

## **Public and private sectors preferences regarding the briefing process**

The influence of the briefing process on municipalities, public-private companies and contractors in infrastructural projects with an integrated contract

Master of Science Thesis

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## **Preface**

This MSc thesis is about the public and private sectors' preferences with regard to the briefing process in infrastructural projects with integrated contracts. This thesis is aimed at accomplishing the graduation process for the completion of the MSc Construction Management and Engineering at the Eindhoven University of Technology. The MSc track has provided me with a great set of skills and knowledge that I will be able to use in future work.

Through the outcomes of this study I hope that I have provided a good understand of this dynamic and interesting topic. The construction sector is rapidly changing, not only the use of materials is continuously innovated but also the ways of collaboration between all actors. These changes in responsibility are necessary for the construction sector to cast off the shady image that has haunted the sector for many years. By using integrated contracts for infrastructural projects the whole process is made more transparent and a higher efficiency is reached. Although I have studied the many problems of the integrated contracts, I believe that the future of integrated contracts does not stop here.

I would like to thank those that have contributed to this research both directly and indirectly. I would like to thank Brano Glumac for his input in the area of methodology. Furthermore I would like to thank Gerrit Burger for his personal dedication and for being enthusiastic about the topic of this research. Furthermore I would like to thank all my colleagues at Aiber and A-lanes A15 for their support during the graduation project and advice along the way.

What I liked most of doing this research was listening and discussing with professionals and friends. Therefore, many thanks to the interviewees for their input and their time.

And last but not least, a special thanks to my family, girlfriend and friends for their supportive words and input throughout the graduation project.

**Glenn van Steeg**

Utrecht, August 2015



## English summary

Our current complex society requires sustainable road infrastructure, as it is essential for strengthening the national economy and maintaining an international competitive position. The last ten to fifteen years several changes occurred in the way public and private parties are working with each other. The public sector is willing to collaborate more closely with private parties, which has resulted in the: 'market, unless ...' motto. This motto that was formulated in 2004 by governmental organization Rijkswaterstaat, the biggest client of infrastructural planning and development, has marked a completely new approach for the relationship between clients and contractors.

Collaborations between the public and private sector are named Public-Private Partnerships (PPPs). These partnerships are characterized by the use of innovative and integrated contracts. The changing relationship of public and private sector results in a clear shift of tasks and executive responsibility towards the market in the Dutch infrastructure construction sector. Public sector clients like Rijkswaterstaat are taking a step back and are focusing more on the role of asset owner. As a result the tasks and responsibilities within a project are handed over to the private sector. Two types of integrated contracts are investigated in this paper namely Design and construct (D&C) and design, build, finance and maintain (DBFM) contracts. With a D&C contract, the contractor is responsible for designing and constructing a project, whereas in DBFM contracts he is responsible for designing, building, financing and maintaining the project over a period up to 30 years.

As part of the integrated contract, the contractor is responsible for managing the interest of all surrounding actors. They are also referred to as shareholders and consist out of two important groups: municipalities and public-private companies. Realization of the total infrastructural project means that segments owned by these actors also have to be reconstructed. Therefore, before the tender phase commences the client determines the needs of the shareholders and documents these in a list of requirements. By stipulation of the integrated contracts, these requirements are written down functionally, which means that the requirements describe which functions have to be realized and does not already force a solution to the contractor in the form of a building estimate. Due to the functionality of the requirements the contractor has much freedom for making the design and construction, for he has the possibility to come up with solutions that are innovative and more efficient than they would have been with the traditional type of contracting. In literature the process that is characterized by collecting, analyzing and documenting the shareholders' requirements and demands is also referred to as: the briefing process.

The contractor experiences much difficulties in the collaboration with the surrounding actors and the client during the briefing process. Reviewing the subsequent literature on the subject and organizing interviews with multiple experts on the subject has led to six attributes that are key to the briefing process. These six attributes are:

- Timing of first meeting (pre-requirements)
- Flexibility list of requirements
- Department in charge of analysing requirements
- Requirement types
- Validation of requirements
- Training for DBFM or D&C in PPP

The attributes have been used in a discrete choice experiment. Respondents from public, private and semi public-private sector have been asked to fill in a questionnaire, which consists out of nine choice sets. They had to make a decision between two alternatives each consisting out of different attribute levels. For each attribute, three attribute levels were assigned. The general preference

model shows some surprising outcomes. For example the general preference towards the 'department in charge of analyzing the requirements' is that this should be done by the design department, although literature prescribes the use of the systems engineering department. The stakeholder management department is least favored in this model. Also the attribute 'requirement types' shows an unexpected result, namely the use of 'specification based on performance' is ranked the highest, oppose to 'specification based on functionality'. This notion is also supported by the many problems faced using functional requirements found in the literature study and as well in the interviews with experts. All experts feel that changes have to be made within the contract as they feel that requirements have to be set-up functional where this is possible, however when a tested solution exists this has to be used.

In general the chosen attributes support the hypothesis that changes have to be made in the briefing process to ensure satisfaction for all parties involved. Shareholder and contractor prefer to have the timing of the first meeting during the tender phase, although this is not possible now the client can make a small adjustment to the contract so this is possible with future projects. Also the use of functional requirements in the contract is a point of discussion. Results from the questionnaire show that respondents prefer to have a specification based on performance, while the use of functional requirements in some cases challenge the contractor to come up with an creative and innovative design most of the time it leads to much discussion between shareholder and contractor. Therefore the proposition is to use functional requirements where it can lead to improvements and use tried and tested methods where necessary.

## Samenvatting

Onze huidige complexe samenleving vraagt om duurzame infrastructuur, aangezien dit van essentieel belang is voor de versterking van de nationale economie en het behoud van onze internationale concurrentiepositie. Tijdens de laatste tien tot vijftien jaar zijn er veel veranderingen doorgevoerd in de samenwerking tussen publieke en private partijen. De publieke sector is bereid om nauwer samen te werken met private partijen en dit heeft geresulteerd in het 'markt, tenzij ...' motto. Dit motto, dat in 2004 door Rijkswaterstaat is geformuleerd, heeft gezorgd voor een nauwere samenwerking tussen opdrachtgevers en opdrachtnemers.

Deze manier van coöperatie tussen publieke en private sector wordt ook wel Publiek-Private Samenwerking (PPS) genoemd. Kenmerkend is het gebruik van innovatieve en geïntegreerde contracten. Hierin worden verschillende fasen geïntegreerd in één contract wat uiteindelijk leidt tot meer verantwoordelijkheden en taken voor de aannemersorganisatie. Publieke opdrachtgevers nemen een stap terug en richten zich meer op de rol van asset manager. Er bestaan verschillende geïntegreerde contracten, maar dit onderzoek zal zich beperken tot Design and Construct (D&C) en het Design, Build, Finance and Maintain (DBFM) contract. Met een D&C contract is de aannemer naast de bouw ook verantwoordelijk voor het ontwerpen. Bij het DBFM is hij daarnaast ook verantwoordelijk voor de financiering en het onderhoud voor een periode van maximaal 30 jaar.

Eén van de nieuwe taken en verantwoordelijkheden voor de aannemersorganisatie binnen het geïntegreerde contract is het uitvoeren van omgevingsmanagement. Omgevingsmanagement houdt in het activeren, onderhouden en sturen van de relaties tussen het project en zijn omgeving. De omgeving van een project bestaat uit meerdere belanghebbenden. De belangrijkste bij infrastructurele projecten zijn: gemeenten en publiek-private ondernemingen. Vaak zijn zij eigenaar van segmenten van het totale tracé die aangepast moet worden. Voordat het project de aanbesteding in gaat, stelt de opdrachtgever samen met de belanghebbenden een programma van eisen op. Binnen de geïntegreerde contracten is een van de voorwaarden dat eisen functioneel opgeschreven worden, hierbij geeft de opdrachtgever aan 'welke functies' hij/zij primair gerealiseerd wil zien en niet 'welke oplossing'. Door de eisen functioneel op te stellen beoogt de opdrachtgever meer vrijheid te geven aan de aannemer voor het maken van het ontwerp, want hij heeft de mogelijkheid om te komen met oplossingen die innovatief en efficiënter zijn dan dat zij met de traditionele aard van de aanbestedende zouden zijn geweest. In de literatuur wordt het proces van het verzamelen, analyseren en documenteren en valideren van de eisen en wensen van de belanghebbenden ook wel aangeduid als: de eisen analyse.

De aannemer ervaart veel problemen tijdens de initiatief fase van het project waar het verzamelen, analyseren en valideren van de eisen centraal staat. Ook het functioneel specificeren van de eisen zorgt voor veel onduidelijkheid bij alle betrokken partijen. Voor dit onderzoek is een uitgebreid literatuur onderzoek uitgevoerd en zijn ook diverse professionals geïnterviewd. Al deze informatie heeft uiteindelijk geleid tot zes attributen die zeer belangrijk zijn voor het hele proces van de eisenanalyse en die voor verbetering vatbaar zijn, dit zijn:

- Tijdstip van de eerste ontmoeting tussen aannemer en belanghebbenden
- Flexibiliteit van de eisenspecificatie
- Afdeling verantwoordelijk voor het analyseren van de eisenspecificatie
- Mate van functionaliteit
- Validatie van eisen
- Training voor geïntegreerde contractvorm

Deze zes kenmerken zijn gebruikt in een zogenaamd 'discrete choice experiment'. Hierbij worden respondenten uit de publieke, private en semi publieke-private sector gevraagd om een vragenlijst in te vullen, die bestaat uit negen keuze sets met twee alternatieven. De zes kenmerken vormden de basis voor de alternatieven. De kenmerken hadden allemaal drie levels die bij elk alternatief verschilden. De respondent moest dus een afgewogen keuze maken om zijn algemene voorkeur te geven. De resultaten vertonen enkele verrassende resultaten. Een van de meest verrassende uitkomsten is dat de respondenten liever zien dat de ontwerpafdeling de analyse van de eisen oppakt, dit in tegenstelling tot wat de literatuur en experts voorschreven, namelijk het gebruik van de systems engineering afdeling. De stakeholder management afdeling eindigde als tweede op de ranglijst.

Een uitkomst die iets minder verrassend is heeft betrekking op functioneel specificeren. Ook volgens de geïnterviewden leidt dit tot veel problemen en daardoor kozen de respondenten ook voor 'specificatie gebaseerd op prestaties' in plaats van 'specificatie op basis van functionaliteit'. Uit de interviews is naar voren gekomen dat veel professionals vinden dat de eisen functioneel gespecificeerd moeten worden waar dat mogelijk is en anders voor een beproefde oplossing gekozen moet worden.

De uitkomsten van dit onderzoek tonen aan dat het hele proces toe is aan verandering. Respondenten geven bijvoorbeeld aan dat zij graag het tijdstip van de eerste ontmoeting tijdens de tender fase willen. Hoewel dit nu nog niet mogelijk is kan het door een kleine aanpassing van de opdrachtgeverskant wel zo ingericht worden. Ook het gebruik van functionele eisen in het contract is een punt van discussie. De resultaten van de enquête geven aan dat de respondenten specificatie op basis van prestatie-eisen hun voorkeur geniet. Belangrijke reden hiervoor kan zijn dat het gebruik van functionele eisen in veel van de gevallen leidt tot veel discussie tussen belanghebbenden en aannemer. Ook leidt het gebruik van functionele eisen onvoldoende tot creatieve en innovatieve oplossingen waardoor geconcludeerd kan worden dat het beter is om functionele eisen toe te passen waar het kan leiden tot verbeteringen en anders gebruik te maken van beproefde methoden.

## Abstract

Infrastructural projects are known to have many delays which in most cases originate from problems in the plan development and/or realization phase. From a financial point of view these delays and the accompanying stagnation of large infrastructural projects is undesirable, because public funds have to be used as efficient as possible. The last ten to fifteen years several changes occurred in the way public and private sector are collaborating with each other in the construction sector. With the introduction of integrated contracts like Design, Build, Finance and Maintain (DBFM) more tasks and responsibilities are transferred to the private sector. Managing the expectations and interests of surrounding actors in infrastructural projects in the Netherlands has become increasingly important and are therefore stipulated in the contract. As part of the integrated contract, the contractor is responsible to analyze, validate and to make the design according to the requirements of the shareholder. These requirements are collected and documented by the client and all requirements are set down functionally, which means that the requirements describe which functions have to be realized and does not already force a solution to the contractor in the form of a building estimate. This process knows many problems and limitations, namely: lack of identification of shareholders' needs, inadequate involvement of all the relevant parties, inadequate communication between those involved in briefing and briefing information still being given during late design and construction stages. First a literature study has been conducted and also experts have been interviewed about the most important problems. Six attributes were pointed out to be key to this process. Many professionals from the construction sector were asked to fill in an online questionnaire stating their preference on the subject. The results show that respondents prefer to have the timing of the first meeting during the tender phase and that the use of functional requirements have to be reconsidered. One of the recommendations is to use functional requirements where it can lead to innovative and creative and solutions, when this is not the case to use specifications based on performance to avoid ambiguity and problems between all involved parties.

