance as Willcocks state: "Most organizations use tendering to select service providers. Such an

approach has the advantage of putting pressure on service providers to deliver best value for money against their industry peers" (Willcocks et al, 2007).

Different authors place focus or emphasis on different parts of the process though. Difference in the nature of the products/services, circumstances (like bargaining power), available time and resources, experience from responsible managers, are all factors that influence the selection process. Not only the process itself can be (somewhat) different, also the contents of the sourcing documents.

Comparing the list of Rushton and Walker (2007) from paragraph 5.2 with the practice situation at CEVA, shows some adjustments. First of all, part 9 (Rushton & Walker, 2007): Risk assessment, is only based on some information on the financial stability and some past performance information (in case available) in selection processes at CEVA. Part 11, 12 and 13: Contract type, Charging structure and Terms and Conditions are aspects that the client KPN wants to dictate. As we have seen from Emmett and Crocker (2009) sufficient market power must be with the buyer, which is the case for KPN.

Parts 15, 16 and 17 are on the Selection process, Criteria and Response format for the carriers. The selection process and selection criteria are extensively discussed in this thesis. Criteria for awarding the contract to a specific carrier can be described in the form of objectives for the required service. The response format is elaborated on in Chapter 6. Part 18 is a valuable addition to the selection process at CEVA The Hague: "Timescale and method of submitting clarification questions regarding the RFP", as this is absent in the business cases described in chapter 3.

The process as described by Rushton and Walker (2007) shows further a lot of similarities with the selection process at CEVA as was described in chapter 3. One of the most important recommendations from the authors to implement in the process at CEVA is "to adopt a clearly defined process that is well planned, has clear objectives and is adequately resourced, so that the many key stages can be successfully completed" (Rushton & Walker, 2007). In other words, a good start is half the work and this should be achieved by consensus (internal and with the client KPN), commitment and deploying sufficient skilled resources.

The selection process in practice at CEVA agrees for a large part with literature. Literature spends more time and describes some aspects in more detail or lays a different focus. One of these is the engagement of carriers and relationship building. Literature describes tendering processes as a possible way of sourcing. Before sending out a RFI (and later a RFP or RFQ) an ITT (Invitation To Tender) can be send out. This document formally notifies possible carriers that a tender process is started and checks whether they are interested. Also, confidentiality can be arranged.

From literature can further be concluded that it is important to know who has negotiating power and how many carriers are available that could provide the requested service. This should become clear in the first phase of a selection process. According to Rushton and Walker the first question to be answered before engaging any selection procedure is whether the distribution should be outsourced at all. In case the distribution will not be done in house, the first step then is to determine the goal. Goal formulation should be done explicitly in consensus with the client KPN.

For instance Sonmez (2006) mentions on supplier selection: "It begins with the realization of the need for a new supplier; determination and formulation of decision criteria; pre-qualification (initial screening and drawing up a shortlist of potential suppliers from a large list); final supplier selection; and the monitoring of the suppliers selected (i.e. continuous evaluation and assessment)" (Sonmez, 2006). In practice, the amount of time needed for the pre-qualification phase depends largely on the difference or innovativeness compared to the existing process. The last phase: monitoring and assessment is often disconnected from the selection process by companies.

A step by step approach is advisable because of the many different aspects and information: "In order to ensure that all of the many different aspects of contractor selection are adequately addressed, it is advisable to adopt a general, step-by-step approach" (Rushton & Walker, 2007).

5.4.1 LESSONS LEARNED

From both literature and practice eat CEVA can be concluded that a step by step approach is favorable for complex selection processes. In literature more emphasis is placed on the determination of a goal and accompanying selection criteria at the beginning of the process. How selection criteria can be derived was explained in the previous chapter. Criteria and their importance can be dynamic due to varying degrees of information over time, which makes the process more complex.

From practice lessons that were learnt, were the importance of management involvement and commitment. These factors have a big impact on the (quality of) the process. During the whole process enough resources of the right quality should be available. The management of the client KPN should be on board. This is particularly important at the beginning of the process as a good start is half the work. Other stakeholders that should be involved are (at least) the Contract Manager and the departments from CEVA: Procurement, Legal and IT.

As a tender is chosen for the sourcing of distribution carriers, an extensive document is set up. Consensus with the client is needed and wishes and requirements should be clear. Consensus should be achieved on the goal of the process, the criteria to evaluate and their definitions. During the process new information and insights are gathered, which might lead to more or different (sub) criteria and other definitions.

Recommended is to meet with the possible carriers during the RFI or beginning of the RFQ phase. This way more detailed insight on the desired process is gained which provides a lot of additional knowledge for the shipper (CEVA-KPN). Another advantage is that relationships can be build. This is particularly valuable in case the shipper has negotiating power as the carriers will then try to show their best practice and provide most resources and commitment.

Looking at the sourcing process from a project management perspective can lead to a better understanding why certain resources are necessary in the process. Preferably an interdisciplinary project team should be assembled to design the required service, analyze the provided information and decide which carrier to select. In our case, the client KPN should always be aligned (procurement and business manager) and from CEVA, the departments: national procurement, IT and the business manager).

The third sub research question is hereby answered. The lessons learned will be used together with the results from chapter 3 (Current situation) in the next Part of this Msc. Thesis.

PART III DESIGN

The last Part of this Msc. Thesis brings all lessons learned together. A Vendor Rating Model is designed to aid decision makers in selection the right distribution carrier. The Vendor Rating Model will be verified and validated. Next it is explained how the Model can be implemented and used in an improved selection process at CEVA Logistics.

CHAPTER 6. VENDOR RATING MODEL

In this chapter selection criteria that resulted from chapter 4 will be used in a Vendor Rating Model. This Vendor Rating Model will be based on a Multi Criteria Decision Analysis technique. First it will be explained what a Vendor Rating Model and Multi Criteria Decision Analysis is and why they should be used. Next it will be explained which technique should be chosen and which information is needed from stakeholders. The chapter reflects back on the practice situation at CEVA described in chapter 3 and lessons learned from literature in chapter 5. Sub question 4 will be answered:

Should a Vendor Rating Model be added to the selection process at CEVA and if yes, how?

6.1 VENDOR RATING MODEL

Carrier selection is a typical Multi Criteria Decision problem. Possible distribution carriers are evaluated on multiple criteria. These criteria are put in a Vendor Rating Model (VRM) that is based on Multi Criteria Decision Analysis (MCDA). These methodologies will be explained in this paragraph.

6.1.1 WHAT IS A VRM?

A Vendor Rating Model is used to give a clear overview of the performance of various suppliers. As an example figure 16 from Gallo et al (2009) is presented on the next page. Criteria, weights, and scores come together in a VRM, which can be used both ex ante and ex post. Using a VRM in an ex post evaluation can be compared to benchmarking. In this thesis the focus is on ex ante evaluation: the selection of distribution carriers.

Business strategy is often based on different alternatives and dimensions, as is supplier selection. A decision has to be made between multiple alternatives, evaluating different criteria. One approach to do this is by Multi Criteria Decision Analysis (MCDA). In fact, all decision problems that are not based on one single objective, aspect or criterion – for instance 'costs' – are Multi Criteria Decision problems (Pruyt, 2009). The goal of a MCDA is often to analyze and rank the alternatives so that decision maker(s) is able to choose the preferred alternative based on the identified criteria.

In deciding the strategy which distribution carrier to select, different stakeholders are involved, as was explained in the previous chapter. Different views and opinions are to be considered. The MCDA methodology is suitable to handle this problem as it provides appropriate or compromise solutions, dealing with – if necessary – subjective scores. MCDA is open and makes trade-offs (if permitted) and scoring explicit (Dodgson et al, 2000).

MCDA is a valuable contribution to a complex decision problem. According to Pruyt: "MCDA methods aid the integration of objective measurement/comparison of alternatives on multiple dimensions and the subjective judgment of the relative value of these different

dimensions" (Pruyt, 2009). How objective measurement is achieved and how subjective judgment is treated will be explained in paragraph 6.2.

For the selection of distribution carriers, criteria were derived in Chapter 4. These criteria are used in a VRM to evaluate suppliers and for instance shown in the rows of a table. Each supplier is shown in its own column. This way the suppliers can be scored on all criteria. Next, weights are inserted and multiplied with the scores. Finally, all suppliers receive a total score and can be compared and ranked. An example of a Vendor Rating Model is shown in figure 16 (Gallo et al, 2009) in which only one supplier is rated.

Indicator *i*	Weights w_i	Assessment					
		Excellent	Good	Average	Bad	Very Bad	x
		10	8	6	4	2	w_i
Price	*8%*		*X*				*0,64*
Speed of Delivery	*23%*			*X*			*1,38*
Flexibility	*15%*		*X*				*1,2*
After sale customer support	*23%*				*X*		*0,92*
Qualità	*30%*	*X*					*3*

Figure 15 Vendor Rating Model. Retrieved from: Gallo, M. et al, 2009. A Vendor Rating Model resulting from AHP and the lineair model

In decision making situations a VRM can be used as a helpful tool. This is in particular useful in complex situations, where a VRM can then be used to aid decision makers. First the VRM displays the total scores of the suppliers and as substantiation the scores on all evaluated criteria are given. In practice there is (almost) never one carrier that outperforms other candidates on all criteria (Brans & Mareschal, 1994 - 2005). By its form and lay out a VRM can or should be useful for communication and discussion purposes and can so aid the decision making.

Input of the VRM can be given in any way and can be decided by the decision makers. On which criteria the suppliers should be evaluated and how is not restricted. For instance the chosen criteria can be general or case specific. The suppliers can be scored by individuals or a team in which case the scores can be aggregated.

6.1.2 WHY

In addition to some favorable characteristics already mentioned in the previous paragraph, it is now further explained why a VRM was designed.

The practice situation as in chapter 3 showed few structure in the selection process at CEVA. This led to some double work and a lot of time was spend on the analyzing phase of the proposals. Next, it became clear in chapter 3 that it is in CEVA's interest to have an efficient sourcing process. First of all the required service from the distribution carriers was detailed and send to potential carriers. The carriers were led free in the format of their response, resulting in manually structuring and analyzing the different responses. An improvement can be made by adding structure to the way information is given and asked from potential carriers.

Another possible improvement is to specify how the carriers have to be scored on selection criteria, as this is absent in the five Step Sourcing Methodology from CEVA. A solution is to implement a VRM in this process and when done well this can improve the effectiveness and efficiency of the selection process. From the business cases that were discussed it proved to be a useful tool. Whether efficiency and effectiveness are improved is discussed further in the end of this chapter.

In general, models to aid decision makers have become quite common according to Willcocks et al: "The process of selecting suppliers has also been translated into a template by several consulting companies and many CEO's will find such standardized practices useful" (Dodgson et al, 2000). The main advantage is that when working with a model, a structured approach is already available and the model – once developed and known – can help to achieve confidence for the decision makers.

To support their employees in handling complex decision issues the UK government set up an extensive document, evaluating MC(D)A techniques. According to Dodgson et al their Multi Criteria Analysis manual, "MCA has many advantages over informal judgment unsupported by analysis:

- it is open and explicit;
- the choice of objectives and criteria that any decision making group may make are open to analysis and to change if they are felt to be inappropriate;
- scores and weights, when used, are also explicit and are developed according to established techniques. They can also be cross-referenced to other sources of information on relative values, and amended if necessary;
- performance measurement can be sub-contracted to experts, so need not necessarily be left in the hands of the decision making body itself;
- it can provide an important means of communication, within the decision making body and sometimes, later, between that body and the wider community;
- scores and weights are used, it provides an audit trail." (Dodgson, 2000).

The main strength of Multi Criteria Decision making will be explained according to two examples on sports. First of all, humans have a measurable height and weight. Which person has the favorable dimensions differs per situation. For instance with playing basketball a few additional centimeters in length can make a big difference, whereas in soccer a few centimeters longer or shorter is less important. In other sports a shorter person might have a favorable construction. For different sports, weight might be more important than height, as is the case in judo. Which dimensional characteristic has a bigger impact is dependent on the situation.

The example 'who wins the Olympics' is a classic one. In case country A wins 22 gold medals, 12 silver and 8 bronze (total of 52) and country B wins 8 gold, 34 silver and 14 bronze (total of 56). One could argue that both countries have won. For instance, country B has won in case all medals weight the same (1), since their total is highest. In case one values gold medals higher than the other with the value 2 country A would score (66), whereas country B would then score 64, resulting in the best score for country A. MCDA provides tools to deal with the relative importance of characteristics (criteria) and their scales on which they are measured.

The importance of weighing and scoring can be translated back to decision making on complex issues as is done by Dodgson et al.: "The local authority case illustrates an important feature of MCDA modeling: its insensitivity to many differences of opinion. The criteria weights favored by a minority of participants gave a slightly different prioritization, but exactly the same recommendations for the target level of savings. Thus participants could agree about what to do without agreeing on all the input data. This is an important feature of using numbers to express judgments." (Dodgson et al, 2000) Weighted scores will be explained in paragraph 6.4.

The VRM that will be designed in the rest of this chapter is based on experiences from the business cases and lessons learned in the previous chapters. The selection of distribution carriers for telecom and television products is the process on which is focused with the help of the model.

6.2 TECHNIQUE AND DESIGN

In this paragraph a Vendor Rating Model (VRM) will be designed. Alternative decision making tools are shortly discussed and it is explained why the VRM is build the way it is.

The goal of the model is to make the selection process of distribution carriers at CEVA more efficient. To do this the following properties should be met by the model:

- Aid in decision making
- Calculate the highest scoring carrier
- Communication tool and structured approach
- Cope with different opinions/perceptions

- Cope with relative importance of criteria
- Low implementation costs

And from Dodgson et al (2000), the following properties can be added:

- Internal consistency and logical soundness;
- Transparency;
- Ease of use;
- Data requirements not inconsistent with the importance of the issue being considered;
- Realistic time and manpower resource requirements for the analysis process;
- Ability to provide an audit trail; and
- Software availability, where needed.

As was discussed in chapter 3 and 5, the selection process itself is a lengthy task and claims many resources from the shipper – in this case CEVA, resulting in substantial costs. The main costs occur directly by the time invested by the concerned employees and indirectly in opportunity costs. The time invested in the selection process could have been used to work on other tasks. To control the costs of the selection process, it should be done efficiently. The selection process should therefore be designed properly.

The Vendor Rating Model is therefore designed according to the following properties that will be discussed hereafter.

Table X Properties of a Vendor Rating Model

Property	Max. or Min.
Completion Time	Minimized
Confidence in Decision	Maximized
Ease of use	Maximized
Transparency	Maximized
Adaptability	Maximized
Objectivity	Maximized
Level of Detail	Min./Maximized

6.2.1 PROPERTIES FOR DESIGN

Completion Time

The completion time is the time it takes to start using the VRM until a decision can be made. Using the Vendor Rating model will be a large part of the selection process. To make the selection process efficient the completion time should therefore be minimized.

Confidence Decision
One of the aims of the model is to aid decision makers in their jobs. Designing a VRM should therefore be able to convince decision makers that they have made the right decision based on the information available. Although it can probably only be judged afterwards whether the right decision was taken, the feeling of confidence of the decision makers should be maximized.

Together with the Completion Time, the property Confidence in Decision is the most vital for a VRM. These two properties value the efficiency and effectiveness respectively of the VRM. The lower the time the using of a VRM takes, the more efficient the selection process is. However, spending (too) less time on the selection process will result in lower confidence by decision makers, and vice versa.

Ease of use
A VRM should be easy to use so that the completion time can remain low. Not all decision makers have a technical background, so the mathematics underlying the model should not become too complicated, otherwise the confidence in making the decision will decrease. A VRM that is easy to use will be accepted earlier and implemented in the selection process of a shipper. The ease of use should be maximized.

Transparency
The model should be transparent in the way carriers are assessed and scored. This way different opinions and perceptions of different stakeholders involved can be taken into account. Also, choices made by decision makers should be visible and substantiated. The use of the model as a communication tool is a good quality.

Adaptability
Different sourcing projects have different characteristics and criteria and their relative importance are therefore often case-specific. This was concluded in Chapter 2. It is not efficient in case for every project a new VRM has to be build. The aim is therefore to construct a general model and can easily be adapted for case specific input and characteristics. The adaptability of the model should be maximized.

Objectivity
Different decision makers have different opinions on criteria and their relative importance. Gaining insight in objective facts will result in an understanding of the to be sourced product, and agreement on which supplier to choose. By substantiation with objective facts people can convince others to change their opinion. In Multi Criteria Decision problems there is usually not one 'best' solution (Pruyt, 2009). Sticking to objective measurements and facts will lead to decision making that can be funded and substantiated. Objectivity should therefore be maximized.

Level of Detail
This property has conflicting influence – like many of the other properties – on the completion time and gained confidence in the decision. Increasing the level of detail will result in a higher confidence in the decision and a better substantiated one. Adding details in a VRM will increase the time required to use the model, which increases the completion time. Adding details might also decrease the ease of use and might lower the adaptability of the model. The amount of detail to be provided will have to be investigated further and is probably personal and/or case specific.