*“Just remember, once you're over the hill you begin to pick up speed.”*

*Arthur Schopenhauer*

# 1. Introduction

This chapter will give an introduction to the topics discussed in this research. First, the motive for this research is explained. Secondly the problem definition and research questions will be presented and elaborated. In order to provide an answer to the research questions, this chapter will also elaborate on the research methodology used. Furthermore the relevance of the research is presented and the structure of this paper is outlined.

## 1.1 Motive

Our current complex society requires sustainable road infrastructure, as it is essential for strengthening the national economy and maintaining an international competitive position. What follows is that the planning and development of infrastructural projects have become more important, but also more complex due to the increasingly demanding and complex institutional settings (Williams, 1999).

Infrastructural projects are known to have many delays which in most cases originate from problems in the plan development and/or realization phase (Arts, 2007). From a financial point of view these delays and the accompanying stagnation of large infrastructural projects is undesirable, because public funds have to be used as efficient as possible. Therefore much research has been executed on efficiently spending this public money and trying to change the construction sector for the better (Yu, et al., 2007; Lenferink & Tillema, 2013; Eversdijk & Korsten, 2009).

The last ten to fifteen years several changes occurred in the way public and private parties are working with each other. The public sector is willing to collaborate more closely with private parties, which has resulted in the: 'market, unless ...' motto. This motto that was formulated in 2004 by governmental organization Rijkswaterstaat, the biggest client of infrastructural planning and development, has marked a completely new approach for the relationship between clients and contractors. Collaborations between the public and private sector are named Public-Private Partnerships (PPPs). These partnerships are characterized by the use of innovative and integrated contracts. Integrated contracts are characterized by integrating several stages of the project and handing over the responsibility and tasks within these stages to the contracting organization. The changing relationship of public and private sector results in a clear shift of tasks and executive responsibility towards the market in the Dutch infrastructure construction sector.

Public sector clients like Rijkswaterstaat are taking a step back and are focusing more on the role of asset owner. As a result the tasks and responsibilities within a project are handed over to the private sector. Two types of integrated contracts are investigated in this paper namely Design and Construct (D&C) and Design, Build, Finance and Maintain (DBFM) contracts. With a D&C contract, the contractor is responsible for designing and construction, whereas in DBFM contracts he is responsible for designing, building, financing and maintaining the project over a period up to 30 years. Working on schedule and within budget has proved to be very difficult (Lenferink & Tillema, 2013; Arts, 2007). The early engaging of the private sector is also challenging, this new way of working with each other requires: "exchanging knowledge, dealing with new responsibilities and also sometimes new ways of collaboration" (Rijkswaterstaat, 2008).

## 1.2 Problem Definition

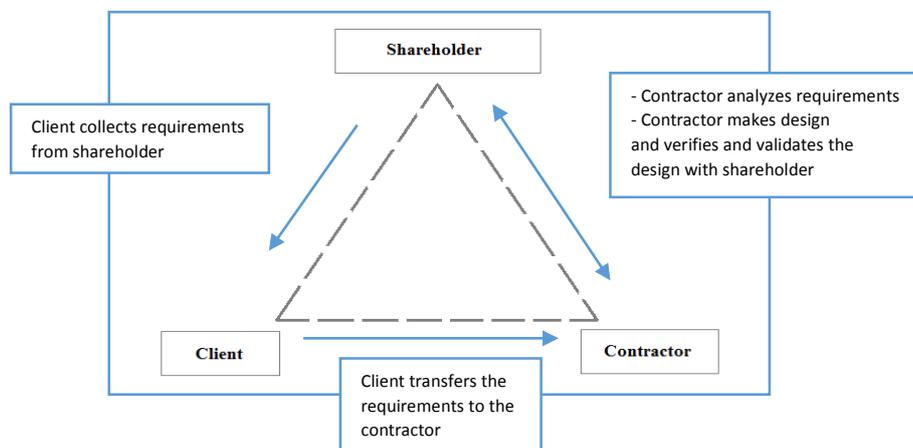
Managing the shareholders' expectations and interests in infrastructural projects in the Netherlands has become increasingly important and are therefore stipulated in the contract (Chao-Duivis, Koning, & Ubink, 2011). The reason for this is given by the study of Aaltonen and Sivonen (2008): "The management of project shareholders, taking into account their needs and requirements is an essential part of the project management and project success". Due to the new role of the public sector as facilitator, managing the shareholders is the responsibility of the private sector.

As part of the integrated contract, the contractor is responsible for managing the interest of all surrounding actors. They are also referred to as shareholders and consist out of two groups: municipalities and public-private companies. Realization of the total infrastructural project means that segments owned by these actors also have to be reconstructed. Therefore, before the tender phase commences the client determines the needs of the shareholders and documents these in a list of requirements. By stipulation of the integrated contracts, these requirements are written down functionally, which means that the requirements describe which functions have to be realized and does not already force a solution to the contractor in the form of a building estimate. Due to the functionality of the requirements the contractor has much freedom for making the design and construction, for he has the possibility to come up with solutions that are innovative and more efficient than they would have been with the traditional type of contracting (Verweij, 2015). These requirements of the shareholder are part of the integrated contract the contractor has with the client and are written down in 'execution agreements' (Interview Christine Davidse, Appendix). These agreements are introduced to make sure that the contractor is collaborating closely with the surrounding actors.

Hence, this is enforced by the 'completion agreements', they form a part of the execution agreements. These agreements are being used to ensure that the requirements collected by the client from the shareholder are validated properly by the contractor, thus ensuring collaboration between these parties. Therefore the contractor proposes a verification and validation strategy for handling the requirements and he must maintain a good relationship with the surrounding actors.

When the completion agreement is not validated by the shareholder, the contractor cannot commence the realization of that segment owned by the shareholder. This can lead to delays, costs increase and a general feeling of discontent. Also, these agreements are connected to payments by the client, not reaching consensus with the shareholder means no money. The relationship between the three actors can be seen as a triangle, see figure 1.

Figure 1, relationship between the three actors



Although it is sometimes hard to measure the results of these integrated contracts, because the lack of data on operating costs and output (Jensen & Stonecash, 2005), the first projects show gains in efficiency, increased project control and are delivered better in time and within budget as compared to traditional contracting (Lenferink, 2008; Klijn, 2009). However despite the fact that there is much known about these "hard" project facts, little is known about the experiences of involved public and private shareholder. Such insights would be valuable because it may uncover directions for improving and streamlining current integrated contracts, which eventually may result in time, and cost gains, but also in increased quality of projects. Therefore, the goal of this research is to gain greater insight into current experiences of key participants involved in integrated road infrastructure-related

contracts, and, more specifically, to explore potential directions for improvement of the integrated contracts

### 1.3 Research questions

The research will be based on a main research question and to answer it several sub-research questions have been formulated. The main research question is:

What are the preconditions for improving the briefing process of an infrastructural project with an integrated contract, and how can a contractor combine these preconditions with the public sectors' interests?

In order to answer the main research question, the following sub questions have been formulated:

1. What is a DBFM contract and what are the risks and responsibilities for the contractor? (literature review)
  - a. What are the other types of integrated contracts and what are the differences between them?
  - b. What is the briefing process and how should it be executed in theory?
  - c. What are the existing theories of shareholder management in a DBFM project?
2. Which attributes in the process of briefing causes the most risk? (literature review, expert interview, small sample survey)
  - a. What is the ease of cooperation by the shareholder and in which parts of the process?
3. What are the main preferences of the parties (contractor and shareholder) regarding the briefing process? (Discrete choice modeling)
  - a. What are the preferences of the private sector?
  - b. What are the preferences of the public sector?
4. How can the contractor improve its success chances in the briefing process? (Discrete choice modeling)
5. How can the briefing process be improved in order that shareholder can use this model to formulate requirements that have a better chance of being implemented by contractor? (Discrete choice modeling)

#### 1.3.1 Research design

The purpose of this research is to investigate the preferences of contractors, municipalities and public-private companies in the briefing process. Many projects are faced with time delays and costs overruns that can be traced back to the briefing process, which is the total process of collecting, documenting, analyzing, verifying and validating the requirements. This process occurs during the first three stages of a project (plan development, initiative and design phase). Managing the surrounding actors has become a very important aspect in large scale infrastructure projects. One of the bottlenecks is the briefing process.

This research will help to evaluate how the briefing process is done now and how it could be improved in the future. This research will consist out of several phases. Firstly, literature is reviewed to look at the most important research about the briefing process. In addition the most important attributes as defined by existing literature will be gathered and listed so it could be used for the next step. This next step is describing the methodology. Discrete choice modeling (DCM) will be used to map the preferences of the different actors concerning the earlier mentioned process. Finally the

results of the survey will lead to recommendations for all actors, about how the process should be approached.

## 1.4 Relevance of the research

The findings of this research will provide valuable information to the contractor, municipality and public-private company about how the briefing process can be done in a more satisfying manner for all actors involved. Persons working for contracting organizations, municipalities and public-private companies are all asked to fill in a questionnaire, all of whom have experiences with the total process and, thus can tell what can be done better or what has already done well. The shareholders will give information on the basis of discrete choice and will judge various alternatives by selecting one out of two. It will be interesting to see what the different actors' preferences are concerning the briefing process and if this can lead to improvement of the general process.

### 1.4.1 Scientific relevance

There is much existing international literature about the briefing process, but there is not much written about the process in the Netherlands and specifically not about the preferences of the different actors. The scientific relevance is in the fact that new insights on active shareholder participation are added to the field. New knowledge about shareholder participation provides clues for creating political and social support so that a contribution can be made to prevent problems in integrated contracts in the future. Furthermore executing a discrete choice experiment has not yet been published in scientific research, therefore this paper can provide new valuable information of carrying out such a survey.

### 1.4.2 Societal relevance

There are a lot of studies and theses written about shareholder management, but it is always contemplative and literature based. This will be one of the first shareholder surveys, where they have to assess the degree in which they are approached now regarding the briefing process and to map their preferences about how they want to be approached. This will be of value for contracting organizations carrying out infrastructural projects in the Netherlands.

In addition this research can also provide valuable insights for Rijkswaterstaat who hands out this type of contracts. Many problems occur because the contract is at times very ambiguous. In this paper the preferences of public-private companies, municipalities and contractors are presented, which means that the contracts can maybe be adjusted according to these preferences.

## 1.5 Outline

This paper will proceed as follows. At first, the terms and definitions used in this research will be elaborated in the glossary. Secondly, a discussion on the literature of the briefing process will be given, it will synthesize all the relevant literature and will result in a list of attributes critical for the process. The subsequent section will define the methodology and present and discuss the results. Consequently the results will lead to a conclusion and recommendations for the construction sector for improving the briefing process. The conceptual framework for this research is illustrated in figure 2. This paragraph will describe the meaning and the relevance of the different parts.

### 1.5.1 Literature

To obtain an extensive understanding about the integrated contracts and the briefing process, a literature study was conducted covering 50 predominantly scientific articles and books. The literature study consists out of multiple topics namely: importance of the briefing process, common problems in briefing and actors' involvements in the briefing process. Evaluating these topics led to several benefits, but also limitations of the briefing process. With the use of the literature study the first

research question can be answered. The literature study also resulted in a list of 16 attributes that have impact on the briefing process. This list of attributes is used for the discrete choice experiment.

1.5.2 Discrete choice experiment

After extensive exploration of both qualitative and quantitative methods, the decision has been made to use the stated preference method, also known as discrete choice experiment. Discrete choice experiment is quantitative research method, used to model the decision process of an individual or segment in a particular context. The advantage of this method is that hypothetical situations can be formulated from which the respondent has to make a decision (Hensher, Rose, & Green, 2005).

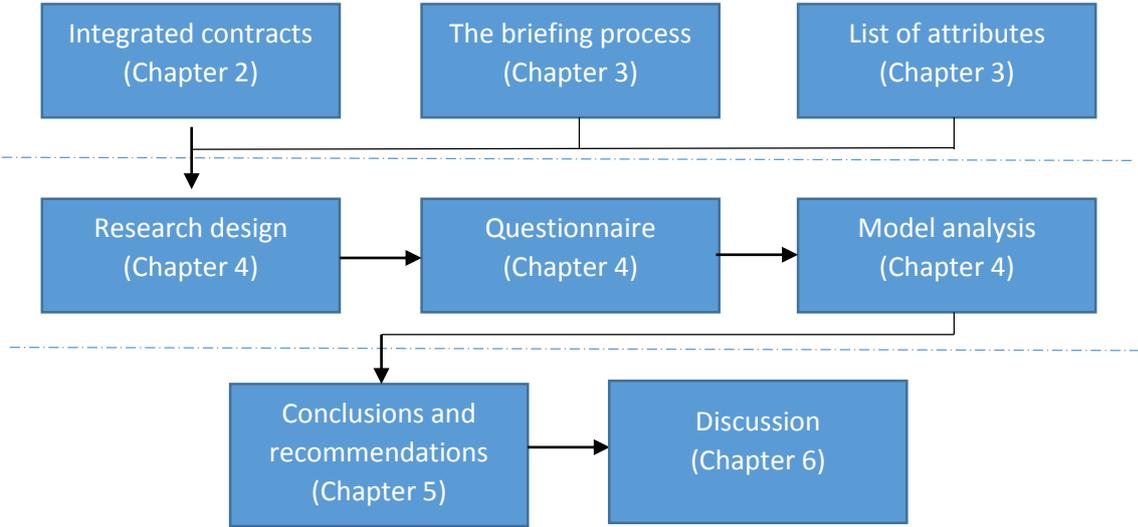
After studying, combining and merging all the relevant literature this resulted in a list of sixteen attributes. With the discrete choice experiment, the respondent have to make a decision among two or more alternatives that consist out of six to ten attributes (Hensher, Rose, & Green, 2005). Therefore the list of sixteen attributes had to be reduced to a smaller number. This has been done by choosing the most important attributes per phase of the project. Finally the choice have been made for six attributes with three levels per attribute that represents the total briefing process the best.

After the attributes and the subsequent levels are defined, it is possible to make the alternatives from which the respondent can make its funded decision. Depending on the chosen method, regression models or discrete choice models must be used to analyse the results of the questionnaire. With the use of this models, calculations can be made to determine the preferences of all the relevant actors.

1.5.3 Finalization

The last part of the research consists out of the conclusions and recommendations. In this chapter the results of the discrete choice experiment are discussed and the research objective is evaluated. In the final chapter, discussion, the research will be discoursed and limitations will be given.

Figure 2, conceptual framework





## 2. Glossary

The following chapter elaborates on the most important definitions regarding the research are elaborated. First, Public-private partnerships (PPPs) will be introduced and the relevance for this research is highlighted. In addition the integrated contracts, DBFM and D&C, is discussed separately and subsequently the most important differences and similarities between them evaluated. Furthermore, the use of project shareholder management in these type of contracts will be defined. Also, the most important definitions of the briefing process are discussed and the cooperation by its participants will be demarcated. Finally, the background will be given of the discrete choice experiment (DCE) that will be used to map the preferences of the different actors towards the briefing process.

### 2.1 Public-private partnerships

In a densely populated country like the Netherlands, the planning and development of any major public infrastructure construction project can be controversial and may affect many different, sometimes discrepant, interests (Olander & Landin, 2005). The planning, development and maintenance of all the large infrastructure projects in the Netherland is done by commission of Rijkswaterstaat, which is the executive arm of the Dutch Ministry of Infrastructure and the Environment. "Rijkswaterstaat manages the country's main road network, main waterway network and main water systems. It is not only responsible for the technical condition of the infrastructure but also, and especially, for its user friendliness. It facilitates the smooth and safe flow of traffic, keeps the national water system safe, clean and user-friendly and protects the country against flooding" (Rijkswaterstaat, Jaarbericht, 2012).

#### 2.1.1 'Market, unless' principle

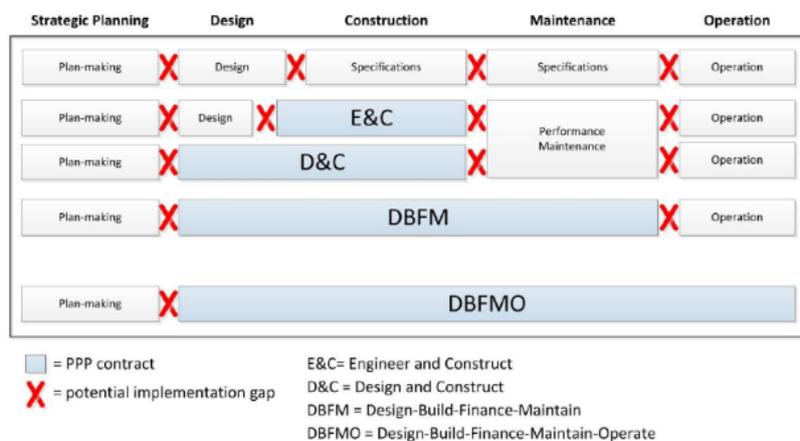
Traditionally, the design, construction and maintenance of infrastructure projects were procured separately. However since the late 1990's more discontent arose among the total construction industry and the intention to change the industry grew. Egan (1998) complained that radical improvements should be made. Most important problems faced by him were: tight profit margin, limited investments in research and development and a big emphasis on the price with tendering. Dorée (2001) emphasized that the organizations working together in the construction industry had a collective feeling of distrust with each other. The total industry that consisted out of public and private sector companies, felt that changes had to be made.

As a consequence the last ten to fifteen years several changes occurred in the way public and private parties are collaborating with each other. Rijkswaterstaat is willing to work more closely with private parties and this has resulted in the: 'market, unless' principle. This motto was formulated in 2004 has marked a completely new approach for the collaboration between government and contractors. As a result of this renewed collaboration between the public and private sector, it has led to the development and introduction of new innovative tendering procedures. The early engagement of the private sector is challenging, since this new way of cooperation requires exchanging knowledge and dealing with new roles and responsibilities for both parties (Rijkswaterstaat, 2008).

While the public sector is taking a step back and are focuses more on the role of the asset owner, the tasks and responsibilities of a project are handed over to the private sector. In PPPs with integrated contracts, contractors not only have to deal with the construction, but also the design and possible financing and maintenance of the project during a period that can span fifteen to thirty years. The first completed projects show possible gains as increased project control and are delivered better in time and within budget (Commissie Private Financiering van Infrastructuur, 2008; Klijn, 2009;

Financiën, 2012). As a result, D&C contracts have been made standard for tendering in 2008 (Finance, 2014). The most common forms from an international perspective are shown in figure 3.

Figure 3, different forms of PPPs (Lenferink, 2012)



## 2.2 Design, Build, Finance and Maintain (DBFM) contract

By the end of 2012, thirteen integrated contracts were carried out, consisting of six infrastructure projects and seven building projects (Ministry of Finance, 2014, Rekenkamer, 2013). The total value of these contracts combined exceeded 6 billion euro and the projects' estimated added value was 800 million euros. By means of the DBFM contract, the public sector is trying to create 'added value' or 'value for money' (Koppenjan, 2008). This is where the DBFM contract is different from a standard building contract.

Value for money means that a higher quality is achieved with the same budget, or the same quality with a smaller budget. This increases the efficiency of realizing the infrastructural project and creates a better ratio between quality and price (Commissie Private Financiering van Infrastructuur, 2008). The Ministry of Finance (2012) calculated that the minimum project value for which DBFM contracts can be efficient is €60 million for infrastructures; benefits then outweigh (transaction) cost. Value for money is achieved because of several aspects, the following which are key to the DBFM model and are explained subsequently.

### 2.2.1 Clear responsibilities between contractor and client

Important for achieving value for money is that there is an efficient transfer, allocation and management of risks. The DBFM contract is designed as such, that all responsibilities are transferred to the contractor (Lenferink & Tillema, 2013). Rijkswaterstaat (2009) believes that contractors have more experience in designing, constructing and maintaining projects and thus by integrating all the aspects, a higher degree of efficiency will be reached.

### 2.2.2 Life cycle approach

The definition of the life-cycle approach given by Lenferink, Tillema and Arts (2008): "the life-cycle approach to infrastructure planning could be seen as consisting of two directions of integration of the planning cycle, i.e. a forward and a backward integration." Forward integration comes down to the natural planning cycle of a project.

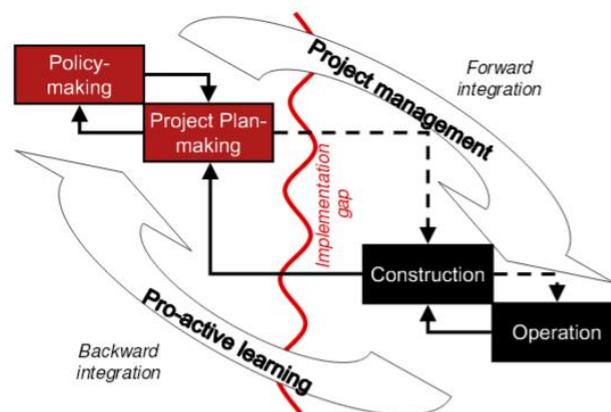
Traditionally less attention is given to the follow-up and implementation of the project, for example getting ready with construction and going into the operating or maintenance phase (Dunshire, 1978). The forward integration phase can be characterized as a top-down approach where strategic

management is handing out the tasks, not worrying about what happens afterwards. This could also be seen as the traditional way of contracting.

However with DBFM projects, due to the many risks and responsibilities, a more bottom-up approach is more considerable. Apart from just do what the client is asking, ‘backwards integration’ is defined by earlier involvement of groups that play an important role in the different planning stages, see figure 4. These groups can be identified as: authorities, residents and public-private sector companies.

Backward integration is aimed at learning and exchanging knowledge by earlier contract involvement (Lenferink, Tillema, & Arts, 2008). In this manner the life-cycle approach can improve infrastructure planning in the sense that better use is made of the knowledge and operational expertise of the actors involved. Moreover this is done by enabling a learning proces by active participation of the shareholders through which the knowledge can be used to improve the project management in infrastructure planning.

Figure 4, illustration of the life-cycle approach (Lenferink, et al., 2008)



### 2.2.3 The financial component

Whereas in the traditional contracts the project is funded and financed mostly by the public sector, the DBFM contract is financed with money from the private sector (Lenferink & Tillema, 2013). The private sector raises the money to start the project and execute the work. The project is unable to be financed by one contractor, since the total costs can exceed the cost of 1 billion euro. Therefore several contractors form a consortium, a Special Purpose Vehicle (SPV). Apart from executing the work together, the SPV has to organize the funding that consists out of private and debt equity. The distribution between these two are 10% for private and 90% for debt equity (Chao-Duvis, Koning, & Ubink, 2011). The SPV consists out of shareholders whom carry out the project activities, but it is also possible that an institutional investor as a pension fund is added.

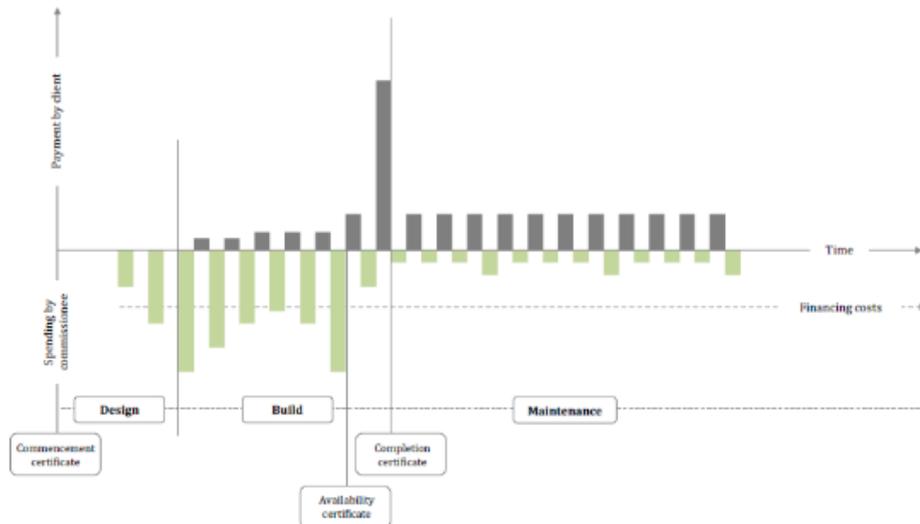
To provide for the debt equity, commercial loans are arranged with financiers, i.e. banks and other types of investors such as insurers. Because the capital of debt can reach a very large amount, one or several financiers are appointed as lead arranger. They make sure that together the lenders provide for the debt equity (Commissie Private Financiering van Infrastructuur, 2008).

Moreover, the preparing costs of the tender and transaction costs are substantially higher than the costs for traditional contracting (Ruding H. , 2008). The procedure of participating in a tender also takes longer than in the traditional model and the DBFM contracts are juridical and financial very complex. Moreover, because the DBFM contract has such a long tender preparation period, it takes very long to work on the tender proposal with the risk of not getting paid in return (Kerr, 2006).

## 2.2.4 The payment mechanism

The payment mechanism of a DBFM project differs from traditional contracting in the sense that payment is made by the client when the asset is available and stays available for the users. According to Chao-Duivis et al. (2011): “the contractor receives an availability fee from the client which starts running from the moment of availability of the work irrespective of the actual use.”

Figure 5, payment scheme of DBFM



During construction the client pays a certain percentage of the building sum for when a certain segment of the project has been made available to put in use. The client will by default deposit the largest sum of money when the project is complete, see figure 5.