Conflicting properties
As can be read, some properties of the to-be designed model can conflict. The time required to use the model (Completion Time) should be minimized, whilst the other properties have to be maximized. Whether a Vendor Rating Model should provide a lot of detail or be more generalized is investigated further in this chapter.

Selection processes are complex and dynamic. According to Pruyt et al (2009): "Complex issues and the strategies used to dissolve them almost certainly involve many decisionmakers, stakeholders, stakeseekers, actors, and impacted parties on different geographic and timescales and institutional levels, who often have different points of view and perceptions on these issues and strategies stemming from different backgrounds, value systems, roles and interests." (Pruyt et al, 2009). All these different aspects are applicable in complex decision making and therefore present in the model and the supporting process.

Now that the desirable properties are known the Vendor Rating Model will be developed in the next section. This is done by the lessons learned from practice and literature.

6.2.2 Developing the Model
For the Vendor Rating Model the software package Microsoft Excel was chosen. The two main arguments for this are the low implementation costs as all computers by CEVA are already provided with this program. Second, since the program is generally known, decision makers will not have to be convinced first on the abilities and robustness of the software package. This way, also the ease of use property is satisfied.

Next, during a selection process different information is received from the possible carriers. This information should be structured, scored and substantiated, for which the MCDA methodology was chosen. MCDA is in fact an aggregation of possible analyzing techniques dealing with multiple criteria.

So far we have established that supplier selection is a good example of a Multi Criteria Decision. Many methodologies exist, based on the information available and goal of the decision, as is stated by Dodgson et al.: "All MCA approaches make the options and their contribution to the different criteria explicit, and all require the exercise of judgment. They differ

however in how they combine the data. Formal MCA techniques usually provide an explicit relative weighting system for the different criteria" (Dodgson et al., 2000).

Other methodologies are preferred when – in our case carriers – have to be rated and ranked compared to when they have 'only' to be evaluated. Some methodologies are best suited for quantitative input data while others for qualitative input data. Others can cope with both types of data simultaneously, but require additional information on the relation between criteria (inter-criteria information) and the goal of the selection process. Therefore as an example, we will have a closer look at our criteria, which can give us a better understanding which methodologies we can use.

Table XI Types and operationalization

Subjects	QL / QN	Operationalization examples
General	Quantitative	Number of vehicles / Expected growth %
Financial	Quantitative	€ per time period or volume
Quality	Qualitative	Volatility in volume, Performance: Conversion
Process	Quantitative	Time windows, cut off times
Environment & CSR	QN / QL	Total CO2 emitted
Information	Qualitative	System maturity, Redundancy
Other	-	

The extensive generalized list in which the subjects are divided in numerous criteria can be found in Appendix IV. In table XII the type of criteria is shown in the last column. This is not meant as a definite ranking, but the most common type is chosen as an example. In the last column examples are given from within the subjects.

As in the previous chapter described, the definitions – and if possible measurements – of criteria are of high importance. As can be seen in table X there are both quantitative and qualitative criteria to deal with. One of the methodologies that are suitable for these types of criteria is the Analytical Hierarchy Process (AHP), first developed by Saaty in the 1980s (Pruyt et al, 2009). First of all the AHP technique will be described and compared to other techniques. Then the choice for this technique is justified.

6.2.3 Analytical Hierarchy Process

The Analytical Hierarchy Process is a multi-criteria decision methodology that is used to structure and evaluate multi criteria problems through pair wise comparisons. According to Saaty (2005) it can only be used as the elements (criteria) to be measured are known and they may be intangible criteria (Saaty, 2005). Saaty argues that comparative judgment in the form of pair wise comparison is preferred over absolute judgment. He argues: "Comparative judgment which is the identification of some relation between two stimuli both present to the observer, and absolute judgment which involves the relation between a single stimulus and some information held in short term memory about some former

comparison stimuli or about some previously experienced measurement scale using which the observer rates the single stimulus." (Saaty, 2005).

In absolute judgment the scale on which criteria (stimuli) are judged is left implicit and is thus harder to communicate and argue (Saaty, 2005). This is because a scale has to be agreed on and the importance of different scales can vary. For example look at the following situation: Criterion A has been assigned a weight of 3 and criterion B a weight of 4. One could say that criterion B is 4/3 as important as criterion A. However, as no scale has been defined, this 4/3 factor does not say anything. Whether this should be seen as a large or small difference on cannot tell.

A solution for this is pair wise comparison, using defined scales. Furthermore, pair wise comparisons make judgment more scientific than absolute judgment would provide, trough arbitrarily assigning or guessing scores of criteria (Saaty, 2005).

Another argument against measurement methodologies is that they ignore transitivity according to Saaty and "also yield a variety of different answers thus violating the overall justification of the need for a single unique set of priorities" (Saaty, 2005).

Saaty proposed a methodology that was based on the relative importance of criteria that were related through a hierarchy. This is because the human mind has a limit to its ability to compare very small objects/aspects with very large ones, according to Saaty. Each criterion or component is compared to homogenous or criteria on the same level and then compared at the higher level. This hierarchy is constructed according to figure 17 (Saaty, 2005).

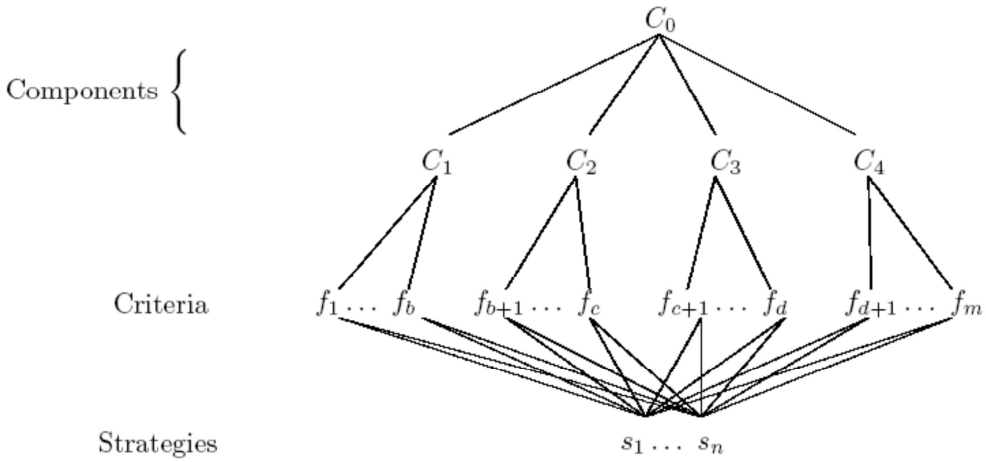


Figure 16 Hierarchy construction. Retrieved from: Saaty, T.L. (2005). "THE ANALYTIC HIERARCHY ANDANALYTIC NETWORK PROCESSES FOR THE MEASUREMENT OF INTANGIBLE CRITERIA AND FOR DECISION-MAKING". Chapter 9, pp 345-407

A hierarchy in this form was already developed in Appendix V for the business case Delivery Plus. Due to its resemblance the AHP methodology seems suitable and structure is provided to the problem. The construction of a hierarchy as shown in figure 17 is one of the strengths

of the methodology. The concept thereby helps decision makers to structure the problem. This is one of the main reasons that the AHP is preferred for CEVA in comparison to other methodologies that will be described later.

The technique of pair wise comparisons suits the ease of use property, since no scales and their importance have to be derived on forehand, as is the case for some other methodologies. As Saaty states on pair wise comparisons: "When alternatives are fundamentally new, different and not fully understood, paired comparisons are essential because there are no familiar and widely accepted standards on which they can be rated" (Saaty, 2005).

Furthermore, according to Saaty "it is clear that users generally find the pairwise comparison form of data input straightforward and convenient" (Saaty, 2005). Decision makers will therefore gain confidence in the methodology, and this is one of the essential properties of the VRM. Their confidence will increase in case they understand the model and its calculations, which answers to the transparency property. How to use the model will be explained in the next paragraph.

6.2.4 RANK REVERSAL

The problem of rank reversal occurs when an alternative or strategy is added or removed from the equation. It is an often discussed phenomenon of the AHP methodology and thereby questions its theoretical basis, according to Dodgson (2001). Rank reversal takes place as an alternative/strategy is added or removed from the evaluation. The order (or rank) of existing alternatives/strategies can change as a new – and independent – alternative is added (or an existing one is removed).

It happens because the methodology is dependent on its alternatives. Because of the pair-wise comparison between all alternatives simultaneously this phenomenon can take place. The phenomenon is explained further by the example of Dyer and Wendell (1985), where 4 alternatives are compared on 4 criteria. The scores of the Alternatives are given:

	Criteria			
Alternatives	C_1	C_2	C_3	C_4
A_1	1	9	1	3
A_2	9	1	9	1
A_3	8	1	4	5
A_4	4	1	8	5

Figure 17 Rank reversal: Example of Dyer and Wendell (1985). I

Dyer and Wendell assume that the 4 criteria are rated *equally important*. In case the first 3 alternatives are taken into account the following rank is obtained:

	C_1	C_2	C_3	C_4	Score	Rank
A_1	1/18	9/11	1/14	3/9	0.320	3
A_2	9/18	1/11	9/14	1/9	0.336	2
A_3	8/18	1/11	4/14	5/9	0.344	1

Figure 18 Rank reversal: Example of Dyer and Wendell (1985). II

	C_1	C_2	C_3	C_4	Score	Rank
A_1	1/22	9/12	1/22	3/14	0.264	1
A_2	9/22	1/12	9/22	1/14	0.243	4
A_3	8/22	1/12	4/22	5/14	0.246	2
A_4	4/22	1/12	8/22	5/14	0.246	2

Figure 19 Rank reversal: Example of Dyer and Wendell (1985). III

When comparing figure 19 and 20 one can see that the rank of the alternatives has changed. Alternative A1 was ranked 3rd (figure 18), but after including the fourth alternative A4, it is suddenly ranked first (figure 20). Dyer (1990) explains what happens: "Alternative A4 does moderate to well on criteria C1, C3, and C4 which is where A3 gained most of its allocated score in the case of three alternatives. Therefore, it dilutes the allocation of the scores of these criteria. Since alternative A1 performed rather poorly on these criteria, it did not suffer significantly because it had such a small proportion of this weight initially" (Dyer, 1990).

The problem happens as the eigenvectors are normalized and then the weights are allocated to the criteria. In figure 18 eighteen points were divided on criteria C1 over 3 alternatives, whereas in figure 19 twenty-two points were divided on criteria C1 over 4 alternatives. The difference in allocated scores (22 over 4 and 18 over 3) results in the reversal of the ranks.

Rank reversal is not only a problem for the AHP methodology. According to Wang and Luo (2009): "the rank reversal phenomenon occurs not only in the AHP but also in many other decision making approaches such as the Borda_Kendall (BK) method for aggregating ordinal preferences, the simple additive weighting (SAW) method, the technique for order preference by similarity to ideal solution (TOPSIS) method, and the cross-efficiency evaluation method in data envelopment analysis (DEA)" (Wang & Luo, 2009).

The added alternative does not have to be an exact copy of another alternative already present in the evaluation and the authors show calculations for their argumentation. According to the authors: "Barzilai and Golany [1] have proved that no normalization can prevent rank reversal. Normalization, however, is often necessary for most of the MADM approaches so that different dimensional units can be eliminated" (Wang & Luo, 2009). It can therefore be concluded that the presence of quantitative criteria which are normalized leads to rank reversal.

Harker and Vargas (1990) reply to the critics of Dyer in the same journal and state that "much of the criticisms of the AHP are based on misunderstanding of the theoretical foundations of the AHP" (Harker & Vargas, 1990). On rank reversal they state: "It is because the alternatives depend on what alternatives are considered, hence adding or deleting alternatives can lead to change in the final rank" and "contrary to Utility Theory no mathematical unjustified rank reversal occurs in the AHP" (Harker & Vargas, 1990). The fact that rank reversal occurs because normalization and not because of the mathematical axioms AHP remains a valid methodology.

6.2.5 OTHER METHODOLOGIES

Some other multi criteria decision techniques will briefly be discussed in this paragraph. The aim is not to present all possible options, but to analyze the ones most often used. MCDA techniques can be divided is some different types. The most common classification is: (Multi Attribute) Utility Theory; Outranking Relation Methods; and Interactive Methods (Vincke, Gassner, and Roy, 1992). In some cases there are only quantitative or qualitative criteria and sometimes there is a combination. Criteria can be traded-off against each other (in other words they are compensatory), or this is not allowed. This last category is called non-compensatory and are less often used according to Dodgson (2000).

In most cases it is allowed to trade-off criteria against each other, as is the case in consumer distribution as was shown in chapter 4.The criteria and the performance of alternatives on these criteria are in some way aggregated. The main difference of various MDA techniques that allow compensation/ trade-offs is according to Dodgson: "the way in which this aggregation is done" (Dodgson, 2000).

Utility Functions

(Multi Attribute) Utility Theory (MAUT) is a technique that is used for purely quantitative criteria. The technique assumes that there is a utility function in which the criteria are aggregated. This way a multi criteria problem is transformed into one utility function (Pruyt et al, 2009):

$$U(f1(si) \dots fm(si)) \rightarrow U(si)$$

The technique is a normative model (it aims to let individuals choose rationally between alternatives) that is universally accepted (Dodgson, 2000). It originated from von Neumann and Morgenstern; and Savage in the 1940s and 1950s (Dodgson, 2000). Keeney and Raiffa improved the method in 1976. However, according to Dodgson: "Although well-regarded and effective, in its most general format is relatively complex and best implemented by specialists on major projects where time and expertise are both necessary and available" (Dodgson, 2000).

Electre

The Electre method is based on dominance or outperforming of alternatives/ strategies and is based on pair-wise comparison (Pruyt, 2009 and Dodgson, 2000). Electre was first developed in France and stands for: Elimination Et Choix Traduisant la Realité. The method researches the outranking of alternatives and its aim according to locate subsets of alternatives, for instance subset E. Then, according to Dodgson: "The aim is to make E as small as possible and for it to act as a shortlist, within which a good compromise option should be found" (Dodgson, 2000). According to Pruyt the following information is needed a priori (Pruyt, 2009):

- strategies *sk*; *sl*∈*S*
- criteria *fj* with *j*∈ {1 … *m*}
- weights *wj*
- concordance thresholds $\hat{c}1$ with $0 \leq \hat{c}1 \leq 1$ and/or $\hat{c}2$ with $0 \leq \hat{c}2 < +\infty$
- discordance thresholds *đj*

At the start of the evaluation indices are constructed: N+, N0, N- and the weights are summed. Then according to Dodgson: "the concordance index, c(i,j), can be calculated for every ordered pair of options (i,j) simply as the sum of all the weights for those criteria where option i scores at least as highly as option j" (Dodgson, 2000). Next the discordance index is calculated: "The discordance index, d(i,j), is a little more complex. If option i performs better than option j on all criteria, the discordance index is zero. If not, then for each criterion where j outperforms i, the ratio is calculated between the difference in performance level between j and i and the maximum observed difference in score on the criterion concerned between any pair of options in the set being considered. This ratio (which must lie between zero and one) is the discordance index" (Dodgson, 2000).

Finally, the subset of favorable alternatives is found through (Pruyt, 2009):

$$\forall s_k \in \mathrm{K}, \nexists s_L \in \mathrm{K} : \mathrm{a}P\mathrm{b}$$
$$\forall s_k \notin \mathrm{K}, \exists s_L \in \mathrm{K} : \mathrm{b}Pa$$

In the above description Electre I was briefly discussed, as there are different variants of this method. Electre I can be used by decision makers to choose a certain alternative/strategy, whereas Electre II is used to rank certain alternatives/strategies (Pruyt, 2009). Other extensions of the model exist as well, like Electre III, IV and IS, but they are in general more complicated and need parameters (including ĉ1, ĉ2 and đj) with no real-world significance to be fixed (Pruyt, 2009).

The main strengths of the method are that both qualitative and quantitative criteria can be used and the method enriches the dominance relation of alternatives substantially (Pruyt, 2009). Next, there is "no confusion of weights, scales and pair-wise differences between evaluations" (Pruyt, 2009).

On the other hand there are several weaknesses, such as (Pruyt, 2009):

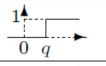
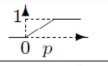
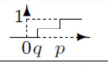
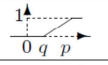
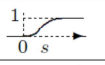
- the parameters *ĉ*1, *ĉ*2 and *đj* don't have a clear real-world meaning, which makes the method less transparent. This might lead to 'cheating', as decision makers guess or try different values
- "the method does not satisfy any system of consistent and appealing axioms'
- the quantitative distances (deviations) on quantitative variables are not taken into account (only negatively in the discordance matrix)" (Pruyt, 2009).

The main reason not to choose the Electre method, or one of its extensions – although it is a universally accepted technique – is because of the parameters with no real-world meaning that have to be defined. This makes the method non-transparent and less easy to understand.