The directorate-general for public works and water (2009) states that the net availability payment (NAP) is a percentage of the gross available payment (GAP) that the contractor receives every period, most of the time this is quarterly, minus the availability adjustment (AA) and the performance correction (PC):

$$\text{NAP} = \% \times \text{GAP} - \text{AA} - \text{PC} \quad (1)$$

Equation 1 shows how the payment is made during the project. If the project is partially available the contractor receives less payment by the client. This deduction is measured in the number of road closures. In the equation this is the availability adjustment (AA) and performance correction (PC), this is done by using penalty points. Because the contractor will receive the largest sum of money when the project is completed, this could be seen as a financial incentive for the contractor to let the project finish earlier. Namely the earlier the contractor can finish construction the earlier they will receive money from the client and the contractor can pay off the debt plus interests that is loaned by the banks

Pohl et al., (2013) acknowledges that performance is stimulated using availability payments: “Next to this control mechanism, the contracting authority has another advantage. Since the availability payment is fixed at financial close, the contracting authority has certainty over future cash outflows. Cost overruns or budgetary problems are minimized”. The use of availability payments are in fact proves very succesful as all PPP projects have been finished on or before time.

### 2.3 Design and Construct contract

Another frequent used type of contract is Design and Construct (D&C). It provides various advantages through entailing the contractor to carry out and be responsible for not only construction but also the design of the work (Öztas & Ökmen, 2003). The D&C contract shows many differences and similarities with the DBFM contract, the most important will be explained in this paragraph.

According to Doloi (2007): "Traditionally in D&C projects, the clients are involved in developing the initial project concept and the design brief and feed same into the design consultant at an early stage. Concurrently, prospective contractors are engaged in developing their competitive tender price based on initial design documentation and a series of assumptions, allowances or contingencies." Basically, Doloi (2007) says that the contractors participating in the tender calculate their offer based on incomplete information or wrong assumptions and this in turn leads to misinterpretation of the design specifications and a wrong fulfilling of the client's and contractor's intentions. The previous citation gives an example of the imperfect information handed over by client or a consultant working for a client. The same problem is also faced within DBFM contract

Another difference with the DBFM contract is that the total costs do not exceed 60 million euros and can, in theory, be executed by one contractor (van Breukelen, 2013). The larger contractors in the Netherlands: BAM, Strukton and Volker Wessels for example, have different departments that can handle all the phases of the building project. Benefits of working within one company is that it is much easier to distribute the information and to communicate between departments.

Furthermore, in the DBFM contract a combination of private and public financing is used to fund the project (Ruding H. , 2008). Whereas in the D&C contract the public sector is financing and funding the whole project (Chao-Duivis, 2011). As a result the contractor does not have a debt in the form of a loan with the bank. The financial component is a large risk for the contractor, because the bank is often less patient than the client. Having a loan also means paying interest over that loan, which can accumulate to a significant amount over a longer period of time.

Because every construction project is unique and consists out of many complexities and risks, there is also an increasing complication in design and involvement of shareholders. This adds further challenges to the client and the contractor in matching the required skills and capabilities to deliver the project successfully (Doloi, Iyer, & Sawhney, 2010). Öztas, et al., (2003) acknowledges that: "D&C turns out to be a risky contract system for both the owner and contractor unless the risks are identified in advance and managed throughout the project."

Apart from some differences that are very obvious: no financial and maintenance component, lower building sum and lesser risks and responsibilities. The contracts offer a lot of creativity and freedom to the contractor. The DBFM project because of its size are mostly equipped with two other components to reduce the risks at the end for the client. Therefore it is very important for the contractor to map all the risks in advance and also state how to deal with these risks when they occur. One of the biggest liabilities within such a large infrastructure project are the stakeholders.

### 2.4 Project shareholder management

Multiple studies discuss the importance of involving shareholders in an infrastructure project (Woltjer 2001; Innes et al., 1994; Verweij et al., 2013). This review of project shareholder management will first focus on the definition of shareholders. Then the concept of project shareholder management will be discussed using relevant literature, accordingly the concept of government to governance will be explained and participation of shareholders will be elaborated.

#### 2.4.1 Definition of shareholders

Because shareholders play such an important role in this research, the definition of a shareholder by Freeman (1984) is the most complete and widely used: “a shareholder is (by definition) any group or individual who can affect or is affected by the achievement of the other organization's objectives.” Construction projects in the Netherlands involve many interests by public and private parties. Therefore in literature the importance of shareholder management is underlined. An organization that is actively managing shareholders by analyzing them and involving them in the process, is more likely to reach their goal than organizations who do not (Chinyio & Akintoye, 2008). Freeman (1984) also claims that the interests, desires and demands of the shareholders can withhold an organization of reaching their goals. As these three authors agree, the importance of shareholder management is significant. Success in infrastructural projects, is dependent of satisfying the surrounding actors and going into dialogue with them.

#### 2.4.2 Project shareholder management in theory

The definition of project shareholder management (PSM) in literature is not uniform. Rijkswaterstaat (2009) describes PSM as follows: “PSM is the whole of activities, aimed at exploring and involving all environmental parties, with the aim of recognizing and realizing both the own goals and common goals to keep control over the performance of the own shareholder management”. According to Olander (2006): “the challenge for the project shareholder manager is to evaluate the shareholder needs and expectations in relation to the main objectives in order to determine which needs and expectations are to be fulfilled.” By extension, Bourne et al. (2005) state that the project cannot be successful without giving attention to the needs and expectations of the shareholders, even when the project manager was able to stay within the original time, budget and scope. Consequently project shareholder management in large infrastructure projects is acquiring an increasing urgency.

By early involvement of surrounding actors the process of planning and negotiation may take longer than wanted, but this will eventually lead to an overall better process and a final design which can be implemented more quickly (Blair & Pijawka, 2001). Fischbacher, et al., (2003) concede that the management of the interests of shareholders is very important in PPP projects, because the interests of private and public parties collide with each other. However, when the interests of the shareholders are not respected and managed properly this leads to possible resistance and conflicts. Failing to meet an agreement between contractor and shareholder can lead to an increase in costs and time.

#### 2.4.3 From government to governance

According to Crawford (2009): “ [...] in the public sector, investment in project management has been closely aligned with governance, with the aims of achieving transparency, accountability, efficiency and effective use of resources; improving implementation of policy and change; maintaining public confidence and facilitating the delivery of public value.”

The central idea here is that the role of the state is changing. The studies of Pierre et al., 2005; Hysing, 2009a and Sørensen, 2006 argue that it is more appropriate to speak of a shifting than a shrinking role of the state. This means that the role of the state is transforming from being based on constitutional power towards functioning as a facilitator and cooperative partner (Hysing, 2009b). This effect is also noticeable in the Netherlands in the way that public and private parties are cooperating with each other, which means renewed responsibilities for the private sector.

#### 2.4.4 Participation by shareholders

One of the new responsibilities for the contractor is managing the expectations of the shareholders, which implies letting the shareholders actively participate in the process. Participation is defined as a

process where individuals, groups and organisations choose to take an active role in making decisions that affect them (Wandersman, 1981; Rowe, et al., 2004). Participation of shareholders can empower them through the co-generation of knowledge with the contractor and it may increase the likelihood that environmental decisions are perceived to be holistic and fair (Richards, Blackstock, & Carter, 2004).

Interactive decision-making is a form of participation which is much used in the Netherlands. The definition of interactive decision-making by Pröpper et al. (1999): “early involvement by the government of citizens, societal organisations, companies and other public parties in the process of decision-making.” Various studies provide four objectives: improving of efficiency, creating support for decision-making process, substantive enrichment of the process and increasing the democratic legitimacy of the decision (Otto, 2007; Edelenbos, et al., 1998; van Buuren, et al., 2008). Jugdev et al. (2001) believe that project management has to be understood as a holistic discipline for achieving organizational efficiency, effectiveness and innovation.

#### 2.4.5 Project versus process management

According to Edelenbos et al. (2008) the management of PPPs can be approached from two different perceptions, from the perspective of project management or from the viewpoint of process management. Where first the focus was on delivering the product, the private sector is now required to deliver a service (Lenferink, et al., 2013; Hoezen, et al., 2010).

Project management is dividing the construction process in successive phases and focuses strongly on managing the phases based on five aspects: costs, organization, time, information and quality (Mantel, 2005; Meredith, et al., 2000). Moreover this is emphasized by the fact that each transition phase is marked by a document containing the results of the previous part and describes the approach and the requirements for the following phases. To put it differently, project management is focussing on internal project management and less on initiating and maintaining interaction with the environment.

Unlike project management, process management is based on the assumption of dynamics and complexity in the interests and perspectives of many actors (Edelenbos & Klijn, 2009). It refers to a management style that is aimed at managing interaction, activation of actors and creating a variety in content (de Bruijn, Teisman, Edelenbos, & Veeneman, 2004). Process management usually begins with going into an open dialogue. Therefore the process managers do not strive to find a solution to quickly (Edelenbos & Klijn, 2009). In other words the problem-solving occurs through DDD communication strategy: Dialogue, Decide and Deliver (de Bruijn, ten Heuvelhoff, & in 't veld, 1998).

Edelenbos et al. (2008) emphasizes that within a project the balance between project and process management can easily be overshoot. Therefore, it is not the conclusion that project management should be replaced by process management strategies. Public and private parties involved in large scale projects have to make conscious decisions about the effective mixture of the two approaches. Moreover this not only has to be restricted to the early stages of the project, but also to the implementation stage of the project.

There are multiple differences between process and project management. Project management has its advantages by being solution oriented and focusing on the five aspects: costs, organization, time, information and quality. However, support for the project from the surroundings of the project is lacking, because shareholders are informed insufficiently (Olander & Landin, 2005). As a result shareholders which are not involved in an early stage may actively oppose to decisions made (Sorensen & Torfing, 2007). In contrast, process management focusses on cooperating with the

shareholders by exchanging views and interests, thus creating a process of discussion and negotiation (de Bruijn, ten Heuvelhoff, & in 't veld, 1998). Consequently this generates much support for the project. However the drawback is that such an investment in shareholder consultation takes much time, energy and subsequently money from the project organization (Edelenbos & Klijn, 2009).

## 2.5 Briefing process

As is mentioned before in this chapter, the role of the state is changing. This means that more responsibilities are handed over to the private sector. This implies that as part of the integrated contract the contractor is obligated to have more contact with the surrounding actors. In this paragraph the briefing process and the importance of collecting the shareholder requirements will be discussed. In addition, the method of Systems Engineering (SE) will be elaborated, which is prescribed by the government for structuring the briefing process.

### 2.5.1 Definition of briefing

The briefing process in a construction project is a dynamic process and is characterized by dealing with complexities in identifying and conveying shareholders' actual needs and requirement. It should involve frequent interaction, shared understanding and commitment among shareholders, client and contractor (Yu, et al., 2006a). The most important factors of this briefing process are documented in a number of papers, including the ones by Lutters et al. (2014) and Othman et al. (2004). An analysis about why the construction industry used briefing is discussed below.

A study by Lutters et al (2014) state that for the briefing to be useful, it must be reliable. Because in this process the contractor is relying on information from the shareholder there are many uncertainties. "[...] to reach an adequate set of requirements and a correlating product definition, shareholders collectively need to understand each other's motives and consider on (the rationale behind) contradicting proposals." Also Lutters et al. (2014) state that this process will always contain uncertainty, however a manageable amount of uncertainty gives the freedom to make creative decisions. Consequently the briefing needs flexibility, since this relates to the briefing processes needs to evolve with the design project.

To maintain an integrated and structured approach of generating, analyzing and validating the requirements of the shareholders, the Systems Engineering (SE) method is recommended by public parties as Rijkswaterstaat and ProRail, to be used in infrastructural projects in the Netherlands (Rijkswaterstaat, 2011). The main goal of administering SE with the development of projects is formulated as stated by ter Huerne, et al. (2006): "the SE process is an iterative and cyclical, problem solving process that is applied for: generating input for the next phase of project- and/or product development, generating information for key decision moments and the transforming of (validated) customer wishes and demands to product-and process designs."

### 2.5.2 Collecting the shareholder demands

The first step of the SE process is to assess the demands or preferences from the shareholders. This is initially done by Rijkswaterstaat. However, after the tender has been granted, the contractor has to check whether the preferences and demands are still the same. This process is called briefing (Tang, et al., 2012; Yu, et al., 2006; Barrett, et al., 1999; Chinyio, et al., 2008). The gathering of the shareholder requirements is the input for the SE process (Department of Defense, 2001).

The end result of the briefing consists out of a document which gives is the starting point of the design. According to OGC (2010): "for construction projects, the project brief is a formal statement of the objectives and functional and operational requirements of the finished project. It should be in sufficient detail to enable the construction team to execute the detailed design and specification of

the work and is therefore an essential reference for the construction team.” Therefore the goal of the brief is to draw up the list of general requirements the project has to satisfy, furthermore this list will be the directory for the planning and design of the work.