Promethee

Promethee is a method that is known as "one of the most efficient but also one of the easiest" decision support system in the field (Brans and Mareschal, 1994 - 2002). For each criterion a specific function must be defined, according to Brans and Mareschal. According to Pruyt: "The PROMETHEE methods rescale the differences *dj*(*fj*(*sk*),*fj*(*sl*)) of pair-wise comparisons between each two strategies *sk* and *sl* on each criterion *fj* on scales between 0 and 1 by means of 6 predefined types of 'generalized criteria' *F* (rescaling functions). The method builds outranking relations on pairs of alternatives" (Pruyt, 2009). The predefined types of generalized criteria including their function are shown in the table below:

Table XII Types of criteria with their function (Pruyt, 2009)

Type:	Type I	Type II	Type III	Type IV	Type V	Type VI
Shape:	Γ -shaped criterion	U-shaped criterion	V-shaped criterion	Level criterion	Linear criterion	Gaussian criterion
Para-me-ters	immediate strict preference (-)	indifference threshold (q)	increase up to preference threshold (p)	indifference (q) & preference (p) threshold	indifference (q) & preference (p) threshold	standard deviation (s)
MAX						
min						
F	$0 \Leftarrow d \leq 0$ $1 \Leftarrow d > 0$	$0 \Leftarrow d \leq q$ $1 \Leftarrow d > q$	$\frac{d}{p} \Leftarrow d \leq p$ $1 \Leftarrow d \geq p$	$\begin{cases} 0 \Leftarrow d \leq q \\ \frac{1}{2} \text{ else} \\ 1 \Leftarrow d > p \end{cases}$	$\begin{cases} 0 \Leftarrow d \leq q \\ \frac{d-q}{p-q} \text{ else} \\ 1 \Leftarrow d > p \end{cases}$	$1 - e^{\frac{-d^2}{2s^2}}$

Retrieved from: Pruyt, E. et al. (2009). *Foundations for Engineering Design and Decision Making.* TU Delft

For each criterion a scale is (re)defined, for which a lower and upper value is required *and* knowledge (or best guess) of the characteristics of the possible values in between. This last knowledge requires a somewhat technical background and is for most decision makers not that easy. Support of a good analyst would therefore be required.

The steps to take are quite straight forward and show quite some resemblance with the Electre methods. As the type on which the criteria are evaluated are known (see table XII), the alternatives are compared on each criterion. The re-scaled differences of the pair-wise comparisons is multiplied by the respective weights. The result is used to "construct an outranking relation consisting for each strategy of a positive outranking flow Φ^+ for

which it outranks other strategies and a negative outranked flow Φ^- for which it is outranked by other strategies" (Pruyt, 2009). The final result is calculated by:

$$\begin{array}{ll} s_k P^{II} s_l & \Leftrightarrow \Phi(s_k) > \Phi(s_l) \\ s_k I^{II} s_l & \Leftrightarrow \Phi(s_k) = \Phi(s_l) \end{array} \qquad \text{with} \qquad \Phi(s_k) = \Phi^+(s_k) - \Phi^-(s_k)$$

Just like with the Electre methods there are – more complicated – extensions to the method (II, III, IV, V, GAIA). The main strengths of this methodology are the relative easiness if the functions of the scales on which the criteria are scored and known (Table 12) are understood. There are multiple user-friendly software packages developed for this methodology. Also, both quantitative and qualitative data can be used (Pruyt, 2009).

Weaknesses however are:

- The need to specify lower and upper bounds to the scales on which criteria are scored. This could be solved easily by assigning the lowest score of an alternative to the lower bound and the highest achieved score to the upper bound.
- For the intermediate scores of alternatives a function has to be determined, which requires a technical background
- Rank reversal is possible which might make the method not very robust (Pruyt, 2009). (Rank reversal is explained for the Analytical Hierarchy Process).
- "If the values of Φ^+ and Φ^- are not near 1 or 0, their interpretation could be problematic in two respects:
- because of the compensation between the weights and generalized criteria functions over the differences
- because of the fact that similar flows might express extremely different things (Roy and Bouyssou 1993, p405)." (Pruyt, 2009).

Promethee looks as an interesting methodology which follows a rather simple approach. However, if there is no analyst with a sufficient technical background available during the process, the evaluation of alternatives will become too shallow. The problem of rank reversal is present with this methodology.

More options

There are more options available for multi criteria decision problems. The four (including AHP) described methodologies are however most well-known. Some other methodologies can also be used, like: Fuzzy sets, Argus.

"Fuzzy sets attempt to capture the idea that our natural language in discussing issues is not precise … Fuzzy set theory is useful whenever variables defining a complex and vague system can neither be quantitatively defined nor assigned very precise measures, but are described by linguistic values" (Dodgson, 2000). Fuzzy sets are more a way to cope with assigning weights and scores when quantification is not possible. Examples are according to

Verbeieren: Fuzzy Weighted Sum and Fuzzy Maximin (Verbeieren, 2004). According to Saen (2009): "A mathematical ranking method is used to convert the qualitative attributes into crisp scores. All the quantitative and qualitative performance measures are normalized and then using the proposed model, data are integrated into a single score to rank suppliers." (Saen, 2009).

The Argus method stands for: Achieving Respect for Grades by Using ordinal Scales. As the name already states, the method is valuable in case there is a lot of ordinal data. The method was developed with the aim to treat ordinal data in an ordinal way consistently instead of quantifying them as almost all other methods do (Verbeieren, 2004; Pruyt, 2009). The other way round (quantitative to ordinal) is still necessary, which is a weakness of the method, as this leads to loss of information (Pruyt, 2009). Next the problem of possible rank reversal should be eliminated: "pair-wise comparisons between two strategies should not be influenced by other strategies" (Pruyt, 2009).

6.3 General discussion VRM and MCDA and techniques

In this research the methodology of the Analytical Hierarchy Process was chosen. The main reason for this choice is the relative easiness of the model. A Vendor Rating Model build upon this technique will therefore increase the confidence of decision makers. Other methodologies also get the job done, but are more applicable in other situations.

AHP is often discussed for the problem of rank reversal, but as long as the decision maker is aware of this effect this should not be a problem. In case an additional strategy/alternative is added/removed, the ranking of alternatives should be checked and the (new) decision is still valid.

Most preferred about the AHP is that it can greatly help in adding structure to a (multi criteria) selection problem. Pruyt states one particular remark on this method: "The AHP allows easy structuring of many criteria" (Pruyt, 2009). It is this characteristic that is most valuable to the selection process of CEVA as was explained in paragraph 6.1. Furthermore, the AHP methodology is strong in its theoretical foundation of comparative judgment. The methodology is easy to understand and use, transparent and adaptive.

Sonmez (2006) mentions other techniques in respect to decision making in general of which MCDA is one. For instance, mathematical programming, multivariate statistical analysis, artificial intelligence & expert systems, and group decision making; can be seen as alternatives to MDCA (Sonmez, 2006). For the selection a lot of information has to be processed and analyzed and often there are qualitative criteria involved. Therefore the first two mentioned alternatives are less appropriate. Artificial Intelligence & Expert systems seem to be less usable as well, as a selection process is often case and organization specific.

Within MCDA alternatives to the AHP technique are available as well, which were discussed in 6.2.5, but mainly because of the added structure of the technique and its ease of use the AHP technique was chosen.

6.4 How to use the VRM

Now that the concepts of VRM and MCDA are elaborated, it is explained how the VRM is built. The developed VRM is available in Microsoft Excel, and the general list of criteria from Appendix IV was inserted. The information that is required from stakeholders to work with the VRM is elaborated on in chapter 8.

To construct an AHP model, the following steps have to be performed that are quite similar to other methodologies as well:

1. Determine the goal of the project (S0)
2. Determine the criteria and/or components to reach the goal
3. Construct the hierarchy
4. Determine the scale for scoring
5. Score the alternatives (scenarios: in our cases carriers) on the defined criteria
6. Determine the relative importance of criteria through pair wise comparison
7. Determine the scores of the carriers on the subjects
8. Determine the relative importance of the subjects through pair wise comparison
9. Determine the ranking of the alternatives/scenarios

In figure 21 the goal of the project is stated at the top: S0. The main components are the first level of hierarchies and are stated in the figure as S1, 2, 3 and 4. In this example there are 4 components in the first level. The components are built up of criteria (which may be built up of sub-criteria) on which the strategies are rated. The Analytical Hierarchy Process makes sure that strategies are compared on criteria on the same level of hierarchy so that relative weights can be assigned correctly.

Translating the figure to the selection of distribution carriers can be done according to the following:

S0:	Selecting the 'best' carrier – the Goal of the process
S1 till Sn:	Main subjects for evaluation – for instance Price, Quality, etc.
F1 till Fn:	Criteria of the project – used to evaluate the suppliers
A, B, C:	Alternative Carriers – will be evaluated on the criteria

To show the working of how AHP can help with decision making the methodology is set up for the business case Delivery Plus. This business case was chosen because of the resemblance in structure and the availability of information. The (hierarchical) structure of a General selection problem for distribution carriers is shown in figure 21. The calculations and application of the AHP are shown in Appendix VII.

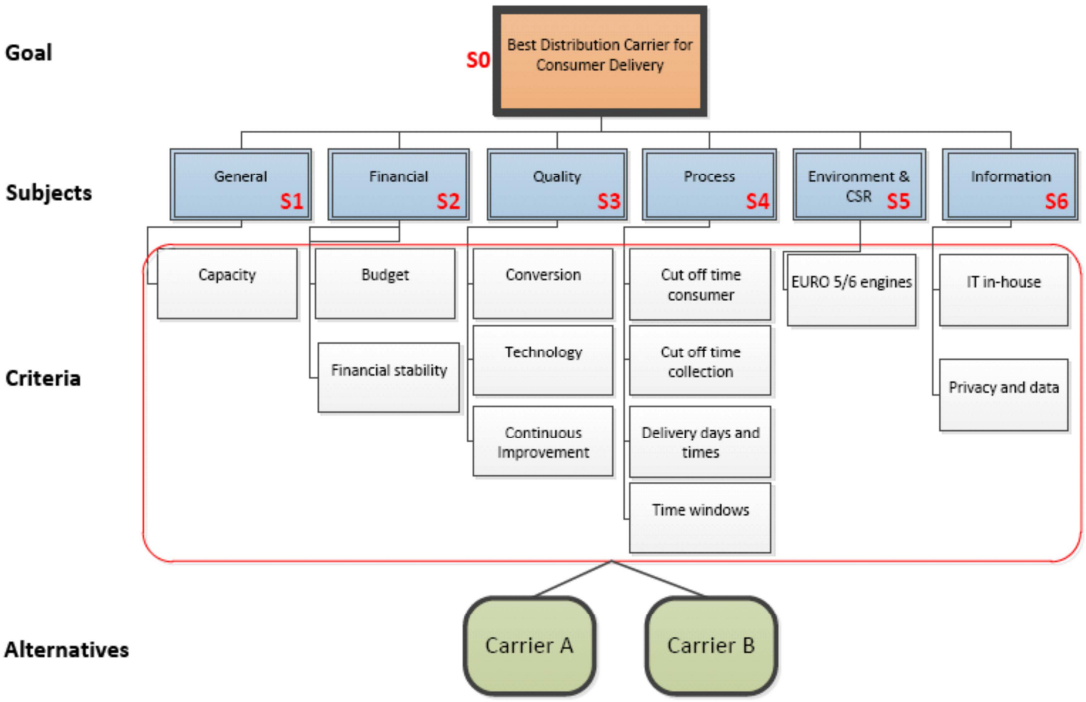


Figure 20 Hierarchy for Delivery Plus

AHP performed on Delivery Plus

The business case Delivery Plus was explained in Chapter 3. The AHP process will now be applied on this business case shortly. The mathematical work-out is shown in more detail in Appendix VII.

Determine the goal of the project (S0)

The goal of the project was formulated as: "Innovatie bezorgproces zendingen met aanvullende services Nederland"

Criteria, Components and Hierarchy (2 & 3)

The criteria and the components are shown in figure 21 and together form the hierarchy. The components are in the General Project described as Subjects.

Determine the scale to score alternatives

In the previous paragraph the importance of scales was discussed. In selection processes it can be hard to determine the scales and subsequently the meaning of an absolute measurement. According to Saaty: "A person may not be schooled in the use of numbers but still have feelings, judgment and understanding that enable him or her to make accurate comparisons (equal, moderate, strong, very strong and extreme and compromises between these intensities)" (Saaty, 2005). Therefore Saaty derived his fundamental scale that is shown in Appendix VIII. To derive the relative importance of criteria figure 15 can be applied. For the relative scores, the same scale can be used, but in that case the word

'importance' needs to be replaced with 'preferred'. Some discussion exists in literature, focusing on the absence of mathematical substantiation of this scale, but in general it is accepted and seen as relatively objective. The scale is given from 1 ('equally important') trough 9 ('extremely more important').

6.4.1 SCORING AND RELATIVE IMPORTANCE

For the alternatives the three possible carriers that reached the shortlist were taken. In the VRM the carriers are first scored on the criteria in the lowest level in the hierarchy shown in figure 12. Next, these scores are multiplied by the relative importance of the criteria. Moving on to one level higher in the hierarchy, the carriers are now scored (via the criteria) on the Subjects. The relative importance of the Subjects is determined and again a multiplication of the scores and relative importance takes place. Finally the carriers are scored from bottom to top, on the Main Goal of the Project.

The AHP methodology uses pair wise comparison and works bottom up. The comparison should be read from left upwards shown by the red arrows in the following table. In this example the Carriers are scored on Conversion (criterion F2) and Carrier B scores 8,00 higher on importance on the Fundamental scale from Appendix VIII, meaning that Carrier B is 'very, very strongly' preferred over Carrier A. On the opposite site of the diagonal the reciprocal value is found: 1/8 = 0.13.

Conversion

F2	A	B	C	GEOMEAN	F2'
A	1,00	0,13	0,14	0,261379	0,060793
B	8,00	1,00	2,00	2,519842	0,586076
C	7,00	0,50	1,00	1,518294	0,353132
				4,299516	

Matrix multiplication takes place with the scores on individual aspects (criteria and subjects) and the relative importance of these aspects (criteria and subjects). The evaluations of the carriers are calculated by the theory of eigenvalues (see the figure below), which is proven by many scientists.

$$A'w = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix} = cw.$$

Geometric mean

Instead of using a normal mean to aggregate scores, the geometric mean is preferred. According to Saaty: "It is known that with the reciprocal condition, the geometric mean is a necessary condition for combining individual judgments" (Saaty, 2005). The geometric mean says something about the ratio, whereas the 'normal' mean says something about the differences between numbers. Since in our case judgments (scores) are compared so the geometric mean in preferred.

Result

The result of the model is shown in table V.

Final Score Carriers on Main Goal

G0	S1'	S2'	S3'	S4'	wG0'	G0'	Rank
A	0,08	0,64	0,16	0,19	0,311944	0,2559	3
B	0,51	0,29	0,50	0,31	0,240617	0,4143	1
C	0,41	0,07	0,35	0,50	0,240617	0,3298	2
					0,206822		

Inconsistency

Some scientist in literature is claim that the calculations of the AHP model are inconsistent. Saaty disproves this argument by the following explanations of the fact that we simple allow inconsistency in practice: "Thus the story is very different if the judgments are inconsistent, and as we said before, we need to allow inconsistent judgments for good reasons. In sports, team A beats team B, team B beats team C, but team C beats team A. How would we admit such an occurrence in our attempt to explain the real world if we do not allow inconsistency? So far we have legislated inconsistency, which is natural in making judgments, by assuming axiomatically that it should not exist particularly with regard to transitivity!" (Saaty, 2005).

6.5 Conclusion Vendor Rating Model

In this chapter a Vendor Rating Model was developed to aid decision makers in the selection process of distribution carriers. Selecting distribution carriers depends on many dimensions and criteria and can therefore be characterized as a Multi Criteria Analysis problem. The Vendor Rating Model therefore, uses a Multi Criteria Analysis methodology. Furthermore it was explained in this chapter how the Vendor Rating Model is built and how it should be used. Sub question 4 is answered:

Should a Vendor Rating Model be added to the selection process at CEVA and if yes, how?

To answer this question the conclusions from the paragraphs of this chapter are elaborated on.

6.5.1 *Vendor Rating Model*

A Vendor Rating Model provides an overview in which carriers can be evaluated on multiple criteria. Vendor Rating Models can be used to evaluate, rank and ultimately choose the preferred carrier. The model is able to help in the structuring and analyzing of information and proposals of potential carriers. The analysis then leads to scores for the individual carriers, which can be aggregated. This should help decision makers to choose the preferred carrier.

Tender processes are often used for complex selection decisions and therefore a tender document has to be set up. This document asks for specific information on criteria from the carriers, which should a few weeks later be analyzed, structured and judged. Integrating these two processes could lead to a reduction in time spent on the selection process, since the carriers then provide the information in a universal lay-out, which is already structured.

6.5.2 *Technique and design*

For the Vendor Rating Model a specific Multi Criteria Analysis methodology was used. Since there are both quantitative and qualitative criteria present in complex selection decisions the Analytical Hierarchy Process (AHP), first developed by Saaty, was chosen. The methodology compares alternatives – in our case carriers – on the specified criteria. The decision makers have to define the criteria and agree on the scale that is used to score the carriers. Further, weights have to be applied on the relative importance of the criteria.