In literature, various process models are given for collecting shareholders demands (Kamara, et al., 2000; Rijkswaterstaat, 2011; Bahill, et al., 2001; Chang, et al., 2008). These process models have been compared and this resulted in the following necessary activities. The responsibilities per activity are assigned to one or both parties, see table 1.

*Table 1, process of collecting the demands*

<b>Activity</b>	<b>Responsible</b>
Analysing project context	Contractor
Analysing shareholders	Contractor
Collecting functional requirements of the shareholders	Client first, contractor after tender is granted
Defining validation strategy	Contractor/client
Defining verification strategy	Contractor/client
Validating shareholder demands	Contractor/client

The first activity is to analyze the project context, table 1. Analyzing the current situation and the scope of the project is important, because the problems and goals will be made apparent (Engwall, 2003). As soon as the shareholders have been identified, the demands are first gathered by the client. After the contractor has been granted the tender, the contractor then receives all the documentation the client has gathered from the shareholder (Rijkswaterstaat, 2011).

The verification- and validation strategy is important during the whole process. Consequently it is necessary to think about these matters in an early phase and it has to be supported by the shareholders. The last process in this phase is to validate the demands. This implies that the demands are checked together with the shareholder on completeness. In the validation phase it is possible that the shareholder does not agree with the demands as they are put on paper. The contractor then has to adjust the demands accordingly.

### 2.5.3 Requirements analysis

After the demands of the shareholders have been collected and specified, the requirements have to be analyzed. The goal of the requirements analysis is to convert the demands into measurable requirements (Kamara, Anumba, & Evbuomwan, 2000). Therefore the requirements have to be made specific (Department of Defense, 2001). According to: Rijkswaterstaat, 2011; Defence, 2001 and Kamara, et al., 2000, the following activities are selected, see table 2.

*Table 2, process of requirement analysis*

<b>Activity</b>	<b>Responsible</b>
Analysing the requirements (scope, conflicts, structure, positioning)	Contractor
Specifying the requirements	Contractor
Making the requirements measurable	Contractor
Making the requirements traceable	Contractor
Setting up verification matrix	Contractor
Validating requirements specification	Client/contractor

After completing these activities, the requirements will be: specified, measurable, traceable, verified and validated. The input for this sub-process is the demands of the shareholders which are very abstract. Going through this iterative process of analyzing the requirements will make it more tangible (Rijkswaterstaat, Stappenplan van projectopdracht tot vraagspecificatie, 2011). The verification and validation activities are considered to be the most decisive activities in all of the sub-processes. In the verification matrix is defined how the requirement will be verified, when this verification will take place and who will be the verifier.

#### 2.5.4 Verification and validation

Verification determines the conformity between a process or a product and the specified requirements, or in other words proves that the system is well designed (van Bergeijk, 2008). Verification takes place on different moments in the life-cycle of a system. Bahil et al. (1992) state considering the verification method on forehand, the requirements are also immediately formulated SMART, since verification means that shareholder also gives his approval to the requirements.

The verification of the requirement can be done by: logical argumentation, inspection, simulation or assessment by an expert. Katasonov, et al. (2005) believe that with verification there needs to be investigated if the requirement is to the point, traceable, organized, standardized and controllable. Furthermore they state that the completeness, unambiguity and consistency have to be validated. Tran, et al. (2005) concede that a requirement can only have one meaning and should not be ambiguous. When a system consists out of various requirements, sub-requirements need to be used and have to be clearly stated. Consequently the correct method of verification, will make it easier to validate the requirements and this is considered the last step.

## 2.6 Research method

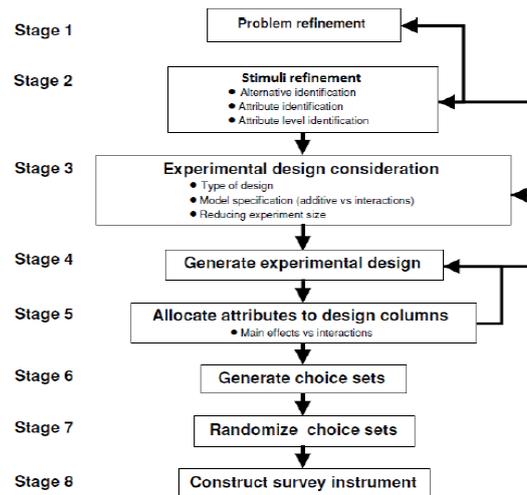
This paragraph will introduce the research method discrete choice modeling and the application of it. Moreover the steps will be discussed how a discrete choice experiment is created, since this method is used later on in the paper and is specified in detail for this specific research in chapter 4.

### 2.6.1 Background Discrete Choice Modeling

Discrete choice modelling (DCM) is a method that describes the choices that decision makers' make among alternatives of products and services (Hensher, Rose & Green, 2005). There are various types of data and data collection methods available to determine the preferences of target groups. The DCM method allows the researcher to determine which impact product or services have on different target groups (Hensher, Rose, & Green, 2005).

Kemperman et al. (2000) state: "choice models are based on the premise that individuals' preference or utility functions can be derived from observations of their choice under hypothetical situations." Train (2009) agrees by saying that discrete choice modeling is: "[...] to understand the behavioral process that leads to the respondents' choice." In other words, the Discrete Choice Experiment (DCE) describes the likelihood or probability of a particular choice for a number of alternatives. An individual is assumed to have preferences defined over a set of alternatives or a so called treatment combination. Hensher et al. (2005) note: "much of the literature refers to each individual attribute level as a treatment. Combinations of attributes, each with unique levels is called a treatment combination. Treatment combinations thus describe the profile of the alternatives within the choice set." Hence DCE is a technique for investigating individual or group preferences. For the preparation of the DCE, the steps in the design scheme proposed by Hensher et al. (2005), see figure 6 are used as a guideline. The first step of the design process defined by Hensher et al (2005) is problem refinement.

Figure 6, design process for a discrete choice experiment (Hensher, Rose, & Green, 2005)



Secondly, the discrete choice model is based on attributes which are extracted from the literature on the subject of briefing. These attributes show the problems involved in the briefing process. The most important attributes have been selected by a group of experts, which have been involved in the process of briefing as either working for public-private companies and municipalities or a contracting organization. In order for the questionnaire to be short enough only the attributes that are most relevant and interesting for the potential target group will be used in this questionnaire. Attributes are broken down into multiple attribute levels. These are defined as the levels assigned to an attribute as part of an experimental design process. Per attribute, first the consideration has to be made how many levels to assign to it, noting that the number of levels does not have to be the same for every attribute (Hensher, Rose, & Green, 2005). However, using more levels can result in more information, and hopefully be more accurate.

Next step in the process is the experimental design consideration. For the experimental design, several design characteristics have to be considered. The number of different classes have to be identified (full factorial or fractional factorial design), the coding format has to be assessed (orthogonal, dummy or effects coding) and a choice has to be made between labeled and unlabeled alternatives.

Finally, the experimental design can be generated. This means that the combination between the attribute levels have to be generated and the attributes need to be allocated to design columns. This process ends with the generation of the choice sets and also randomizing these choice sets to receive reliable data. When the choice sets are generated, the survey will be prepared and distributed to reach respondents.



### 3. Literature review

Before starting the empirical analysis, this chapter will discuss the relevant literature. In order to give a good overview this is divided in three parts. First the importance of the briefing process will be defined and in addition multiple studies will be reviewed, common problems will be elaborated and it will be discussed how these studies contributed to solving the problem. Furthermore, the different roles and responsibilities of the different actors in the project will be discoursed relating to the different tender phases. Eventually this literature review will lead to a list of attributes that are importance to the briefing process. For each of the tender phase these attributes will be defined and argued.

In the next paragraphs much use is made of two terms: clients and shareholders. Therefore short definitions of the following terms are given. The client is defined as the person or firm responsible for paying and commissioning for the design and construction of a project, which is Rijkswaterstaat. The shareholder is defined as the organisation which is owner or user of a segment of the project. They are municipalities and/or public-private companies.

#### 3.1 Importance of the briefing process

Briefing is characterized by collecting, analyzing and documenting the shareholders' requirements and demands. According to Barret et al. (1999) the briefing process results in the development of the brief and is then followed by understanding the captured information and ideas, proposing and explaining to the shareholder all the alternatives and issues related to their requirements (risks and constraints), justifying and getting approval of the client for certain alternatives or scheme, followed by the translation of the designers to form the base for further stages. Tang et al (2013) believe that: "construction briefing is the process by which a client informs others of his or her needs, aspirations and desires, either formally or informally, while a brief is a formal document which sets out a client's requirements in detail." Finally, Yu et al. (2006) define the construction project briefing as a complex and dynamic process which involves identifying and conveying clients' actual needs and requirements accurately to the project team.

Research on the effectiveness of the various phases of the briefing process indicates that there exists a gap between the client, contractor and shareholders' expectations (Kelly et al., 2005; Yu et al., 2005; Bogers et al., 2008; Zwemmer, et al., 2008). Whereas the briefing was historically considered a static event of capturing the requirements of shareholders prior to the design of a project. Today, Zwemmer et al. (2008) state that the briefing is considered an iterative and social learning process about the shareholders' organization and its special needs. With the introduction of innovative contracts in infrastructural projects, the contractor has gained more responsibilities and tasks concerning collecting and processing by the requirements (Verweij, 2015).

These projects are very complex and dynamic by nature and the organization also consists out of people working for various companies and collaborating incidentally. As a result very little is learned from the past and knowledge gained in previous projects is insufficiently used in future projects (Verweij, 2015). Consequently, the briefing process is characterized as a problematic process which has many limitations.

#### 3.2 Common problems in briefing

Several scholars studied the impact of construction briefing for contractors, developers and beneficiary actors, including the ones by Kamara et al., 2000; Yu et al., 2006; Othman et al., 2004; Shen et al., 2003; Tang et al., 2013; Chung et al., 2009. In the next paragraphs it will be elaborated how these studies reacted to the problem of an incorrect course of construction briefing.

Furthermore, an analysis of the important attributes and the limitations faced in the aforementioned studies are discussed.

### 3.2.1 Construction sector is changing

Kamara et al. (2000) believe that the construction sector is changing: “[...] there is a growing recognition that clients are at the core of the construction process (since they initiate and pay for construction activities)”. This research focuses on the need for a renewed attention on the briefing process. It describes a model that is designed to facilitate a better understanding and representation of those requirements in the design and construction phases. The results show that structuring the requirements into primary, secondary and tertiary requirements, can help the list of requirements not becoming a ‘wish list’. One of the many pitfalls in this process is that the shareholder has unreasonable high demands that cannot be met by the contractor. The decomposition of requirements will reduce the chance of making a “wish list” (Yu et al., 2005; Zhang et al., 2009).

Moreover, Kamara et al. (2000) believe that the process of briefing has other limitations. Firstly, an adequate understanding of the requirements can only be gained, once they are considered distinct from other project requirements. Accordingly, the requirements have to be seen as a separate part of the contract to be processed right. Also Kamara et al (2000) found another limitation in the fact that designers are faced with the shareholder requirements. However designers are not necessarily good brief writers, since briefing is mainly concerned with processing information. Designers tend to be focus more on the end result and are not good in processing information in collaboration with the shareholders (Lutters, Dankers, Luttinkhuis, & de Lange, 2014). In addition to this problem, the study of De Schepper (2014) proposes a company wide-philosophy in which the total organisation knows how to deal with the briefing process. Therefore not only the designers are responsible for collecting and processing the requirements, but several more departments, for example the project shareholder management department, are involved in analysing the requirements.

### 3.2.2 Critical attributes

The research of Yu et al. (2007) focusses on the important attributes of the briefing process. They found that the major problems included: “lack of identification of shareholders’ needs, inadequate involvement of all the relevant parties, inadequate communication between those involved in briefing, insufficient time allocated for briefing, briefing information still being given during late design and construction stages and the contractor having no real understanding of client objectives” (Barrett et al., 1999; Yu, et al., 2005). The aim of the research by Yu et al (2007) is to identify and investigate the most important attributes of the construction briefing process. By doing a comprehensive literature review thirteen attribute groups were identified to have an effect on the process: projects, shareholder management, team and team dynamics, client representation, change management, knowledge management, risk and conflict management, post-occupancy evaluation and post-project evaluation, key performance indicators, type of business and organizational theory, decision making, communication and finally culture and ethics.

The aforementioned attributes were validated by using a questionnaire survey. The survey was conducted in Hong Kong, the United Kingdom and the United States. The targeted population of the survey included project managers and architects. Results from the questionnaire show that the most significant attribute was client representation, by extension the necessity to ensure adequate representation of client groups to address clients’ needs and to prevent distortion of the brief. Secondly, “strict control of the brief writer is needed to avoid the brief becoming a wish list” is also referred to by Yu et al. (2007) as very important. It is clear that the briefing process should focus on the needs and requirements of the shareholders, but the public-private companies and municipalities

have the tendency to maximize their wish list in anticipation of being bargained down. Consequently it takes much time for the contractor to go through all the requirements and check with the shareholder if it is a genuine requirement.