The AHP is a method that uses pair wise comparison to evaluate alternatives on criteria. The carriers score certain points on these criteria. The human mind has limited capabilities to compare high level aspects with low level aspects. Therefore, a hierarchy is constructed, so that criteria on the same level are compared with each other. The scores on the low level criteria are translated to scores higher in the hierarchy. At the top of the hierarchy the goal is specified. This way the scores of the carriers result in a contribution to the main goal. Constructing the hierarchy will also help to add structure to the problem.

The goal of the Vendor Rating Model is to aid decision makers and improve the selection process. Therefore the following properties were formulated on which a Vendor Rating Model should comply:

Table XIII Properties of the Vendor Rating Model

Property	Max. or Min.
Completion Time	Minimized
Confidence in Decision	Maximized
Ease of use	Maximized
Transparency	Maximized
Adaptability	Maximized

Objectivity	Maximized
Level of Detail	Min./Maximized

6.5.3 How to use the VRM?

Using the Vendor Rating Model can have significant advantages in complex selection processes. The most apparent advantage is the integration of issuing a tender document with an analysis model. Restricting and structuring the way potential carriers provide information in selection processes leads to a reduction on time spent, and could therefore reduce the duration time of a selection process.

The following steps have to be carried out when using the Vendor Rating Model:

1. Determine the goal of the project
2. Determine the criteria and/or components to reach the goal
3. Construct the hierarchy
4. Determine the scale for scoring
5. Score the alternatives (scenarios: in our cases carriers) on the defined criteria
6. Determine the relative importance of criteria through pair wise comparison
7. Determine the scores of the carriers on the subjects
8. Determine the relative importance of the subjects through pair wise comparison
9. Determine the ranking of the alternatives/scenarios

6.5.1 VRM Overall

The main advantage of implementing the VRM based on the AHP methodology is adding structure to the process and contents of the selection process. Large amounts of information need to be analyzed and compared (Rushton & Walker, 2005) and this can be a complex and lengthy task. Adding structure is rated highly by many CEO's (Willcocks et al, 2007).

Next, most properties that were discussed in 6.5.2 were satisfied by the developed VRM. The VRM built upon the AHP technique and is easy to use. Therefore it can help in developing trust from the client so that a decision can be fully supported. The VRM adds to the efficiency of selection process as double work in structuring information is eliminated.

It can therefore be concluded that the developed VRM is a valuable addition to the selection process of CEVA, and should therefore be implemented. How this should be done is explained in chapter 8.

CHAPTER 7. VERIFICATION AND VALIDATION

The developed Vendor Rating Model will be verified and validated in this chapter. As these activities are completed advise is given how to implement the model in CEVA' existing selection process in the next chapter. The developed Vendor Rating Model will be used by CEVA in future selection processes, according to van der Pijl (personal communication, van der Pijl, June 2012). For the validation of the model, the business case Delivery Plus was taken as an example of how the validation takes place in practice, as this business case is completed. Sub question 5 is answered:

How can the Vendor Rating Model be verified and validated?

7.1 VERIFICATION

In this paragraph the internal consistency of the model will be checked. This is done to check the internal working of the model. It is investigated if values are calculated correctly and whether reliable results are produced by the Vendor Rating Model.

Data

The input data, output data and (internal) calculation are checked. The input data of the VRM is done by manually and represents the scoring or weight of a carrier on a certain criteria (or sub-criteria). It can be checked whether users have filled in the correct fields and in the correct format. The preference (or score) of the user is filled in on the specific sheet in the Excel model according to its corresponding category, as explained in paragraph 6.4. In case for instance no numerical value is put in, Excel automatically shows an error, which is an advantage of using Excel.

The preferences (scores) that are filled in by the users are automatically read in the sheet: VRM. Here the calculations take place and they have been checked by three persons with Excel skills. Where appropriate, (sum)totals are calculated so that the calculations can be checked. All the scores of the carriers on the criteria sum up to 1, as they should.

The output of the model is a rank of the various carriers that is calculated via the scoring on the criteria, subjects and eventually the main goal. The explicit notification of the steps, help the user to understand at least how the output is build up. The rank is based on the final scores of the carriers on the main goal and these values seem correct.

Consistency

Consistency is a measure that is used to check whether the input data is filled in on a consistent way. It checks the following axiom:

If Carrier A > (scores better than) Carrier B; and
If Carrier B > (scores better than) Carrier C; then →
Carrier A > (scores better than) Carrier C

Some scientists in literature claim that the calculations of the AHP model allow inconsistency. Saaty disproves this argument by the following explanations of the fact that we simple allow inconsistency in practice: "Thus the story is very different if the judgments are inconsistent, and as we said before, we need to allow inconsistent judgments for good reasons. In sports, team A beats team B, team B beats team C, but team C beats team A. How would we admit such an occurrence in our attempt to explain the real world if we do not allow inconsistency? So far we have legislated inconsistency, which is natural in making judgments, by assuming axiomatically that it should not exist particularly with regard to transitivity!" (Saaty, 2005). This discussion between scientist is already discussed in paragraph 6.2.

Nevertheless to eliminate consistency a consistency check can be built in. Two types could be distinguished:

- the consistency of the relative importance or weight of the criteria and subjects
- the consistency of the scores of the carriers on the criteria

7.2 VALIDATION

Validation is done to check whether the results of the model are consistent with reality. Is the model able to deliver the result that is wanted by the client KPN? The Vendor Rating Model should comply with the properties defined in Chapter 6. The VRM is based on the experiences and input from the two discussed business cases in chapter 3, which have been completed. The input and analysis of the distribution carriers for the two business cases was therefore validated by the client KPN.

During the two discussed business cases in Chapter 3 the two analysis of the responses from the potential carriers were validated by KPN management. The following parts were validated:

- the constructed hierarchy (Division of the goal, into subjects, into criteria)
- the relative importance of criteria and subjects (weights given by KPN)
- the scores and argumentation of CEVA

As an example of how a VRM is validated in practice, the business case Delivery Plus is reviewed.

Delivery Plus

The business case Delivery Plus (Chapter 3) aimed to select a carrier for the distribution of mobile phones accompanied by digital contracts. Handling these digital contracts requires

state of the art technology that was unknown to CEVA. This made the selection process complex.

For the analysis of the responses from the carriers a Vendor Rating Model was constructed, of which the final result is shown in figure 22. For confidentiality reasons the weights (relative importance) of the criteria and the scores of the carriers on these criteria have been deleted. The green fields were asked from managers of the client KPN and the yellow fields – with the scores of the carriers – were filled in by CEVA based on their extensive analysis. In a 2 hour meeting between CEVA and KPN management these scores were evaluated, discussed and so validated.

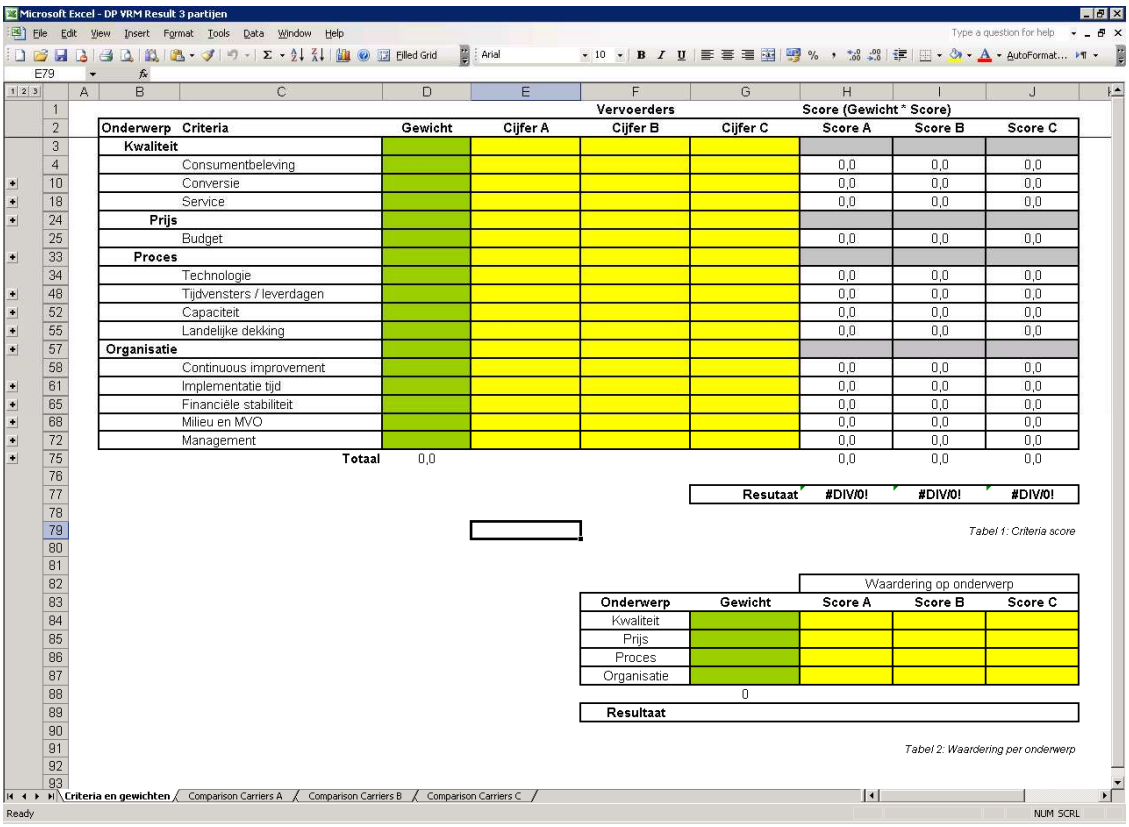


Figure 21 Analysis Delivery Plus with a VRM

On the far left of figure 21, three small columns can be found, with some **+**-signs under column 1. These buttons represent the 'Group-function' in Excel and when opened the rows that are hidden in the figure are opened. In these rows the argumentation of CEVA that led to the scores can be found and this was discussed with KPN management. Since KPN management made only minor alterations and was really impressed by CEVA' analyzing work, according to CEVA manager van der Pijl (see Appendix 2), it can be concluded that the VRM was of high quality and confidence was gained.

Properties
In the previous chapter seven properties were defined. These properties will be validated for the business case Delivery Plus.

Completion Time
The completion time of Delivery Plus was rather long and experienced quite some delays. This was already stated in Chapter 5. The main reason for this is the fact that the VRM from the Delivery Plus case was only capable of performing the analysis of the responses from the carriers. The tender document describing the required service and asking information from potential carriers was done in a separate file. Integrating these two functions – as was done in Chapter 6 – will result in a more efficient process and lower completion time.

Confidence in Decision
The analyzing work of CEVA was validated by KPN management and since they made only minor alterations, it can be concluded that the VRM was of high quality and confidence was gained. According to CEVA manager van der Pijl (see Appendix 2), KPN was really impressed by the analysis done by CEVA. Since the methodology used (Weighted Average) was simple, KPN management had no problem understanding the working of the model.

Ease of use
As it took not a lot of effort and time to explain the working of the VRM this property was satisfied. The methodology used was the calculation of the Weighted Average. The lay-out of the model including the 'Group-function' of Excel made the model easy to use.

Transparency
The argumentation of the scores gained by the potential carriers is structured and right at hand through the 'Group-function' of Excel. This is one of the main strengths of this model. As soon as one score of a carrier on one criteria was changed, the model automatically calculated the resulting change in the final score and made this visible.

Adaptability
The model can easily be adapted as criteria, or subjects can be added, removed or redefined. This will only take a couple of minutes. A process that will take longer is when a new hierarchy is set up (Step 1) and the whole structure has to be changed.

Objectivity
Although some subjective criteria were present in the evaluation, like the Subject: Quality, the carriers were rated objectively. This was achieved because the arguments for this subject were quantified. Next, as can be seen in figure 21, the names of the carriers were replaced by 'A', 'B' and 'C'. The model itself is therefore objective, however subjective weight (aggregated or agreed) are inserted to answer to the preferences of the client.

Level of Detail
The level of detail was rather high as the argumentation was made visible. For readability only the main results on the highest aggregation levels were shown, without the argumentation (figure 21). The level of detail was rather high, but this was required since the complexity of the required process was high through innovative technology.

7.3 Conclusion Designed VRM

In this chapter it was explained how the verification and validation is done of a VRM. The sub question 5 is answered.

How can the Vendor Rating Model be verified and validated?

Due to the fact that the newly developed VRM is not yet used – but will be in future selection processes – it could not be validated fully. This is because for successful validation data is required and the model should be used at least once. Based on the former VRM from Delivery Plus as an example, the way how this should be done was shown in this chapter. The fact that CEVA will use the developed VRM in future selection processes does say that the model is developed satisfactory, and is therefore a valid tool to support decisions.

The lessons learned from the business case Delivery Plus (and Service Points) were already used in the development of the (new) VRM in Chapter 6. The properties are satisfied as much as possible. The goal of the model is to aid decision makers in their decision to select the 'best' distribution carriers. Whether the 'best' carrier is chosen can be judged best after implementation. As performance can be measured during the operation from the distribution carrier that has won the tender, the decision can be truly validated. In case the goals are achieved (whether this is an improved service, lower costs and/or anything else) the decision has been the right one. Next to measuring the performance of the operating carrier, customer surveys can be held to see whether customer satisfaction has increased, and a possible amount in sales can be checked.

The designed VRM from Chapter 6 has been verified by multiple people and showed no inconsistencies in the working of the model. How the model can be validated was explained through elaboration on the business case Delivery Plus. The newly designed VRM from Chapter 6 will be used in the near future by CEVA according to the two Contract Managers at CEVA (Appendix II and III). Therefore it can be said that the model is validated and applicable for the practice situation at CEVA.

When the VRM is used in the correct way and at the right time, the process of selecting distribution carriers at CEVA can be improved. How the VRM should be implemented and thereby increase the quality and efficiency of the selection process is explained in the next chapter.

CHAPTER 8. IMPLEMENTATION

In chapter 8 it is discussed how the developed Vendor Rating Model can be implemented in the selection process of CEVA. It builds further on the VRM as designed in Chapter 6 and implements this in the current practice at CEVA as was discussed in Chapter 3. The following sub question is answered: *How should a Vendor Rating Model be implemented in the selection process at CEVA?*

8.1 USING THE VENDOR RATING MODEL

For the Vendor Rating Model the underlying methodology of the Analytical Process was chosen as was explained in Chapter 6. One of the main reasons that this approach is chosen is because of the structured way of evaluating alternatives. Explicit formulation of the goal of the selection process was not always done, as was explained in Chapter 5. Constructing the hierarchy can help with determining the goal of a selection process and is therefore a valuable addition for the practice situation at CEVA.

Constructing the hierarchy was explained in paragraph 6.4 and the result of a general selection process is shown in figure 22.

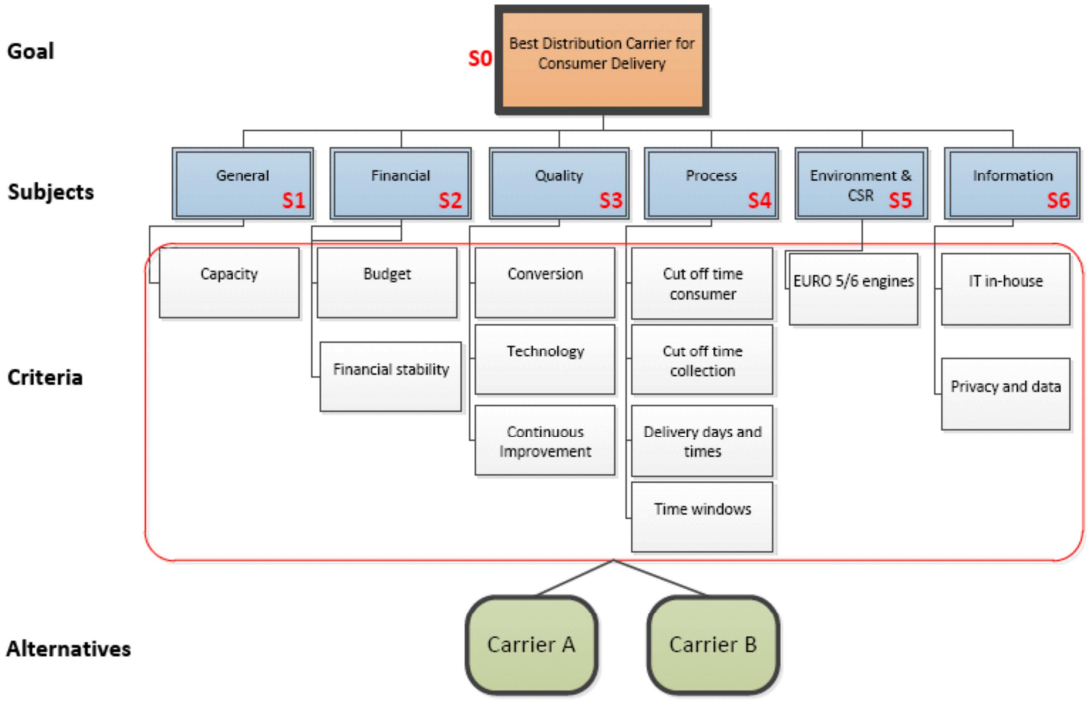


Figure 22 Hierarchy General Consumer Delivery as a result from Chapter 4 and 6

The hierarchy aids decisions makers in formulating the goal of the process and structures the (ex ante) evalution. Implementing the Vendor Rating Model – including the hierarchy from the AHP in selection process is shown in figure 24.

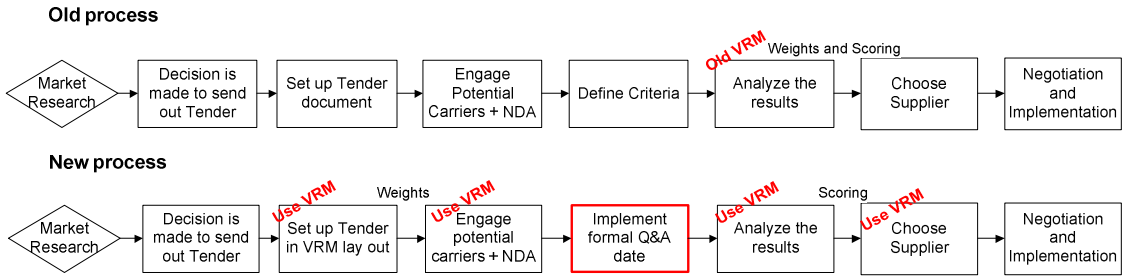


Figure 23 Implementing the VRM in the Process

In the figure can be seen that a VRM can be used in four of the steps in the Selection Process, whereas in the old version a VRM was only used for analyzing the information from the responses of the carriers. To eliminate double work in structuring information the VRM should be used already earlier in the process.

8.1.1 Four Functions

In a selection process four functions can be distinguished:

- Information Giving: Set up structured Tender document
- Asking for Structured Information: Standardized format of Tender responses
- Analyzing: Scoring potential carriers based on responses
- Decision: Choose the preferred Carrier base on Analysis

The first function is satisfied in the second step of the selection process: Setting up the Tender document, to explain the required service of the carriers. In practice it turned out that the VRM – that was built in Microsoft Excel – was too difficult. In particular for complex processes, rather than simple package delivery without additional services, a lot of information should be send to the carriers. It is therefore suggested that the this Information Giving Function is done in Microsoft Powerpoint format.

The other three Functions can and should be combined by using the VRM in the specific format. Asking the required information from the potential carriers in a structured way in a specified format will increase the efficiency of the selection process. Also, double work for the structuring of information is eliminated. If carriers send their responses in the specified format (Excel) they can be compared more easily and equal. This improves the quality of the process and reduces the time required for the analysis.

8.2 Sourcing in Practice

In this paragraph it is explained how the developed VRM should be implemented in the selection process at CEVA. Next, other improvements that resulted from the previous chapters are discussed.

8.2.1 The five Step Sourcing Methodology

The five Step Sourcing Methodology was discussed in chapter 3 and comprises the methodology that is used by CEVA worldwide for their complex sourcing activities. The VRM can be seen as an addition to this methodology and provides a tool for the missing activities in the first steps of the methodologies. As was discussed in chapter 3, how to derive the criteria and their relative importance is not discussed in CEVA' methodology. In this methodology the VRM can replace most of the actions in Step 1 (Market/Requirement and Strategy formation) and 2 (Supplier engagement).

In Step 1 a Request For Proposal is developed. Using a VRM can provide the layout and structure to specify the required process by CEVA and KPN. This way the VRM can act as a communication tool with the potential carriers and KPN. Having structured information delivered from the carriers with the help of the VRM will reduce the amount of time required to analyze the proposals.

8.2.2 Performance and Selection

The VRM could be used by all selection processes that are initiated by CEVA. It is in particular useful in complex tender processes were multiple carriers have to be evaluated and compared. The following figure provides an illustration for managers which action to take.

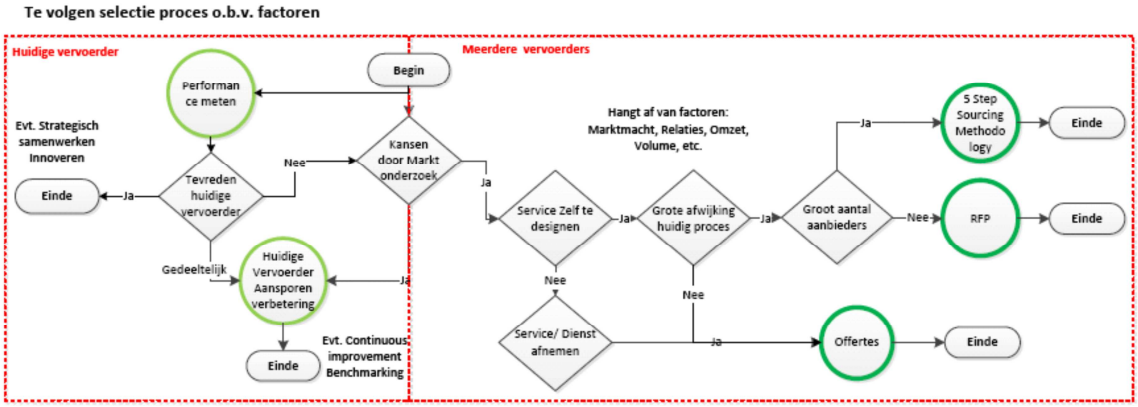


Figure 24 Different complexity of selection processes

In the left part of the figure the performance of the existing carrier is evaluated. In case CEVA and/or KPN is not fully satisfied two things can happen. First of all incentives can be searched to make sure that the current carrier increases its performance. Second, new

carriers can be sourced. The figure therefore begins at the top, evaluating market opportunities. Moving to the right there are 3 main question that have to be answered:

- Can the required service be designed by KPN-CEVA themselves?
- Is there a big difference with the current service?
- Are there many potential carriers who could provide the service?

Self-Design
The first question has to do with market power. As the volumes – and thus potential revenues – are large, KPN has quite some market power and can demand relatively a lot from carriers. The potential carriers are probably willing to go the extra mile to win the contract and invest a lot of time in the selection process.

Difference current situation
In case the required service that is put up for tender (or another supplier selection method) is relatively similar to the current situation, less time is needed to set up tender document. In case the difference is big as for instance new technologies and innovations have entered the market for distribution, more time is needed. During this time information is acquired on the new technologies and innovations and it should be researched what the added value and impacts will be of those technologies or KPN.

Number and type of carriers
The last question is about the number of potential carriers. In case there are only a few carriers that are able to provide the desired service, these carriers have relatively a lot of bargaining power. In case competition between potential carriers increases as there are for instance multiple interesting carriers, bargaining power of KPN increases.

In case some carriers are already known to KPN or CEVA (because of past performance or from other sites from other clients of CEVA), different information is asked. The amount of potential carriers in the long list and short lit also influence the decision of the amount and format of information that is asked from the carriers. Completion time depends on the time required to analyze all the required information.

Selection Process
The three questions above lead a suggestion for the type of selection process to use. This thesis focusses on the top right part of the figure: complex selection processes involving tendering. On the bottom right 'Bids/proposals' can be found. This process should be used for relative simple selection questions.

In the far top right corner the figure states: The five Step Sourcing Methodology, and just below it reads: RFP. The two differ in the amount of complexity in the process. The first is the most complex and extensive one as there is a lot of (new) information to be acquired. The second is still a complex selection process, but due to the lower amount of possible

carriers, the evaluation is a bit easier than when there are a lot of potential carriers and solutions.

8.2.3 MANAGEMENT INVOLVEMENT

Another issue to remember when performing a selection process is management involvement. Implementing a Vendor Rating Model might increase the quality of the process and decrease the time required for the analyzing phase. Further advantages are the communication aiding function and the increase in confidence for making decisions.

Responsible managers have to take these strategic decisions. Although the design, ease of use and layout of the VRM might improve the confidence gained from the model, early involvement of manager will also improve the quality of the process. Often managers have experience in these processes and are capable of making complex decisions. As Willcocks (2007) states: "organisations that have the ceo and a multidisciplinary team involved in sourcing strategy make more effective decisions" (Willcocks et al, 2007).

8.2.4 VALUABLE CONTRIBUTION

The aim of implementing a Vendor Rating Model was to be a valuable contribution to the selection process of CEVA. Implementing the VRM as an addition in the existing five step methodology will probably result in acceptance by CEVA management. The main strengths of a VRM implemented in the selection process are:

- Decrease in duration time of the selection process by integration of Information Asking Function in the tender document and Analyzing Function
- Efficient communication tool through ease of use and lay out
- Effective handling of preferences and calculation of ranks
- Adding structure to the selection process through the construction of the hierarchy
- Increase in confidence for decision making

8.3 INFORMATION NEEDED FROM STAKEHOLDERS

When strategically selecting distribution carriers, much information is needed. To answer a main question like 'who is the best carrier for me?' many other underlying questions have to be answered. Information is required from market conditions, but also from stakeholders. This is explained in this paragraph.

8.3.1 STAKEHOLDERS

First of all there are multiple stakeholders involved in the strategic choice, which carrier should distribute the products to the final customer. Once the decision is made that a new carrier is to be selected, usually a tender document is set up. For relatively low volumes existing or new carriers can 'simply' be asked for a proposal or bid, but the focus in this thesis is on the complex selection decisions when for instance whole products streams re being tendered. KPN – as problem owner – is therefore essential in providing information.

KPN

Crucial information is required from the problem owner KPN. First of all the goal of a selection process should be described by the problem owner. CEVA can advise KPN, but in the end it is the problem owner who makes the decision and should be responsible for setting the goal.

Goal setting is extremely important (Emmitt, 2010; Emmett & Crocker, 2009). When there is a clear goal at the beginning of a process a good start can be made. Implementing a new technology is for instance in most cases not the goal of a selection process, but the implementation of this new technology - to increase customer satisfaction or to lower costs - is in fact the main goal. Jumping to solutions is an often made mistake with the formulation of the goal.

For the formulation of the goal responsible managers from KPN should be interviewed. Next, the goal of a selection process can be divided into selection criteria. Often used criteria (see chapter 4) are Price, Quality and Delivery. The respective weights of these criteria might be different for specific order types and moments in time and should therefore be verified at the beginning of a new project.

Required process

As the goal is specified, the process should be specified, explaining what is requested from the carriers. Specific requirements have to be formulated and details gathered, so that requested process is optimized. Also, (forecasted) volumes need to be specified and customers' wishes have to be translated into the process. In Appendix VI a general list of criteria divided per subject is presented. This list can is valid for all consumer distribution for telecom products.

Relative importance

The generalized list of criteria needs to be validated by KPN. Next, the relative importance of the criteria have to be specified, since for certain products specific criteria are more important than others. In other cases criteria might not be a discriminating factor between potential carriers and might therefore be eliminated. Great care should be taken in this case, since these criteria might have to be translated into contractual agreements once a carrier is chosen. In most cases (some) criteria will be added that are specific for the required process.

Then, the relative importance of criteria must be determined by KPN. For this the Vendor Rating Model can help, as was explained in the previous paragraph. Using pair wise comparison and a scale of relative importance is objective and easy to do. First of all the criteria on which the potential carriers are evaluated must be defined and how they are measured must be determined.

CEVA

Another important stakeholder is CEVA. As KPN prefers to be taken care of, CEVA' job is to help KPN in formulating strategies and making decisions. The final consumer' wishes are to be translated in business opportunities for KPN. Selecting the right carrier is an important part of this process as the carrier is the last identity – and it might be the only one in case of online sales – that has contact with the customer.

CEVA can aid KPN in providing the information that is required for an efficient selection process. Formulating the goal, defining criteria, establishing their relative importance, are all activities in which CEVA can takes care for KPN. Next, sending out the tender document, analyzing the proposals from the carriers, scoring the proposals, formulating and substantiating advice to the client KPN are all activities done by CEVA in the selection process.

Consensus

Many of the described elements need some form of consensus. Consensus between KPN and CEVA must be reached on the main goal of the process, the definition and the relative importance of criteria, the scoring of the carriers on the criteria, and the final strategy to be taken. All the aspects during a complex tender process on which consensus must be reached, are shown in the figure 25.

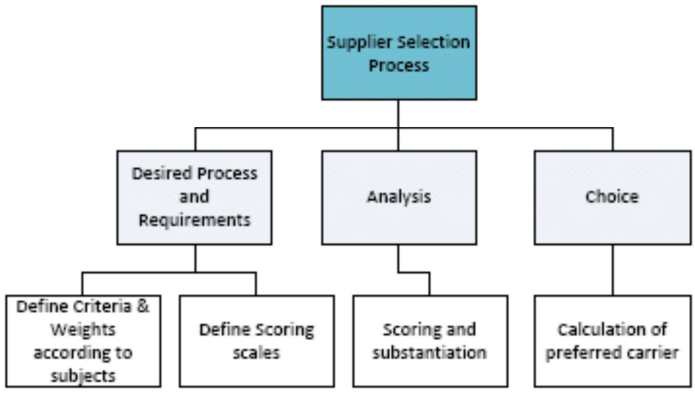


Figure 25 Consensus required from CEVA and KPN

Carriers

The role of the carriers is very important in any selection process. The importance of their involved is often misjudged. Cooperation from the carriers is vital for the quality of the selection process. Carriers will only operate (fully) when winning the contract is beneficiary for them. In case carriers are not fully cooperation or committed they provide, short answers and less detail, which decreases the quality of the process.

To get the supplier to go the extra mile, Willcocks et al (2007) state the following incentives:

- "The prestige of the customer
- The degree to which the client CEO is personally involved

- The size of the contract
- The potential for additional supplier revenues and good profit margins with this client and with other clients because of his deal
- The opportunity to enter into new markets
- The opportunity for knowledge transfer to supplier
- The perceived risks
- The supplier headquarters' sales targets or other financial considerations, such as like meeting quarterly sales quotas" (Willcocks et al, 2007).

Meetings with the potential carriers in the starting phase of a selection process can provide many valuable additional information, improving the quality of the selection (tender) document and the evaluation. This way as additional information is gathered, also knowledge on possible technologies are acquired by CEVA and relationships can be built with the potential carriers.

8.4 Conclusion Implementation

In this final chapter of the Design part of this Msc. Thesis it was explained how the developed Vendor Rating Model from chapter 6 could be implemented. The last sub question was answered:

How should a Vendor Rating Model be implemented in the selection process at CEVA?

A Vendor Rating Model is a tool for analyzing and comparing carriers that can be used in a standardized approach in the selection process. The five Step Sourcing Methodology, as discussed in Chapter 3, is a standardized approach in which a VRM could be implemented. In this methodology the VRM can replace most of the actions in Step 1 (Market/Requirement and Strategy formation) and 2 (Supplier engagement). Therefore it should already be implemented in the beginning of the selection process.

The old and new selection process are compared in figure 26. Note that the first 'Use VRM' is eliminated, which is shown by the red ellipse.

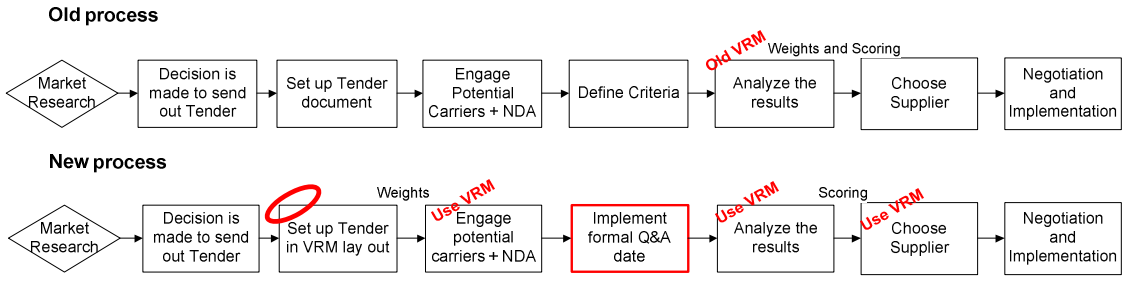


Figure 26 Old and New Selection Process compared

In practice it turned out that the Function of Information Giving is best carried out outside of the VRM in for instance a Powerpoint format. The following functions are present in a selection process:

- Information Giving: Set up structured Tender document
- Asking for Structured Information: Standardized format of Tender responses
- Analyzing: Scoring potential carriers based on responses
- Decision: Choose the preferred Carrier base on Analysis

In Step 1 a Request For Proposal is developed. Using a VRM can provide the layout and structure to specify the required process by CEVA and KPN. This way the VRM can act as a communication tool with the potential carriers and KPN. Having structured information delivered from the carriers with the help of the VRM will reduce the amount of time required to analyze the proposals.

Structuring the analysis and scoring of the carriers will make the process more efficient, communication of the evaluation easier and (with the right argumentation) it will increase the confidence gained by the decision makers.

CHAPTER 9. CONCLUSION AND RECOMMENDATION

This Msc. Thesis has evaluated the selection process of distribution carriers at CEVA Logistics. Three main aspects were researched to do this. The first part described the selection process in the current situation. The second part of this thesis showed a research of two shortcomings to the current situation. First of all selection criteria were researched and second improvements from literature to the selection process were researched. In the third part of this thesis a Vendor Rating Model was designed as an addition to the current situation. First, the sub-questions from the three parts will be discussed.