### 3.2.3 Studies concerning governmental influence

One of the specific characteristics of PPP projects is that they have more shareholders than other type of projects (Tang & Shen, 2012). A good relationship between shareholders and contractor will benefit the process of briefing whereas a bad one will hinder it (Yang, Shen, Drew, Ho, & Xue, 2011). Accordingly, the research of Tang et al (2013) focusses on exploring what attributes influence shareholders in the briefing process from a governmental point of view. Various authors already did research on the subject and studies by Chan et al. (2004), Carnoli (2006) and Zhang (2004ab) provided the input for the questionnaire survey that was sent to governmental departments in Hong Kong that had experience with PPP projects.

The results of this survey indicate that the public sector finds open and effective communication the most important attribute, despite its broad and vague meaning. Ranked second is the “[...] skillful guidance and advice from project manager” (Tang & Shen, 2013). Therefore the public sector relies on the project manager from private parties to give advice, since he has more experience when it comes executing a project. The use of consultants and openness and trust were rated respectively third and fourth. From this research, it can be concluded that shareholders in the form of governmental departments are requesting guidance and active collaboration from the contractor.

### 3.2.4 Interaction between contractor and shareholder

In addition to the aspect of skillful guidance, the study by Othman et al. (2004) stressed the importance of not confining the development of the project brief to a certain stage, since it will hinder the interaction between the shareholder and the contractor. The early stages of the project are considered crucial to the rest of the project, because once decisions have been made, by their nature, they cannot be readily deleted or altered in some way in the following stages. Consequently, changing the project brief in a later stadium has an impact on cost, time and quality and are considered a major source of dispute and litigation throughout the construction sector (Verweij, 2015).

The research of Othman et al (2004) used a literature review and case studies to review the current theory relating to brief development and identified the attributes important to this process. A total of thirty attributes within thirteen categories have been identified. These attributes can be held accountable for the failure of the brief development. Therefore Othman et al. (2004) propose a dynamic brief development which relies on the following underlying principles: “the brief should be seen as an ongoing process extending throughout the project life cycle, the brief is considered a live document that has to be continually developed and adapted in an innovative manner”. Furthermore the study of Othman et al. (2004) show that: “learned lessons should be handed out to shareholders and project teams in order to enhance the performance in future projects and a system has to be set out as early as possible to manage the brief.”

### 3.2.5 Functional analysis

In the study of Shen et al. (2003) the use of functional analysis is reviewed. Functional analysis is described as a tool through which the requirements are expressed as functions of the project being designed. Furthermore, Shen et al. (2003) state: “[...] using the functional analysis approach in the briefing process enables a thorough analysis of the functional requirements of the users, making the briefs more explicit and precise.” In practice the public sector is encouraging the private sector to make use of the Systems Engineering (SE) method. Furthermore Rijkswaterstaat (2011) concedes

that it is necessary to determine the functions of the system and to turn these into objects by using decomposition. As a result, the study of Shen et al (2003) found that this stimulated the participation and effective communication between clients, designers and shareholders by improving the effectiveness of the briefing proposal and eventually identifying the best proposal.

As part of the process it is necessary to link the requirements of the shareholders to the objects that have to be constructed. This can be done by using a crosstab query. These couplings have to be made insightful into one system (Rijkswaterstaat, 2009, Nilsson, et al., 2005). All of these activities are the responsibility of the contractor and this step will be followed by the design process. The designers have to design the objects on the basis of the specified functions, which has to be documented. In these documents, it will be stated which requirements are met and how this is done (Bahill & Briggs, 2001). Often designers make a choice to change their design. These are not all documented, because after the design it has to re-assessed whether or not the design will be approved by the shareholder. It is therefore necessary to document decisions.

Finally the study of Chung et al. (2009) proposes to tackle the problems faced with construction briefing by supplementing face-to-face meetings with computer mediated discussion. The most common problems found by Chung et al (2009) concerning the briefing process can be found in table 3. Many problems derive from the fact that information is not shared sufficient or organizations are not putting enough effort in knowing the other parties' objectives. The framework presented in this research uses electronic communication to supplement face-to-face meetings to maximize the benefits of costs ratio of expanded shareholder management in project briefing. The problems listed in table 3, are used for the list of attributes later in the literature review.

*Table 3, common problems associated with briefing Chung et al. (2009)*

<b>Problem</b>	<b>Reason</b>
Confusion with client organization over direction and aims of the project	Internal fighting and hidden agendas within the client organization
Inexperienced client has insufficient knowledge to decide how to proceed	Refusal to commit finances to a phase that may seem unnecessary
Focus of feasibility studies is limited mainly to financial consideration	Time pressure and refusal to commit finances
Unstructured approach/ lack of focus for whole project	Does not have the support of all parties and does not adhere to the project
Unstructured approach to collecting shareholder demands	In order to be applicable to every project, may turn out to be too general to be useful for any given project
Difficulty of trying to accommodate various needs of all users	Failure of focus group representatives to consult/ report back to user groups
Contractor has no real understanding of client objectives	Previously, unclear if such information would be useful to contractors, hence not provided

In this paragraph many problems have been pointed out that affect the briefing process. The most common problems in briefing are that of a lack of communication, unstructured approach as difficulty in accommodating the various needs of the client and shareholders and the contractor not having a clear understanding of the client or shareholders' objectives. All of these problems arise due to bad collaboration between the different actors. In the next paragraph the actors' involvement will be specified into larger detail.

### 3.3 Actors' involvement in the briefing process

Since construction projects are of a complex, multi-disciplinary and dynamic nature, initiatives from many actors can alter the course of the project. The three main actors involved in an infrastructural project are client, contractor, public-private companies and municipalities all of which have their own roles, responsibilities and interests in the project. As can be noted from previous sections, much research has been about the process of briefing and many attributes were found that have an impact on the process. Several authors investigated the different roles and responsibilities of the actors involved.

#### 3.3.1 Clients' involvement

In modern construction projects significant challenges exist for the client and contractor to deliver the project. This is mainly due to complexity in design and the involvement of many shareholders (Doloi, 2007). In infrastructural projects in the Netherlands, the client's role is fulfilled by the public sector in the form of Rijkswaterstaat. Although in the past the public sector has been the major steering force for determining construction processes and their results (Kwak, Chih, & Ibbs, 2009). Nowadays the role of the client is referred to as facilitating, thus giving more responsibilities to the private sector (Verweij, 2015; Koppenjan, 2008; Lenferink, et al., 2013). Since this change is very recent, there is a need to make the participatory process of the public sector more systematic (Song, K., Frostell, Ravesteijn, & Wennersten, 2011). Several studies have focussed on the changing role of the client and what this means to the way the brief is being built. Many authors like Adnan et al., 2012; Yu, et al., 2010; Shen et al. 2003 studied the effect of the clients involvement on integrated contracts.

In the research of Adnan et al. (2012) the role of the client in D&C contracts is discussed. The aim of this research is to determine the primary success factors which support the successful use of the D&C contract. A total of sixty questionnaires were sent to clients, requesting to rank the success attributes found in literature. It was found that the client attributes for a successful D&C project among others are: developing a clear understanding of project scope, a clear brief through the assessment of contractor's proposal, a clear understanding of project costs and fulfilling the end-user requirements.

The research of Yu et al. (2010) also studied the effects of the briefing process in D&C projects. This process is indicated as the crucial factor which can lead to improvements of D&C projects, which is also supported by the study of Lam et al. (2010). Yu et al (2010) conducted several semi-structured interviews and reviewed multiple case studies to investigate the daily practice and its associated difficulties in managing shareholders' requirements in construction. The study has revealed valuable insights into the potential difficulties faced by practitioners in both the public and private sector. Potential constraints are: a lack of a comprehensive client's project brief, a lack of active involvement of client in the briefing process and a lack of impartial parties. Accordingly, the interviewed experts were also asked to come up with solutions to the problems above. Several recommendations were given by Yu et al (2010) to improve the prevailing practice within the industry: comprehensive preliminary project statements, well defined project goals at the initiative, formal procedures in gathering requirements and specific roles and responsibilities for each contracting party.

This is also underlined by the research of Volker et al. (2012), who studied the effect of client involvement in DBFM projects in the Netherlands compared to Australia. A qualitative multiple case study approach was used to identify patterns between the incentive mechanism and project characteristics. Although the projects are executed in different countries, all four cases share the same innovative and incentive based types of infrastructure. The results show that despite the significant differences between the projects, the clients experienced similar contextual factors.

Low et al. (2006) states that poor project performance may also be caused by the incompetence of the client itself. They believe that clients' actions before, during and after the project can affect the performance of a project. Furthermore, the recommendations that are given to the client are the following: "client should be clear about what they are being asked; client should be quick in their response; client need to be clear about the decisions made; client must be well aware of the ramifications of the decisions; client should ensure that the decisions are clearly communicated to the related parties; and finally client should adequately address the financial needs of other shareholders" (Toor & Ogunlana, 2010). Therefore, Low et al. (2006) prefer an active client, because a lack of client's involvement can be dangerous resulting in unexpected changes, delays, cost overruns and conflicts on the projects.

### 3.3.2 Contractors' involvement

Construction projects and their success are highly dependent on contractors, which is underlined by the studies of: Ng et al., 2009; Kumaraswamy et al., 2001; Yaweli et al., 2005. Appointment of the right contractor will not only ensure the overall quality of the project but also offer the opportunity of saving on costs (Yaweli et al., 2005). Before the contractor is awarded the project, the client has already identified the shareholders and collected their requirements (Bahill & Briggs, 2001). Accordingly, the client sends this document to the contractor after he is granted the tender.

Although the contractor receives all the documents concerning the identification of the shareholders and their requirements from the client, by stipulation of the contract the contractor is responsible for executing project shareholder management. This means that he has to validate the requirements and actively manage the shareholders (Chao-Duivis, Koning, & Ubink, 2011). This is to ensure that the contractor is letting the shareholder actively participate in the project which minimizes the risks of discussion and unnecessary involvement of the client. A number of studies have been conducted on how to effectively apply project shareholder management.

For example, Karlsen (2002) provided a six step process of project shareholder management, which included: initial planning, identification, analysis, communication, action and follow-up. Other studies indicated similar process model centering on identification, communication and ranking shareholders, while displaying some differences (Bourne & Walker, 2005). By extension, Bourne et al. (2005) state that the project cannot be successful without giving attention to the needs and expectations of the shareholders, even when the project manager was able to stay within the original time, budget and scope. Consequently project shareholder management in large infrastructure projects is acquiring an increasing urgency.

On the other hand, Eskerod et al. (2008) clarified the premises underlying project shareholder management, which includes making deliberate efforts to exert influence on project shareholders in order to maximize their contributions to the project, allocating limited resources in such a way that they achieve the best possible results and expanding efforts spread across a range of shareholders rather than concentrated on just a few. When all the parties acknowledge this fact, more room is left for innovation.

### 3.3.3 Public-private companies' and municipalities' involvement

One of the tasks of the project shareholder manager is letting the beneficiary actors participate in the construction process by giving information concerning the project, organizing meetings and discussing problems when they come up. Participation is defined as a process where individuals, groups and organisations choose to take an active role in making decisions that affect them (Wandersman, 1981; Rowe, et al., 2004). By letting the shareholder actively participate in the process, it can empower them through the co-generation of knowledge with the contractor and it

may increase the likelihood that environmental decisions are perceived to be holistic and fair (Richards, Blackstock, & Carter, 2004).

Because the role of the government has changed from an initiator to a facilitator, actively managing the shareholders has increasingly become the task and responsibility of the contractor. Various studies provide four effects of actively managing the shareholders: improving of efficiency, creating support for the decision-making process, substantive enrichment of the process and increasing the democratic legitimacy of the decision (Otto, 2007; Edelenbos, et al., 1998; van Buuren, et al., 2008).

Thus within infrastructural projects, the role of the beneficiary actor is getting increasingly important to manage. A project may seem successful to the client, but may be an unsuccessful venture for contractors and the end users (Toor & Ogunlana, 2010). Because shareholders have different interests in the project, the perception of success may also vary among them (Bryde & Brown, 2005). Particularly, in the case of public development projects where there are many shareholders, it is important to collect the viewpoints of all interested groups on the project success.

Much literature has been published on the concept of participation throughout the designing and development of the brief, especially in urban design projects (Redström, 2006). In a project organization, mainly two general groups can be recognized: users and providers. In the first category, the shareholders and client can be distinguished and the providers are represented by the contractor. Zwemmer et al (2009) believe that a variety in ideas, needs, values, goals and expectations can be a source of conflict. These conflicts could be the result of not understanding each other's goals and objectives and the inability to step into someone's shoes. The concept of participation and user engagement therefore relies on the fact whether or not shareholders are able to should benefit from each other's knowledge (Luck, 2001). However this implies that the shareholder should be seen as an expert.