PART I: SELECTION PROCESS IN CURRENT SITUATION

As explained in the previous chapter CEVA operates in the field of contract logistics as the logistic service provider of KPN. CEVA uses globally a 'five Step Sourcing Methodology' which should help the procurement departments and responsible managers. In this first Part the following sub-question was researched:

1. How is the selection process of distribution carriers currently designed at CEVA for its client KPN?

To answer the first sub-question not only the formalized and standardized five Step Sourcing Methodology from CEVA was explained, also two business cases were elaborated. The businesses cases explain the selection process in practice at CEVA.
From the five Step Sourcing Methodology it can be concluded that there is a standardized approach available at CEVA. Also knowledge on selection processes is available in the global organization.

The business cases followed the five Step Sourcing Methodology on headlines.. This is because despite the high amount of detail of the Methodology, some crucial steps are not operationalized. The Methodology describes the required process on a high aggregation level, such as: "Analyse RFP returns". The way this analysis should be done is not explained and therefore, the responsible managers have a lot of freedom to fill in the intermediate steps.

How to analyze results of the responses from potential carriers is not explained. During the business cases the responsible managers set up the required tender documents and these were verified by the national Procurement department. Other stakeholders that were involved were: KPN management, Legal, Site Manger and IT. KPN management is the most important one, as it represents CEVA' client. The design of the required process (content of tender document) is verified by KPN and a timeline is agreed. Most of the work in the business cases was done by the individual site, including the analysis of the responses.

Finally, advice was given to KPN management which distribution carrier to select and negotiations were started with the winning carrier.

During the business cases a tender document and analysis had to be designed. The five Step Sourcing Methodology could not help due to its high aggregation level. On which criteria the distribution carriers had to be scored and how these should be derived was left to the responsible managers to figure out. Therefore in the following Part of this Thesis a literature research was performed on possible selection criteria. In the business cases selection criteria were defined by CEVA and validated by KPN management.

In short the current selection process for distribution carriers is constructed at CEVA as follows:

1. Perform a market research
2. Setting up a tender document
3. Engage potential carriers
4. Define criteria
5. Setting up an analyzing tool
6. Determine weights with the client KPN

Different stakeholders are active in the selection process and have their own interests. In the beginning of the process minor conflicts of interest can exist between CEVA and KPN and between CEVA - KPN and the carriers. Later in the selection process the interests can show major conflicts, for instance during contract negotiations. Table XIV provides an overview of these interests.

Table XIV Interests of stakeholders from chapter 3

	Interests CEVA	Interests Client	Interests Carrier	Conflicting Interests
Step 1 Information	Efficient market research	Effective market research	Clear information on required services	Minor
	Clear information on possibilities	Choice	Invite to RFI	Minor
Step 2 Engagement	Derivation of criteria and goal of tender	Clear formulation of goal and criteria	Clear information on required services	Minor
	Commitment of client	Resources from CEVA	Fit with required services	Major
	Short list of client to lower amount of repsonses	Best carriers in short list	Invite to RFP/RFQ	Major
	Efficient analyzing of responses	High quality of analysis	Ability to present own strengths	Minor/Major
Step 3 Negotiations	Best services at the right price for clients	Best services at the right price	Max. benefits from own operations	Major
	Clear understanding of goals	Clear insight in charging details	Fair price for standard services	Major
Step 4 Implementation	Clear understanding of SLA and KPI	High performance standards	Achievable performance standards	Major
	Efficient and smooth start up	Smooth start up	Efficient and smooth start up	Minor
Step 5 Benchmarking	Clear measurement of performance	Clear measurement of performance	Clear measurement of performance	Minor
	Good performance by carrier	Good performance by carrier	Max. benefits from reaching performance standards	Major

The first part of this thesis revealed two shortcomings in the five Step Sourcing Methodology:

- Selection Criteria: Which are required and how can they be derived?
- Selection Process: How can the process be improved in detail?

These two shortcomings were therefore researched in the second part of this Msc. Thesis.

PART II: SELECTION CRITERIA

In the second part selection criteria were researched that can be used in supplier selection. With the help of selection criteria, appropriate carriers can be selected for consumer distribution. The following research question is answered:

2. Which criteria are applicable for supplier selection and how can they be derived?

For the answer several sources were consulted. As a starting point technical literature was reviewed. Interestingly many selection criteria that were used almost 50 years are still applicable. The criteria: Quality, Delivery and Price are nowadays considered most important.

The most common criteria found in literature, ranked according to their relative importance are (amongst others: Yahya & Kingsman, 1991; Ho et al., 2010; Watt et al., 2010):

1. Quality
2. Delivery
3. Price/Cost

- Technology
- Capability
- Service
- Innovation
- Past Project Performance
- Communication
- Technical solution

The reason that the first 3 criteria are numbered is to show the fact that they are relative more important than the others. In complex selection processes the other criteria are also asked, but are mentioned significantly less often in literature. For instance the criterion Past Project Performance is not asked from potential carriers, as this is known by the decision makers.

The criterion Communication is relatively new as is the criterion. Environment and Corporate Social Responsibility (not in the list). Although environmental consciousness has increased over the years (Thanaraksakul & Phruksaphanrat, 2009), it is still considered relatively unimportant.

Next, two extensive business cases were used as input from the practice situation at CEVA Logistics. Consumer wishes were researched as a last source for selection criteria as the wishes of the final consumer have to be satisfied. Finally lessons learned were translated in the following table of generalized criteria.

Table XV Categories of generalized Criteria

Category	Examples
General	Stability and capacity
Financial	Budget, surcharges and volume bonuses
Quality	Conversion, Technology and communication
Process	Time windows and cut-off times
Environment and CSR	Kg CO2 emitted and paperless process

Information	Redundant IT systems and Privacy
Other	Optional additions/improvements

In the table above the criteria: Quality, Delivery and Price can be found. Delivery is part the category Process and Price is formulated as Financial. Working with categories of criteria proved to be helpful in structuring selection problems. Within the categories different criteria occur that are preferably measurable. In case criteria are not measurable, decision makers should search for alternative formulation of the criteria or a Likert scale could be used.

Case specific criteria

The table above describes generalized categories of selection criteria that are in principle valid for all selection processes of distribution carriers. Within the categories case specific criteria can be added due to specific circumstances or consumer wishes. As Watt (2009) stated: "In addition, individual companies could include other categories to those provided in this article to tailor the tender assessment process to meet their individual organizational needs" (Watt et al, 2009)

PART II: SELECTION PROCESS

In the second chapter of Part 2 the selection process was discussed in technical literature. The selection process from CEVA was analyzed and the two business cases showed how this worked in practice. Next, literature was studies for possible improvements or additions. The following sub-question is answered:

3. How can the selection process of distribution carriers be improved at CEVA for its client KPN?

A step by step approach is also suggested in literature. Also, emphasis is placed on the formulation of the goal and structuring of the required service. From practice lessons that were learnt, were the importance of management involvement and commitment. These factors have a big impact on the quality and duration of the process. This is particularly important at the beginning of the process as a good start is half the work. Other stakeholders that should be involved are (at least) the Contract Manager and the departments from CEVA: Procurement, Legal and IT.

Recommended is to meet with the possible carriers during the RFI or beginning of the RFQ phase. This way more detailed insight on the desired process is gained which provides a lot of additional knowledge for the shipper (CEVA-KPN). The higher the commitment from the carriers, the higher the quality of the evaluation of the potential carriers. Another advantage is that relationships can be build. This is particularly valuable in case the shipper has

negotiating power as the carriers will then try to show their best practice and provide most resources and commitment.

For some management decisions it is not necessary to use, rather complex, tender techniques, as sufficient information can perhaps be acquired through asking for a bid from carriers. In case there is lack of information and not all market opportunities are clear a tender process is needed. What type of selection process is preferred can be seen in the following figure, where complex tender processes are shown on the top right.

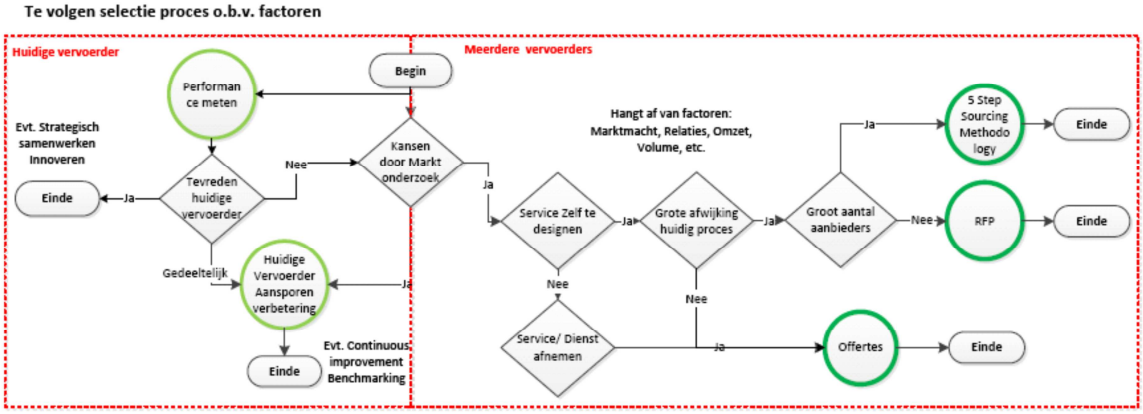


Figure 27 Process and types of Sourcing

From project management lessons can be learned to place emphasis on the required resources. Preferably an interdisciplinary project team should be assembled to design the required service, analyze the provided information and decide which carrier to select. In this case, the client KPN should always be aligned (procurement and business manager) and from CEVA, the departments: national procurement, IT and the business manager).

In the business cases a tender document was set up, which showed the required process from the potential carriers; and asks for information and argumentation of the carriers. Later a different document was set up, to analyze the responses from the carrier and advice was given to the client KPN. By adding structure to the process and documents the selection process could be made more efficient. How this is done, is explained in Part III.

PART III: VENDOR RATING MODEL

In the last Part of this Msc. Thesis an improvements to the selection process of CEVA were designed. In this Part a Vendor Rating Model (VRM) was constructed to help decision makers (KPN management) which carrier to select. Next, the VRM is verified and validated. In chapter 8 advice is given how this VRM should be implemented by CEVA. The following sub-question is answered:

4. Should a Vendor Rating Model be implemented in the selection process at CEVA and if yes, how?

The developed Vendor Rating model is based on a Multi Criteria Decision technique. It helps to structure an extensive decision problem, as for instance the strategic selection of distribution carriers. The Multi Criteria Decision technique that was chosen is the Analytic Hierarchy Process (AHP), first developed by Saaty. The main reason for choosing this technique is its simplicity and the construction of a hierarchy with which structure is added to the process. Furthermore, AHP can cope with both qualitative and qualitative criteria and uses pair wise comparisons.

The goal of the Vendor Rating Model is to aid decision makers and improve the selection process. Therefore the following properties were formulated which a Vendor Rating Model should comply to:

Table XVI Properties of the Vendor Rating Model

Property	Max. or Min.
Completion Time	Minimized
Confidence in Decision	Maximized
Ease of use	Maximized
Transparency	Maximized
Adaptability	Maximized
Objectivity	Maximized
Level of Detail	Min./Maximized

The VRM was verified and showed not internal miscalculations. Validation can in fact only be done ex ante through analysis of sales and customer satisfaction. Whether or not the correct decision is taken with the help of the model is the question that can best be answered as performance results from the carrier that has won the tender are known. As an example for the content of the VRM, the VRM (different than the final VRM) from the business case Delivery Plus was explained. As KPN management validated the contents and analysis of the Delivery Plus VRM they were impressed and confident in the decision.

Tender processes are often used for complex selection decisions and therefore a tender document has to be set up. This document asks for specific information on criteria from the carriers, which should a few weeks later be analyzed, structured and judged. Integrating these two processes could lead to a reduction in time spent on the selection process, since the carriers then provide the information in a universal lay-out, which is already structured.

9.1 CONCLUSION

The current selection process of distribution carriers can be improved based on practice experience and technical literature. Structuring was done during two parts of the selection process. With the help of a newly developed Vendor Rating Model these processes can be integrated and efficiency can be gained. Combining the answers from the sub-questions answered above, the main research question can be answered:

How should the selection process of distribution carriers that is used by CEVA for its client KPN be designed?

The process of selecting distribution carriers that is used by CEVA Logistics can be improved in various ways. The most important aspect is to structure the process and necessary documents. Certain steps in the process can be integrated with which the efficiency is increased. Furthermore, more emphasis should be placed on formulation of the goal of the selection process. The best way that the above research question can be answered is by the following figure (26):

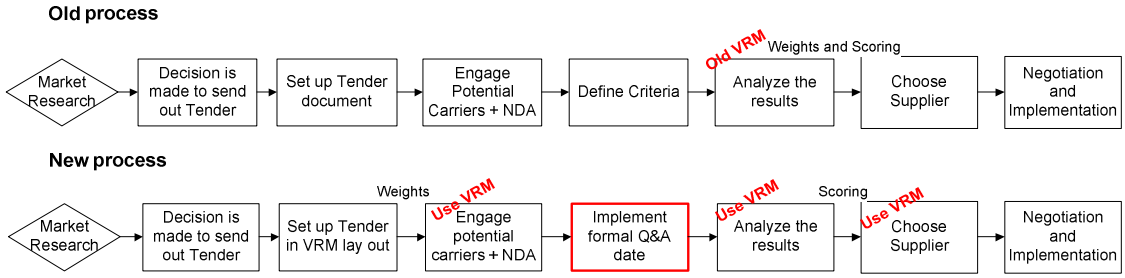


Figure 28 Selection Process compared: Old and New

As can be seen in figure X the newly developed VRM is used already for setting up the tender document. This improvement in the process structures the way information is asked from potential carriers. A universal format of answers by the carriers will speed up the analyzing phase as the responses can be compared more easily. A formal Questions & Answers session should be inserted (red in figure 26).

The technique behind the VRM: AHP will make this comparison easy, structured and efficient. The technique makes pair-wise comparisons between the responses of the carriers. AHP also requires a hierarchy to be constructed in which the criteria are structured into subjects. The methods is relatively easy to use and will therefore help to increase the confidence gained in the decision made.

Four functions can be distinguished in a selection process:

- Information Giving: Set up structured Tender document
- Asking for Structured Information: Standardized format of Tender responses
- Analyzing: Scoring potential carriers based on responses
- Decision: Choose the preferred Carrier base on Analysis

The aim of the developed VRM was to incorporate these functions. In the implementation it became clear that the first function was hard to incorporate, mainly because of readability. It is therefore suggested that the Information Giving function is separated so that in the potential carriers receive two document: One information giving document in which the requested service is explained and one Information asking document (VRM). The VRM is designed in such a way that the last three functions are combined, so that no additional structuring of information is required.

The typical selection process for CEVA takes in the new situation approximately 2 – 3 months, which is almost twice as fast as the process as performed during the business cases. To achieve a duration of 2-3 months enough and sufficient quality resources should be available and not more than 5-6 carriers should be asked. Management involvement should be high, including the Client' management. In case the requested service in the tender is beneficial for the carriers as well, they will have high commitment and this increases the quality of the process. The higher the quality of the selection process, the better the decision is made for the best distribution carrier.

9.2 RECOMMENDATIONS

Many lessons were learned in this Msc. Thesis. For CEVA Logistics the following recommendations can formulated that are valid for the selection of distribution carriers. The distribution focusses on consumers and telecommunication products. The recommendations can be categorized in the following subjects: Process and Criteria.

Process

- Integrate a Vendor Rating Model in the Selection Process
- Use this model for both the setup of a tender document and the analysis of proposals from distribution carriers
- Make sure plenty of time and resources are available from the start of the process, including management involved and national Procurement (CEVA) – Preferred is the formation of a project team including 2 employees of the client KPN and 2 or 3 from CEVA Logistics including the Contract Manager
- Perform market research proactive, for possible improvements and benchmarks of the service from the current carrier
- Don't forget to formulate an exit strategy in case the current carrier will not continue its service
- Spend plenty of time on raising commitment and involvement from the client before the start of a selection process
- Make sure the tendered services are also beneficial for the carriers, as their commitment and involvement will lead to more detailed answers and thus a higher quality of the proposal
- Trust is vital for commitment from both the client as the carriers and can be achieved through transparency and objective analysis
- Spend plenty of time on Goal Specification and structuring of the required service
- Agree on forehand on the way criteria have to be scored and on what scale
- Insert a Formal Q&A (Questions and Answers)
- Try to capture performance obligations in contracts, as SLA and KPI's
- Acquire analyzing knowledge at Procurement

Criteria

- Use the categories of criteria from Table 14 that are in principle always applicable
- A more extensive list of criteria for consumer distribution for telecom products can be found in Appendix IV
- Criteria and in particular their definitions are often case specific
- Define the criteria together with the client and agree on measurement scales
- Maximize transparency on criteria and (soft factors) influencing the decision

- In case it is hard to reach consensus to the relative importance of the general criteria a customer satisfaction research could be performed. Or else a factor analysis, to acquire stated preferences from the final customer

CHAPTER 10. REFLECTION

In this Msc. Thesis first of all the involved companies were introduced and the scope and background was described. These conditions are an important factor to keep in mind when reflection on this Msc. Thesis.