### 3.4 Attributes of importance

Studies in the previous paragraphs show that the briefing process possesses some difficulties. The literature review has led to fourteen attributes that are of influence to the briefing process. They are listed in table 4. Successfully going through the briefing process, means going through various stages and is crucial to the effective delivery of the project in time and on budget (Maier, 2014). For each stage of the tender the most important attributes are described.

In the following table, all attributes are listed. They are divided in terms of tender phases and the nominative value has been assessed on the base of being mentioned in the results of the studies. When the attribute is ranked high in multiple researches, the nominative value is also high. If the attribute is mentioned, but is not listed in the results the nominative value shows "N/A", which means: not applicable.

Table 4, List of attributes that are important in the briefing process

Phase of tender	Name	Description	Nominative Value (registered impact)	Reference
Initiative	Clear tender procedure	The procurement process has to be made insightful and transparent for shareholders by having a clear management structure and determining the appropriate decision making method by the client	High	(Chan, Lam, & Chan, 2010) (Zhang, 2005) (Tang & Shen, 2013) (Ahmad, Ismail, & Alwi, 2011)

	Understand goals	Client must be able to understand the goals and operation of the shareholders' business and understand the roles and responsibilities in the project	High	(Lindahl & Ryd, 2007) (Juaim & Hassanain, 2011) (Yu A. , Shen, Kelly, & Hunter, 2007) (Kamara, Anumba, & Evbuomwan, 2000) (Ahmad, Ismail, & Alwi, 2011) (Tang & Shen, 2013)
	Strict control	Skillful guidance, strict control and consultation during the briefing by the contractor are necessary to ensure that the brief does not become a 'wish list'	High	(Ahmad, Ismail, & Alwi, 2011) (Tang & Shen, 2013) (Juaim & Hassanain, 2011) (Othman, Hassan, & Pasquire, 2004) (Yu A. , Shen, Kelly, & Hunter, 2007)
	Degree of functionality	Explicit distinction has to be made between: building estimate, functional and performance requirements	High	(Bogers, Van Meel, & Van der Voordt, 2008) (Blythe & Worthington, 2001) (Juaim & Hassanain, 2011)
	Add financial data	Next to functional requirements, it also has to be made clear what the accompanying budget for each requirement is	Medium	(Bogers, Van Meel, & Van der Voordt, 2008) (Hoezen, van Rutten, Voordijk, & deWulff, 2010) (Juaim & Hassanain, 2011)
	Brief checked	Have the consistency and completeness of the brief checked by an objective organization	Medium	(Bogers, Van Meel, & Van der Voordt, 2008)
	Training for DBFM and D&C in PPP	The client should regularly organize workshops for shareholders in the begin stage of the project	High	(Yu A. , Shen, Kelly, & Hunter, 2007) (Lindahl & Ryd, 2007) (Tang & Shen, 2013)
<b>Plan development</b>	Reviewing brief	Contractor should review brief with shareholder before moving on to designing	High	(Ahmad, Ismail, & Alwi, 2011) (Juaim & Hassanain, 2011) (Shen, Li, Chung, & Pui-Yee, 2003)
	Department in charge of analyzing requirements	Consistent, company-wide philosophy that encourage and supports continuous improvement of processes.	Medium	(Rezaiea, Ostadib, Tadayoun, & Aghdasi, 2009)
	Time when fixed	Client should determine how and at what time the brief becomes fixed	Medium	(Othman, Hassan, & Pasquire, 2004) (Yu A. , Shen, Kelly, & Hunter, 2007)
	Decision making	Effective decision making can only occur when shareholder representatives are senior managers	Low	(Othman, Hassan, & Pasquire, 2004) (Yu A. , Shen, Kelly, & Hunter, 2007)
	Flexibility list of requirements	List of requirements should be sufficiently flexible to reflect changing shareholder requirements	High	(Othman, Hassan, & Pasquire, 2004) (Yu A. , Shen, Kelly, & Hunter, 2007)
	Validation of requirements	Agreement on the brief should be obtained among all parties	High	(Tang & Shen, 2013) (Zhang, 2005)

<b>Realization</b>				
Involvement of Government	Government should be involved when shareholder and contractor cannot reach a consensus	Medium	(Othman, Hassan, & Pasquire, 2004) (Chan, Lam, & Chan, 2010) (Ng & Loosemore, 2007)	
Time allocated	More time should be allocated for contractor to make the design and begin with realization	Medium	(Yu A. , Shen, Kelly, & Hunter, 2007) (Othman, Hassan, & Pasquire, 2004) (Kamara, Anumba, & Evbuomwan, 2000)	
Experience shareholder	Shareholders experience of designing should be taken into account during meetings about design and contracts	Low	(Juaim & Hassanain, 2011) (Tang & Shen, 2013)	

### 3.4.1 Definition of the three phases

The initiative stage is considered the first stage of the project in which the public sector in the role of project developer, puts a project out to tender. Because of the innovative nature of the project, which is discussed in chapter 2, the project not only includes the construction of the road, but can also include: designing, financing and maintaining the road. (Lenferink, 2012). In this stage there is a lot of involvement from client and shareholders. Firstly, the client has to identify the different owners and determine their needs. These needs then, are collected, processed and documented functionally by the client (Bahill & Briggs, 2001). The client is to have much contact with the shareholders in this first stage of the project, but also focus on its core activity namely, the total project.

At the end of the initiative stage, one contractor or consortium of contractors is granted the tender. The contractor then starts with the process of planning and designing the project, but because of the integrated nature of the contract, the contractor is responsible for more than simply construction. In the plan development phase the contractor receives the requirements, as they have been documented by the client. This phase is a very critical in the briefing process, many problems can occur regarding unsuccessful communication and insufficient information provision.

Finally, the realization and design of large infrastructure projects go hand in hand because of the sheer size of some projects (Verweij, 2015). In practice, the contractor will start construction when designing of other sections is still in progress. By stipulation of the contract, the contractor is required to let the design of some parts of the project be validated with the successive owner of this sub-project (Chao-Duivis, Koning, & Ubink, 2011). In practice the validation of the design by the shareholders leads to a lot of resistance from the shareholders and eventually causes projects to exceed their initial budget and time planning.

### 3.4.2 Attributes of initiative stage

#### *Clear tender procedure*

Shareholders are clueless for what is and what is not included in the contract. Therefore several scholars state that a clear tender procedure has an effect on the success of a PPP project, see table 4 (Chan, et al., 2010; Zhang, 2005; Ahmad, et al., 2011; Othman, et al., 2004; Lindahl, et al., 2007 and Adnan, et al., 2012). Large infrastructural PPP project usually consists out of the main project and several sub-projects owned by shareholders. In order to be able to construct the main project, the bridges or tunnels owned by these shareholders have to be adjusted or demolished and later on reconstructed. The contractor is responsible for the construction of these sub-projects and aforementioned research has shown that this leads to many resistance from the shareholders.

Studies by Jefferies (2006) and Zhang (2005) show that it is also unclear for the shareholder who is eventually responsible for the maintenance of the project. Most shareholders believe that the contractor is responsible, since maintenance is one of the components of the DBFM contract. However after construction, the sub-project is handed over back to the shareholder who is responsible for maintenance (Interview Christine Davidse, Appendix A1). Consequently this issue also causes much discussion at the end of the realization phase, since the shareholder refuses the transfer of the project.

Moreover the use of a clear management structure of the client in the tender procedure is referred to by several scholars as having a major effect on the tender procedure. Tang and Shen (2013) studied various factors that have an impact on the effectiveness and efficiency by analyzing shareholder's needs at the briefing process and they showed that the use of a clear management structure by the client was ranked high. In addition Yu et al (2006) believe that a clear management structure is necessary. Their results show that the ability to effectively interact with the shareholder is improved if the management of the client is able to confidently and competently interact with the shareholder.

Because in the briefing process many decisions have to be made regarding the determining of the requirements and whether something is stipulated in the contract or not, making the right decisions means that the client should determine the right decision making method on forehand. Briefing involves a lot of decision making by individuals and groups. Knowing what kind of decisions to make and when to do this is crucial to the process and success of the project (Yu A. , Shen, Kelly, & Hunter, 2007). The briefing team should not limit itself by choosing one decision-making method, but should be able to be in control of the process by transparent leadership.

#### *Understanding goals and business of shareholders*

Understanding the goals and operations of the shareholders' business, see table 4, has been recognized as one of the most important factors for a successful completion of projects in numerous studies. Othman et al. (2004) observes that the briefing process is usually confined to a certain stage of the project and this obstructs the interaction between the client, contractor and shareholder.

It follows then that the client must be able to understand the goals, objectives and business of shareholders. Consequently in various studies the importance of project shareholder management is highlighted. The research of Chung, et al. (2009) stresses the importance of understanding mutual goals. Chung et al agrees that it may be difficult to build complete consensus with the shareholders, but the framework is still useful in developing a panoramic view of shareholders views though identifying common and diverse objectives and values in relation to the project.

The research of Yu et al. (2006) shows that understanding the beneficiary actors' business goals, business environment and its operating context are important aspects to let the design be validated by the shareholder eventually. Many shareholders have different perspectives and expectations, therefore all shareholders should be treated as separate entities. The attitude of the shareholders in a PPP project has an influence on the quality of outputs (Li, Akintoye, Edwards, & Hardcastle, 2005). 'Soft' factors such as shareholder relationships and shareholder management are thus important to be considered (Chan, Lam, & Chan, 2010).

Shareholders find it very difficult to describe their wishes and demands, which leads to the production of unclear and incomplete project briefs. Furthermore the study of Lutters et al. (2014) state that the briefing process suffers from ambiguity: "by neglecting or omitting uncertainties, designers may easier converge to adequate solutions". As a result from insufficient communication

with the shareholders these ambiguities and uncertainties are integrated into the design and evolve during the project.

#### *Strict control*

Skillful guidance and strict control of the shareholder by the client is a high-ranked attribute in various studies, see table 4 (Tang, et al., 2013; Yu, et al., 2007; Othman, et al., 2004). The project management department of the commissioner has the responsibility to give initial advice and work out feasibility exercises with the shareholders to appreciate the nature of their project (Tang & Shen, 2013). In the research by Yu et al. (2006) the importance of skillful guidance is also assessed. It is the client's responsibility to collate and arbitrate between the conflicting demands of shareholders once they are identified (Blythe & Worthington, 2001). Shareholders want to be recognized as an important group and the client is responsible to actively manage their expectations.

It follows that strict control of the requirements list by the client also leads to documenting requirements which are essential. Kamara et al. (2000) agree by stating that control of the client is necessary, to avoid that the brief becomes a 'wish list'. The brief should reflect the real (business) needs of the shareholder and should not include unnecessary requirements. The study of Yu et al. (2007) found that shareholders tend to maximize their wish list in the anticipation of being bargained down. Several scholars have written about this subject and this attribute is ranked very high in multiple studies (Kelly, et al., 2002; Sterry, et al., 2011).

#### *Degree of functionality*

Subsequently this leads to the following attribute, namely the distinction between the requirements, see table 4. According to Bogers et al. (2008) the lack of a proper structure is missing. As it is part of the contract, the requirements have to be formulated by the client in a functional way, to let the contractor have a lot of freedom in the design. In practice, this process leads to many problems, since the ambition of the shareholder in formulating the requirements are obscured by an overload of technical specifications. Moreover, the requirements are missing financial information. Although the brief should contain information on budget, in practice this information seem to lack (Bogers, Van Meel, & Van der Voordt, 2008).

In addition the information provided by the client should be more transparent. Studies from Bahill et al., 2001; Barrett et al., 1999 and Othman et al., 2004 state that the brief information which is compiled, collected and completed by the client is not handed over well to the contractor. In many projects the information is still being given during the construction stage and this means that the contractor has less time to make a good design. Moreover the results of the study of Lutters et al. (2014) states that there is insufficient information handed over from the client to the contractor, which is also believed by several experts in the interviews, see appendix. Also missing performance requirements is a much heard subject in the interviews. All requirements are put down in a functional manner, this means that there is a lot of room for the contractor to be creative and innovative regarding solutions and creates discussion.

#### *Add financial data*

Information about the budget is an essential component and critical for a good understanding of the requirements, see table 4. The common absence of this type of information in projects could result in the misinterpretation of some of the requirements (Juaim & Hassanain, 2011). Lack of data on the budget for the project makes it very difficult for the contractor to comprehend the contents of the brief. Definitions as high-quality or high-standards may not in fact be understood when budget information is missing (Bogers, Van Meel, & Van der Voordt, 2008).