KPN outsourced their logistical activities to CEVA Logistics and this relation has a strong influence on sourcing. It was agreed that in selection processes CEVA always takes an objective and impartial role when selecting a distribution carrier. In the end the decision is made by KPN management after consultation and advice from CEVA. Objectivity was achieved in the business cases through the elimination of the names of the carriers when their scores on the criteria were applied. Also, the criteria were quantified as much as possible.

10.1 SELECTION PROCESS

Because the fact that KPN was impressed by the quality of the analysis and the developed model, it can be concluded that the developed methodology (including the use of a VRM) is satisfactory. The difficulty in judging the quality of the VRM is a difficult task, as this can be compared with asking the question: 'did we choose the best carrier?'

First of all, the word 'best' has to be defined and individuals have different opinions on what is important. The Vendor Rating Model is able to cope with these differences as a weighted average of the importance of criteria can be used. Furthermore, performance data should be known to truly validate whether the right decision was made. An increase in sales or improved customer satisfaction will for a large part be achieved by the performance of the carrier and can therefore be used for judgment.

Furthermore, since KPN is a large player on the Dutch telecom market, a lot of volume (number of parcels) is available for carriers to distribute. Thereby KPN is a valuable client for the carriers and they will therefore cooperate as this will be profitable business for the carriers. Because of this cooperation the carriers in general respond to tenders in a high quality which increases the quality of the whole selection process.

In general companies don't mind to negotiate and capture performance goals in contracts. Obligations are imposed on the own performance as through cooperation and continuous improvement the own operation can be improved. In most cases also a cost reduction can be obtained.

10.2 PROJECT MANAGEMENT

The fact that throughout this Msc. Thesis the selection process was called the way it was is because of the way CEVA handles sourcing. Sourcing is done process-wise with many stakeholders involved, including central procurement. The difficulty is that the individual sites know the client – in this case KPN – and therefore have a good idea what the customer' wishes (of the client) are and what is required from the distribution carriers. It is therefore recommended to form a project team with some resources from KPN (decision makers), CEVA business (operational and strategic knowledge) and central procurement (sourcing knowledge) to increase the effectiveness of the selection process. Lessons can be learned from project management.

10.3 METHODOLOGY AND PRACTICE

In this thesis first of all the current situation was elaborated including two business cases. Two main lacunas came to light:

- It was not clear which selection criteria were needed and how they could be derived
- Double work was done in structuring information

These flaws were researched in the second part of this thesis (Research). Lessons learned were used to compare improvements from literature with the current situation. In the last part an improved selection process is suggested based on the research and comparison.

Many iterations were done when comparing possible improvements from practice and literature to the original situation. Some trouble was had in structuring the observations in the right part of this Msc. Thesis. In the final part of this thesis (Design) all observations come together and the main message is to add structure to the current selection process.

Selecting a certain distribution carrier is a case specific task in most cases. For some cases the Quality of the distribution is relatively important whereas in other cases a low Price is more important. Working with the AHP methodology in the VRM allows for working with this relative importance and makes it visible. Because of the influence of case specific criteria and their relative importance the influence of the practice is high.

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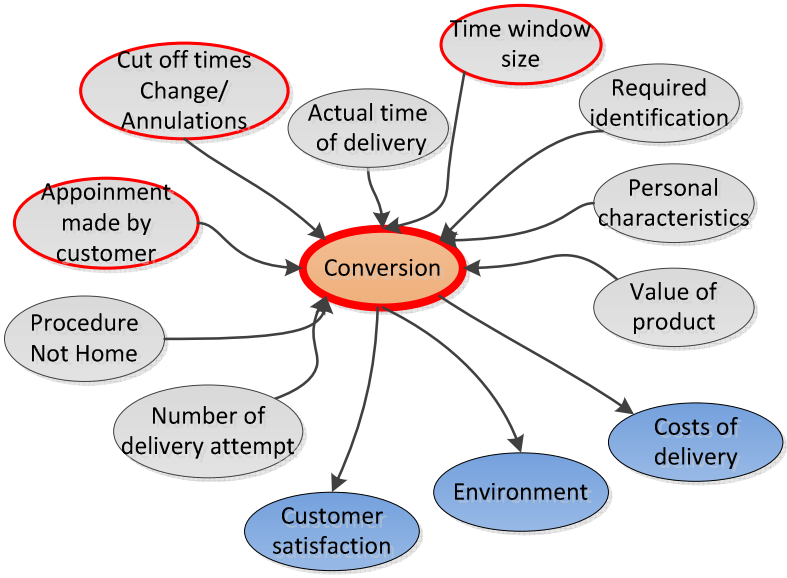
APPENDIX I - CONVERSION

In customer delivery a recurring criterion is conversion. From the example from Table 8, the conversion is made up of the two SLAs together. Conversion has a big impact on the costs of delivery and customer satisfaction. Therefore it is one of the criteria that should be improved and is used as a control and design measure. Many different factors influence conversion and these factors are explained in this appendix. First of all, as stated a definition of conversion that CEVA-KPN uses is:

% successful conversion = Delivered orders / Order take ins

To make this term more clear the following causal relationships are drawn.



Factors explained

Appointment made by customer

In case the delivery appointment by the customer itself, the conversion can increase. The alternative is that CEVA-KPN proposes a date and time for the delivery. Perhaps this proposed date and time is not the first choice of the customer and the customer is therefore less prepared to stay at home at the time of delivery.

Cut off times Change/Annulations

One possible source of a failed delivery attempt is an unexpected change of circumstances from the customer. For instance, one day before delivery the customer is notified that he/she has to work the next day. So, despite the delivery appointment, the customer is not home. The later the customer is allowed and the easier it is, to change the delivery

appointment, the higher the chance that the driver does not stop at the customer' house for nothing.

Actual time of delivery
This factor might also be of influence on the conversion. A delivery appointment scheduled at 10.00 hours on a weekday, might result in a lower chance of the customer being home than at 18.00 hours. This factor would have to be researched.

Time window size
The size of the time window the customer is supposed to be at home so that delivery can take place. The preparedness of the customer to stay at home (or a random delivery address) for the delivery will increase in case the time window is smaller. Currently time windows of 2 hours is the smallest that carriers are able to provide.

Required identification
Deliveries of relatively high valued products are often only allowed to take place by the right person (= customer to place the order) if he/she is able to show the correct identification (passport, driver's license, etc.). The conversion could increase, for example, in case a person of the same family is allowed to sign for the delivery, or even any other person that is at the delivery address. Increasing the allowance of delivery identification will result in a higher chance of fraud though.

Personal characteristics
One customer is not the other. Some people are polite and formally cancel appointments, where others do not take the time to cancel an appointment. Personal characteristics are a factor that cannot be influenced by the carrier or KPN-CEVA and will always explain a certain part of unsuccessful deliveries.

Value of product
This factor can be expressed in both monetary as non-monetary terms. The higher the value for the customer, the higher his/her willingness to stay at the delivery address. For instance a relatively cheap phone that replaces the customer' broken phone leads to a high value of the product.

Number of delivery attempt
When the first delivery fails, a second appointment is made with the customer (the earliest possibility is the next day). Usually the conversion is higher at a second delivery because the customer has waited long enough for his/her order.

Procedure not home
This factor is related with the previous one, but contains more aspects. In case the first delivery fails due to the fact that the customer is not home either a second delivery appointment is made or the order is delivered at the neighbors or at a service point. The

rules for what happens when the customer is not at home can be designed to increase conversion.

Customer satisfaction (result)
Customer satisfaction is a factor that results from conversion. The higher the chance that an order is delivered successfully, the higher the chance that a customer is satisfied.

Environment (result)
The higher the conversion is, the fewer kilometers are driven. Any time a delivery fails; a driver has to take on the same address the next attempt and therefore drives additional kilometers. The more kilometers driven, the more CO2 and other gasses are emitted.

Costs of delivery (result)
An additional appointment for the delivery of an order costs the rate of an additional delivery attempt by the carrier. Next, additional costs can occur like the rate of a call center agent and storage costs.

Overall
As can be seen in the figure, 'time' is a very important aspect in determining conversion, as this word occurs in 3 of the factors. Time windows should be small to satisfy the customer. Making them too small will make the planning of routes by the carrier harder. This in turn leads to higher costs and a higher chance that the delivery takes place inside the correct time window, thus lowering conversion. This interaction between the time windows and conversion is an important relation to research.

Furthermore, it is in practice not possible to achieve a conversion of 100%. This is partly because of the factor 'Personal characteristics'. Next, unforeseeable events (like traffic jams or incidents) and bad communication will lower conversion.

APPENDIX II – INTERVIEW CONTRACT MANAGER MOBILE

Interview – Roy van der Pijl 19-04-2012

This interview was conducted to review the process, contents and results of the Business Case: Delivery Plus (Chapter 3) and sourcing in general at CEVA. The responsible manager: Roy van der Pijl was interviewed.

The complete interview has been recorded (68 minutes), of which the summary is shown here. Questions or follow-up statements of the interviewer are typed in ***bold****.*

RFQ tender DP – Reflection of the Process

Q. What was your experience in selecting carriers?

The actual sourcing of carriers was something new for me. However, I've had experience in various other purchasing processes, including multi criteria and average weighted scoring. In most cases criteria could be derived internally. Delivery Plus was a very complex process.

Q. Were you aware of "The five Step Sourcing Methodology"?

Yes, for the practical implementation of the methodology. Also, best practice sharing and benchmarking is part of the process. Most important is to derive and explain the requirements and criteria with the client and how to evaluate them. Garbage in = garbage out.

In many projects stakeholders are satisfied too easily with insufficient/ unreliable/ incomplete data, which results in a lower quality of the remaining process, in my opinion. Important is to make the evaluation as objective as possible and there may be no room for unclear criteria and their definitions.

Q. How much did the involvement of the client influence the process?

I know the relation with KPN (the client) and their involvement later in the process was high. CEVA has stated a lot of information in a qualitative good way on paper. During meetings compliments were received from the client and they saw the added value of our work and information. The end result has been completely satisfactory for the client and this resulted in new insights and market knowledge for CEVA and KPN.

At the beginning of the process the involvement from the client could have been better. Some requirements were ill-defined and input from the client was necessary. About scoring and evaluation: an idea is to agree on a certain rule, that for instance when carrier A is X less expensive than carrier B, *then* another criterion comes into play.

At the end of the process the client validated CEVA's analysis. In Contract Logistics (the relationship between the client and CEVA) it is very important to speak the correct language.

Q. How was cooperation with other departments?
Procurement: Could have been better. Active control on the quality of the process was done by the individual site.
Legal: Qualitatively high, provided a lot of additional value. Organizational could be improved through better communication.
IT: Good, the IT manager was aligned during the whole process. Tuning the requirements with the client was hard. Even better would be: as the IT system is on the operation table, see which improvements can also be made, like track and trace.
Finance: Should have been more aligned to agree on invoicing and conditions.
Customer Service: In future no different than now. Validation of processes.

Q. Supporting individual sites is not core business of Procurement, but a secondary objective.
I disagree. Sites are allowed to be entrepreneurial, and in that case should also get the responsibility for certain sourcing projects.

Q. How would you have designed the process if the interviewer (Msc. Student) would not have been present?
First of all: determine the stakeholders, and meet with them. Determine what is going well and what is not and how this can be improved. Next, the same process can be followed. Criteria should be determined with the client.

RFQ DP – Criteria & VRM
Q. Are you satisfied with the determined criteria, including their definitions? Were there any missing?
Yes, well done. Definitions could have been more concrete.
Suggestion, additional criterion: Organizational stability. True. The way we derived the criteria were first of all the determination of the subjects and then the criteria. Better would have been to perform an open interview with KPN, to see what is really desired by the client. The weights (relative importance) of the criteria were determined by KPN.
In that case you are relieving the client less. No, this is also a way of relieving the client. A meeting is planned, which is translated into the desired process and criteria.

Q. What about an additional criterion like Risk?
It is hard to find the right information. Potential carriers (respondents) will never fully open up and show you their weaknesses. Therefore, a criterion as risk will become subjective. Financial stability is for instance objective and therefore preferred. During (informal) meetings you should try to evaluate the possible risk of a potential carrier.

Q. Should criteria be independent? Not necessarily. Quality and Price are always related. **And without Price?** There will still be dependencies. For instance the quality is determined by the realized conversion and time windows.

Scoring and evaluating criteria

Q. In the Business Case Delivery Plus Scoring: 1-10, calculation of weighted average score.

Good, in particular because of the joint scoring with the client. We hided deliberately the names of the carriers for an objective evaluation.

When comparing with the business case Service Points were the carriers were rated by: 'satisfactory', 'partly satisfactory', 'not satisfactory' or 'implementation time required' is not necessarily more objective. It's still a subjective task to determine when a carrier is 'satisfactory' and when it is not.

VRM

Q. How did the VRM help to 1) support our advice to the client? 2) Help the client in taking their decision?

1. Real good, amongst others because the client validated the weights and scoring themselves. The client has made the final decision, based on our input. Confronting the client has paid off.

Q. Should the financial comparison (Budget) of the carriers be an integral part of the evaluation?

No, not integral. Financial issues always require more detail.

Q. Which criteria are always valid and which are case specific?

Always: Budget, Service (although different definitions), Process (different criteria and definitions).

The list of criteria and subject from Appendix 4 should be as simple as possible. **Even better would be just before the final decision to evaluate the criteria and their definitions once more, as all information is available.**

Improvements for the future

Q. Was the time spent on Delivery Plus too long?

Difficult to say, there are 2 aspects: time spent and duration time. The time spent was good, duration time could have been shorter. This is partly because of a lower commitment from the other stakeholders in the beginning of the process. This commitment can be increased by making sure that the process is put on the agenda of the stakeholders and to do this your information must be good. In the end the results are good and compliments were received from the client on the quality of the process.

APPENDIX III – INTERVIEW CONTRACT MANAGER FIXED

Interview – Jos Breedveld 17-04-2012

This interview was conducted to review the process, contents and results of the Business Case: Service Points (Chapter 3) and sourcing in general at CEVA. The responsible manager: Jos Breedveld was interviewed.

*The complete interview has been recorded (44 minutes), of which the summary is shown here. Questions or follow-up statements of the interviewer are typed in **bold**.*

Process

Q. What was your experience in selecting carriers?

Within CEVA the previous described business case Delivery Plus. In former job much more experience with purchasing, including B2B projects, online tendering, auctions etc.

Q. What is the influence of the relationship with the client (Contract Logistics)?

Very much. CEVA's role is to facilitate and advice, the client takes the decision.

Q. How would you have designed the process if the interviewer (Msc. Student) would not have been present?

Internal solution. Next to my own involvement, support from other departments, for instance Corporate Procurement.

Q. How was cooperation with other departments?

I wouldn't have done the process differently. The correct stakeholders were involved in time, given the specific circumstances. In particular cooperation with the Legal department was good and fast.

Q. Were you aware of "The 5 Step Sourcing Methodology?

Yes. Tendering is somewhat a standard process. The objectives from the methodology are clear.

Service Points

Q. Which subjects would you add?

Innovation. In the business case Service Points a certain performance level was described. Potential carriers were asked to satisfy these levels. This way it is harder for the carriers to show possible innovation in their responses.

Q. How important is market power?
Market power can lead to a lower price, because of a larger volume. In contract logistics it is common to send out a tender at the end of the contract period. Good performance (past performance) might help with getting an extension of the contract, but services will still be tendered.

Q. How do you look back to the MoSCoW scoring?
This scoring method was not applied correctly, as many criteria were perceived to be of the highest importance (M = Must Have). However, due to the fact this MoSCoW scoring was already implemented by the client, we kept it to keep the involvement of the client high. Time was a crucial factor.

Q. How did the qualitative comparison help to support the decision of the client?
The lay out and analysis was very good. This made the decision for the client decisive. Without the analysis the decision makers would have had to choose on the basis of less tangible values and information. CEVA made a crystal clear comparison, which resulted in the total support of the client.

Q. Should selection criteria be independent?
Yes, in relation to the process itself. In the technical sense is it very important to know what you are evaluating on what way. On a high aggregation level (Price, Quality, Process and Organizatoin) these should be independent. Off course there will still be a relation between price and quality, as a carrier can deliver a high quality, but also at a relatively high cost. This is exactly the goal of a selection process, how to cope with these kinds of considerations.
Most important is the fact that it is clear what is being scored and how. The potential carrier will link the details of the required process and translates this to its own organization. Then it states its price based on the required process.
Without the criterion Price? Process and Quality are also connected, since the way the process is secured (by measuring performance), determines for a large share the quality of the service. You evaluate them separately so that you can give a score to the Subject.

Q. Are criteria allowed to be subjective?
No, this should be eliminated as much as possible. Only for the criterion Quality some subjectivity might remain, since this criterion is hard to define. In cooperation with the client Quality should be defined.

Q. How good was the scoring done in the business case Service Points?

The points that were allocated to the different scores: 'yes, satisfactory', 'unsatisfactory', 'partly satisfactory' and 'implementation time required' with specific weights. However, different scores/points can be assigned easily and this should be done by the client. CEVA is impartial and objective and will advise the client).

Improvements for the future

Q. How would you derive criteria a next time?

My hope is that based on these experiences a basis tender document will be set up. In the future all that will then be required is to update certain aspects according to recent market conditions and case specific criteria.

In a new selection process the input will be updated and then validated by the client.

Q. How would you score the criteria?

I prefer the scoring as was done in the business case Service Points, since there were 4 clear, distinct scores. In the other business case Delivery Plus a 10-point scale was used, which can be interpreted differently by various people. Most important is that it is clear to all stakeholders how the scores are applied and which values are attached to them.

Q. How can customer wishes best be satisfied?

The underlying questions all have the goal to satisfy the wishes of the final customer. To reach these wishes the carriers have to meet with certain performance levels and be able to provide certain services. In most cases innovation is asked for in tenders as this can improve the current service that is provided to the final customer. Thanks to innovation the aim is to live up as close as possible to the expectations of the customer.

The customer wishes can change over time, and selection processes often take a few months to complete. This can be dealt with easily, as additional question (for instance as new innovations enter the market) can be asked when a short list is constructed later on in the process. The process is dynamic, but you aim to structure the process as much as possible. Making a process more complex, results in a more complex solution or output.

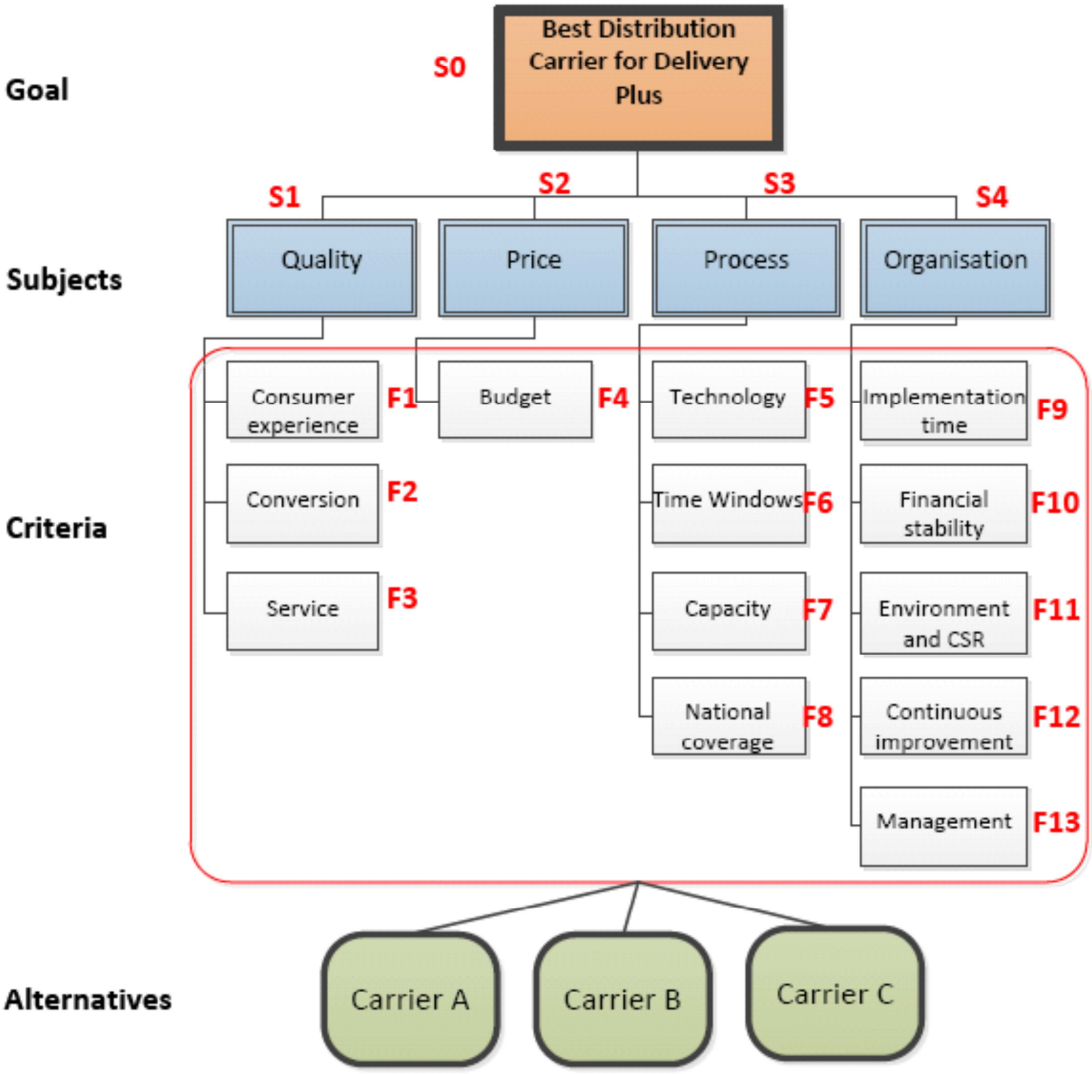
APPENDIX IV – GENERAL SUBJECTS AND CRITERIA

Criteria	Explanation
General	
Company	Loaction, number of employees
Stability	Expected growth, reorganisations
Experience Telecom	Years
Capacity	Number of vehicles, drivers
Financial	
Budget	Prices and charges based on expected Volume
Payment term	Days
Volume bonus	Discount
Fin. Stability	Annual report
Quality	
Flexibility	Volatility in volume
Conversion	Number of orders delivered / Number of orders planned
Communication customer	Information via SMS/ email/ phone
Real time T&T	Real time visisbility on status order
Consumer satisfaction	Measuring consumers whishes
Technology	Maturity and innovativeness of proposed solution
Continuous Improvement	Focus and assurance of continuous improvement
Innovation	Which innovations are to be expected on short term?
Process	
Cut off time consumer	Till what time can orders be placed for next day?
Cut off time Collection	At what time are orders collected at CEVA?
Ability to change order	Annulation, Change of Adress/ Time of delivery
Pre-alerts	Neccesity and layout of pre-alerts
Delivery days and times	Days and hours
Time windows	Hours of time window delivery
Return process	Explanation and frequency
Environment and CSR	
EURO 5/6	Amount and type of vehicle engines
Paperless	When can the process be executed paperless?
CSR activities	Which activities will take place on short term?
CO2 measuring and reducti	kg CO2 per driven kilomter
Information	
IT in-house	Is the IT sytem based in-house?
System maturity	Years
IT redundancy	Back-up systems
Privacy and data	Assuring security
Reporting	Proposal for reporting
Other	
Any aditions/ improvements to the requested service	

APPENDIX V – AHP PERFORMED ON DELIVERY PLUS

Determine the goal of the project (C0)
The goal of the project was formulated as: "Innovatiebezorgproceszendingen met aanvullende services Nederland"

2 & 3. Criteria, Components and Hierarchy
The criteria and the components are shown in the figure below and together form the hierarchy. The components were in the Delivery Plus case described as Subjects.



4. Determine the scale to score alternatives
In the previous paragraph the importance of scales was discussed. In selection processes it can be hard to determine the scales and subsequently the meaning of an absolute

measurement. According to Saaty: “A person may not be schooled in the use of numbers but still have feelings,judgment and understanding that enable him or her to make accuratecomparisons (equal, moderate, strong, very strong and extreme and compromisesbetween these intensities)” (Saaty, 200?). Therefore Saaty derived his fundamental scale that is shown in the figure below. To derive the relative importance of criteria in the figure below can be applied. For the relative scores, the same scale can be used, but in that case the word ‘importance’ needs to be replaced with ‘preferred’. Some discussion exists in literature, focusing on the absence of mathematical substantiation of this scale, but in general it is accepted and seen as relatively objective.

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
2	Weak	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A reasonable assumption
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

Score the alternatives (scenarios, in our cases carriers) on the defined criteria

For the alternatives the three possible carriers that reached the shortlist were taken. They were scored on all criteria. This was the AHP methodology evaluates the performance from

the carrier's bottom up, through pair wise comparison. This will be shown for the criterion Conversion:

Conversion

F2	A	B	C	GEOMEAN	F2'
A	1,00	0,13	0,14	0,261379	0,060793
B	8,00	1,00	2,00	2,519842	0,586076
C	7,00	0,50	1,00	1,518294	0,353132
				4,299516	

The table should be read from left to right. Conversion should be maximized, so a higher score of one of the carriers favors that particular one. Following the red arrows: Carrier B is *8 preferred over Carrier A*, according to Saaty's fundamental scale. According to this scale it is clear that Carrier B is 'very, very strongly' preferred over Carrier A. Similarly, Carrier C is preferred ½ (0.50) over carrier B, meaning that Carrier B is weakly more preferred (2) over Carrier C on Conversion.
On the diagonal of the table a score of 1 is filled in ('equal'). On the other site of the diagonal the reciprocal value of the score is shown: if A is 7x preferred over C, C is 1/7 = 0.14 preferred over A. This way all three carriers are scored on all criteria.
The actual score of the carriers on the criterion Conversion is calculated in the last column under F2'.

Geometric mean

Instead of using a normal mean to aggregate scores, the geometric mean is preferred. According to Saaty: "It is known that with the reciprocal condition, the geometric mean is a necessary condition for combining individual judgments" (Saaty, 200?). The geometric mean says something about the ratio, whereas the 'normal' mean says something about the differences between numbers. Since in our case judgments (scores) are compared so the geometric mean in preferred.

Determine the relative importance of criteria through pairwise comparison

As the carriers are compared (pair wise) on all criteria, the relative importance of these criteria must be calculated. This is done in the top part of the following table.

Quality

wS1	wF1	wF2	wF3	GEOMEAN	wS1'
F1	1,00	2,00	5,00	2,15	0,541528
F2	0,50	1,00	7,00	1,52	0,381631
F3	0,20	0,14	1,00	0,31	0,076842
				3,98	

S1	F1'	F2'	F3'	wS1'	S1'
A	0,09	0,06	0,06	0,54	0,077102
B	0,45	0,59	0,59	0,38	0,514849
C	0,45	0,35	0,35	0,08	0,40805

The Subject Quality (S1) is build up of Consumer Experience (F1), Conversion (F2), Service (F3). The relative weights of the criteria are calculated on the same way as the scores in step 5 (one level lower in the hierarchy) and the result is shown in the last column: wS1'.

Determine the scores of the carriers on the subjects

In the lower part of the table under Step 6 the scores of the carriers on the criteria are determined on one level higher: the Subjects. The scores of the Carriers on the Criteria (F1', F2' and F3') are compared in the lower part of the table under Step 6 and multiplied by the outcome of Step 6 (green column in the table). This way the Carriers (A, B, C) are scored on the Subject Quality (S1').

Determine the relative importance of the subjects

In the same way as the lower levels, the relative importance of the Subjects (S1 – S4) on the Main Goal (G0) are compared.

Relative Importance Subjects on Main Goal

wG0	wS1'	wS2'	wS3'	wS4'	GEOMEAN	wG0'
wS1'	1,00	1,30	1,30	1,50	1,26	0,311944
wS2'	0,77	1,00	1,00	1,17	0,97	0,240617
wS3'	0,77	1,00	1,00	1,17	0,97	0,240617
wS4'	0,67	0,86	0,86	1,00	0,84	0,206822
					4,044999	

Determine the ranking of the alternatives/scenarios

In the last step the Carriers (A, B, C) have to be scored on their contribution to the Main Goal (G0). In this figure the scores of the Carriers (S1', S2', S3', S4') are multiplied with the contribution of the subjects to the Main Goal (Step 8: wG0').

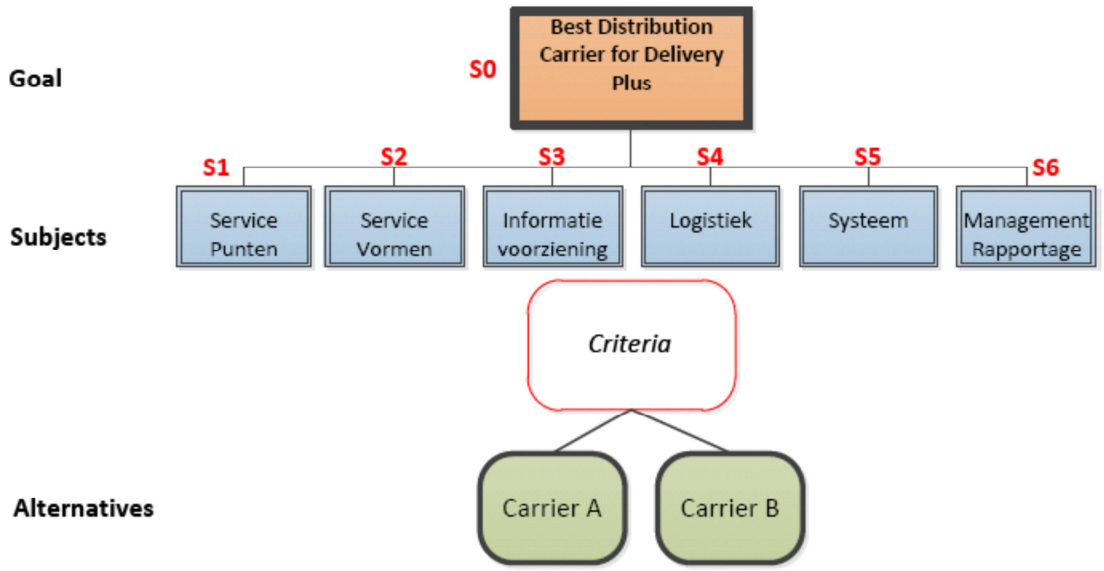
Final Score Carriers on Main Goal

G0	S1'	S2'	S3'	S4'	wG0'	G0'
A	0,08	0,64	0,16	0,19	0,311944	0,2559
B	0,51	0,29	0,50	0,31	0,240617	0,4143
C	0,41	0,07	0,35	0,50	0,240617	0,3298
					0,206822	

Rank
3
1
2

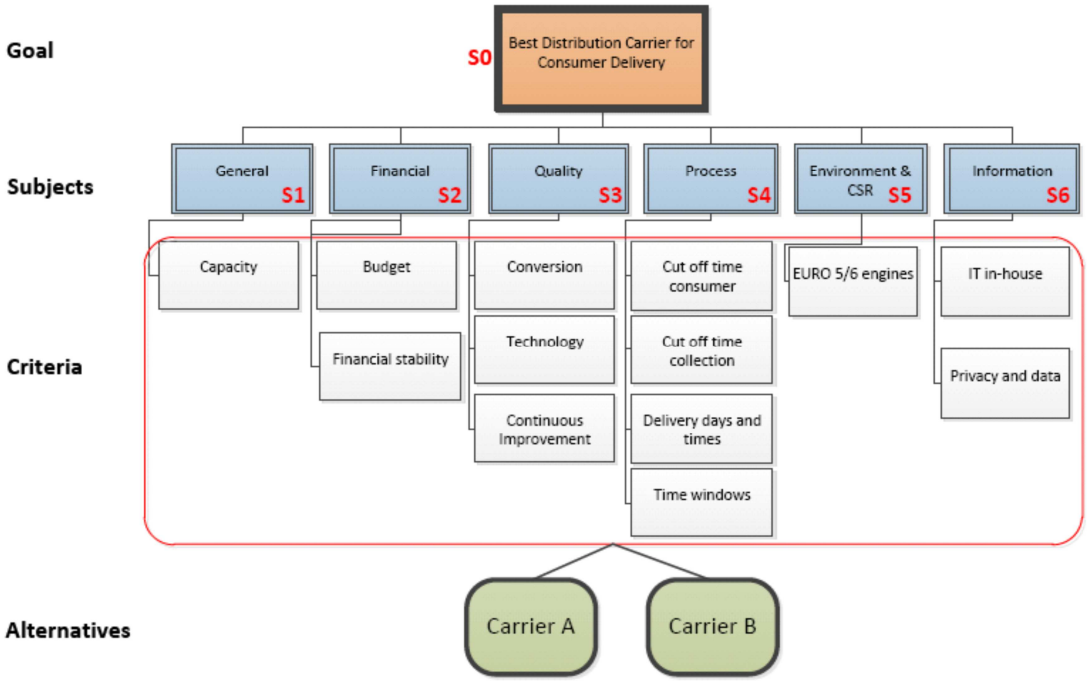
As can be seen in the table in Step 9, the Carriers are ranked to their contribution to the Main Goal (G0'). In this case, Carrier B scores highest (via the lower levels in the hierarchy): 0.4143 and is therefore ranked 1st. Carrier C is judged 0.3298 points and ranked 2nd, whereas Carrier A scores lowest with 0.2559 points.

APPENDIX VI – HIERARCHY SERVICE POINTS



The criteria for this business case are numerous and were formulated in a Program of Requirements.

APPENDIX VII – HIERARCHY GENERAL CRITERIA



As an example to most basic criteria and two potential carriers are shown.

APPENDIX VIII – FUNDAMENTAL SCALE FOR SCORING

Scale for assessing the relationship between criteria/ subjects

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
2	Weak	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A reasonable assumption
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

Taken from Saaty: The fundamental scale of absolute numbers