#### *Brief checked by outside organisation*

Furthermore Bogers et al (2008) state that many problems can be avoided when the brief is checked by an organisation outside of the shareholders' and clients' organisations. Before handing over the documents to the contractor in the plan development phase, letting the brief be checked by an objective organization has some advantages. Firstly, it will help reducing any ambiguities and inconsistencies in the requirements. Secondly, the requirements are tested on feasibility and possible allocations of the project are eliminated, which saves a lot of frustration and communication problems with the designers later in the process.

#### *Training for DBFM and D&C*

The final attribute for the initiative stage is the organization of a workshop, see table 4. By organizing a workshop, the communication among all project participants can be improved, since all the parties know exactly what is and what is not in the contract (Yu A. , Shen, Kelly, & Hunter, 2007). The amount of time it takes to develop the brief is frequently underestimated, because the client is very eager to find a direct solution. Holding workshops with qualified facilitators and shareholders may save time and improve communication in the briefing process as they are simultaneously able to discuss the requirements of the project (Yu A. , Shen, Kelly, & Hunter, 2006). Furthermore, Bogers et al. (2008) asserts that the programming documents can not replace face-to-face communication with the shareholder, since written requirements do not always reflect the actual expectations of the shareholders.

### 3.4.3 Attributes plan development phase

#### *Reviewing the brief*

Firstly, the contractor must not solely rely on the documented information by the client, but must be able to make decisions based on consultation with the shareholder. Yu et al (2007) believe that the contractor is able to make better decisions regarding the project, when the shareholder is consulted regularly. In previous paragraphs the problem of incorrect communication was recurring.

Various authors, for instance Ahmad et al. (2011), Juaim et al. (2011) and Shen et al. (2003) agree that frequently reviewing the brief together with the shareholder is considered to increase the chances of the brief being improved by both parties, see table 4. During the design phase, the designers develop a number of concepts based on the compiled and collected briefing document. Since the briefing stage is of iterative nature, the developed brief will take the form of a detailed document as it is subjected to multiple rounds of review and refinement (Zwemmer & Otter, 2008). The briefing process continues along the design phase as many questions and ideas arise. The frequent review and refinement alongside the shareholders will eventually benefit the design and the total process. In addition the studies of Yu et al (2007) and Othman et al (2004) report that the brief should be sufficiently flexible to reflect changing shareholder requirements. When the briefing document made by the client is sufficiently flexible, the contractor has the freedom to come up with creative and innovative designs as oppose to when the brief already has a fixed scheme.

#### *Department in charge*

Following is the department in charge of analysing the requirements (De Schepper, et al., 2014; Rezaiea, et al., 2009). The study of De Schepper (2014) proposes a companywide-philosophy where the total organisation knows how to deal with the briefing process. Therefore not only the designers are responsible for collecting and processing the requirements, but the total organization is in charge of analysing them. An intermediate step is using the project shareholder management department for analysing the requirements together with the designers, since the shareholder management department has more meetings with these third-parties.

### *Decision making*

Furthermore, the attribute effective decision making can only occur when shareholder representatives are senior managers, see table 4. By ensuring that shareholders will only be represented by senior managers that understand their own business goals and objectives it is easier for the contractor to discuss certain topics. In the research of Othman et al. (2004) and Yu et al (2007) this issue is discussed. Both authors agree that by appointing senior managers responsible for handling the project, more effective decision making is made possible. Senior managers have a higher rank within the organization and have a better understanding of the goals and objectives of the company, it follows then that they are able to communicate better with the client and the contractor.

### *Determining time when brief gets fixed*

Another fundamental principles for briefing is found in the research of Yu et al (2007). Respondents of the survey conducted in this research ranked: 'the client should determine the time at which the brief becomes fixed' highest of all the attributes, see table 4. In addition the brief should be fixed when the detailed design will commence. Othman et al (2004) believe that the modification of the brief has to become fixed before the detail design proposal stage. Late changes to the brief have an impact on project cost, time and quality. Furthermore they are considered a major source of dispute and litigation throughout the construction industry (Veenendaal, 1998).

Moreover, the studies of Othman et al (2004) and Yu et al (2007) found that another major problem within the briefing process is that brief information is still being given during the design/construction phase. Accordingly, when the contractor is working on a design, in some cases he will still receive information during the realization phase. Yu et al (2006) refers to two important aspects of the briefing process, namely that the brief should be compiled, completed and agreed prior to commencing the execution of the project and should act as a reference document which is made available to all parties. This process should also continue over time and should not stop at the completion of the project brief as is referred to by Lutters et al. (2014).

### *Flexibility list of requirements*

By extension, the flexibility of the brief is also a high-rated attribute, see table 4. According to Yu et al (2006) there are basically two schools of thought. One approach sees the briefing document as something that should be frozen after some time, is also referred to as the static brief. The other approach considers the brief as a live and dynamic document that develops iteratively from an initial global brief in a series of stages, also referred to as the dynamic brief (Blythe, et al., 2001; Barrett, et al., 1999; Othman, et al., 2004). Both approaches have certain advantages and disadvantages. Whereas in the static approach there is a predefined start and end of the process and the contractor has more grip on the total situation, the dynamic brief has more advantages for the shareholder, since they can ensure that the final product meets their requirements and fulfills their objectives.

### *Verification of requirements*

The final attribute of the plan development phase is: agreement on the brief should be obtained by all parties involved, see table 4. The result of the plan development phase is a design. In practice the agreement on the brief causes many discussion. Shareholders have been given much power by the contracting organization by letting them validate the design. Admittedly the project is owned by the shareholder and should have control over his own project, but this causes much discussion, since the contractor is falling behind on time and budget due to stagnation in the design phase. The functional requirements cause much room for discussion, since they possess much points of ambiguity.

### 3.4.4 Attributes realization phase

#### *Time allocated for design*

Yu et al. (2005) deplore the tendency that not enough time is allocated for the contractor to make the design and begin with the construction, see table 4. "This often occurs because there is urgency to obtain an immediate solution." Because the contractor has to work on such a tight budget and schedule, not much time is spend on the process of briefing. These problems affect the performance of the project and reduce the client satisfaction during the briefing.

Lutters et al. (2014) state that shareholders sometimes have second thoughts about the design and therefore cannot validate the design. As a result the contractor can not start the execution and falls behind on schedule. This in turn leads to a significant increase in project costs. Because of the integrated nature of the contract and the stipulations in the contract, most of the time the costs are for the account of the contractor (Chao-Duivis, Koning, & Ubink, 2011). Moreover Edelenbos et al. (2009) and Ahmad et al. (2011) find that some shareholders only come forward and are identified in a later stage of the project. When this shareholder group opposes to the project, for example an environmental organization, this can delay the project significantly.

Accordingly, in practice the goals and objectives of the shareholder are also insufficiently taken into consideration by the contractor (Lindahl & Ryd, 2007). Whereas in previous paragraphs the importance of understanding the goals and objectives of the shareholder by the client was highlighted, the contractor also has to understand the goals and objectives of these groups. "Such knowledge should make it possible to create innovative methods for facilitating the management of the construction process from conception to completion" (Lindahl & Ryd, 2007). It will also positively benefit to the relationship between both parties.

#### *Experience of shareholder*

In the relationship with the shareholder it should also be assessed whether the shareholder lacks the design experience, see table 4. For many shareholders participating in such a project will occur once in their career (Chung, Kumaraswamy, & Palaneeswaran, 2009). The contractor then has to assess what type of tactic they have to use in helping the shareholder acquiring the knowledge.

#### *Governmental involvement*

Finally, when the shareholder and contractor cannot find consensus, the solution might be that the government has to intervene between the two parties, see table 4. In the contract is stipulated that the contractor is responsible for every aspect of the work, from design to maintenance. But due to the fact that the integrated contracts are relatively new, practice shows that many problems arise without any form of intervention. Contractors might understand the reason and necessity for PPP projects, after all they also are beginning to understand the roles and responsibilities they have within them, however for shareholders which are used to full governmental control this is sometimes less easier to cope with.

Furthermore governments should be flexible in adopting innovations and technology, but should also provide strong support to the private sector. This is done by retaining control in case of a default and be prepared to step in and try to come up with a solution (El-Gohary, et al., 2006; Jamali, 2004; Li, et al., 2005; Zhang, 2005). Koppenjan (2005) and Lenferink et al. (2013) both argue that it is not clear which role the government is fulfilling in the project and also that there is insufficient involvement. Integrated contracts are being put out to tender since 2003, but the governmental organizations are still struggling on how to manage these projects. They are not consistent when it comes to supporting on these projects. In many studies this attribute is considered to be very important and should be implemented by the government.

### 3.5 Summary conclusion

The briefing process is an iterative, complex and dynamic process which includes various parties that all have divergent and discrepant interests. It involves identifying and conveying public-private companies' and municipalities' actual needs and requirements accurately to the project team. Research on the effectiveness on the various stages of briefing indicates that there is a gap between the expectation of client, contractor and shareholders. Whereas the briefing process was initially considered a static event, nowadays it is an iterative and social learning process about the shareholders' organizations and its goals and objectives.

Multiple researches have studied the process of briefing and have underlined the many limitations and problems. The problems that are found in all literature are that of a lack of communication, an unstructured approach of the total briefing process, difficulty in accommodating the various needs of the client and shareholder, the contractor not having a clear understanding of the client or shareholders' objectives and insufficient time allocated for briefing. All of these problems arise due to the collaboration between the different actors: contractor, client, public-private company and municipality.

Apart from indicating the problems, several scholars also identified various attributes that can be used to improve the process. All of these attributes which are listed in table 4 are being merged based on their importance and are checked on their individual applicability in the discrete choice experiment. Eventually this will lead to six attributes that are of importance to the total process.



## 4. Method

### 4.1 Abstract

Several scholars studied the impact of the briefing process for contractors, public-private companies and municipalities. They found that this process of collecting, documenting, analyzing and validating the requirements entails many problems for all actors involved. Problems that occur in this process are: lack of identification of needs, inadequate involvement of all the relevant actors, inadequate communication between those involved in briefing, insufficient time allocated for briefing, briefing information is still being given during construction and the contractor having no real understanding of client objectives. Reviewing the literature resulted in a list of important attributes influencing the briefing process. Defining the attributes is regarded as the first step of this research. Found attributes have been merged on relevance and finally the six most important attributes characterizing the process of briefing have been used for the discrete choice experiment. Secondly, the research method MNL will be introduced. MNL is a statistical technique that looks at the choices that individuals make between alternatives and allows the analysts to examine the impact the attributes and alternatives have on different groups. An on-line survey is conducted to gather the required data for this research. The results will include the preferences of the different actors concerning the briefing process.

### 4.2 Introduction

With the introduction of integrated contracts in the construction industry, the public sector transfers more responsibilities and risks to the private sector (Verweij, 2015). The use of integrated contracts as DBFM and D&C can have several benefits, for example: they can reduce the financial risks for the government and use contractor's knowledge and expertise for designing and maintenance. These type of contracts have the possibility to offer a lot of freedom to the contractor, because he is not only responsible for construction but also for designing and possibly financing and the maintenance.

Although the government is very content with this new type of contracting (Ruding H. , 2008), several scholars question the effectiveness of these integrated contracts (Lenferink, et al., 2013; Klijn, 2009; Hoezen, et al., 2010). The reported problems are: actors involved in these type of projects often have different views about the execution which stems from the fact that public actors find it very hard to formulate clear and functional requirements. As a result private actors responsible for the construction project find it hard to realise these complex projects. Hence, the contractor finds it very difficult to analyse the requirements defined by the public-private companies and municipalities and come up with an innovative design in accordance with the views of municipalities and public-private companies.

Several scholars studied the impact of the briefing process for contractors, public-private companies and municipalities including the ones by Kamara et al., 2000; Yu et al., 2006; Othman et al., 2004; Shen et al., 2003; Tang et al., 2013; Chung et al., 2009. Research of the effectiveness on the various phases of the briefing process indicates a gap exists between the client, contractor and shareholders' expectations (Kelly et al., 2005; Yu et al., 2005; Bogers et al., 2008; Zwemmer, et al., 2008). Whereas the briefing was historically considered a static event of capturing the requirements of public-private companies and municipalities prior to the design of a project, today Zwemmer et al. (2008) state that the briefing process is considered an iterative and social learning process about the organization and special needs of the municipality and public-private companies. The process of collecting, documenting, analyzing and validating the requirements of the public-private companies and municipalities is also referred to as: the briefing process. Although several definitions of the briefing process exists, this research refers to the following: "construction briefing is the process by which the

owner of a segment of infrastructure informs his or her needs, aspirations and desires, either formally or informally, while the brief is a formal document which sets out these requirements in detail" (Tang & Shen, 2012). In addition the briefing process is seen as mandatory for the contracting organization, since the contractor cannot commence the realization of the project without having the design verified and validated with the surrounding actors (Tran & J.E., 2005). Consequently, the briefing process causes many problems for not only contractor, but also for the public-private companies, municipalities and the client.

Therefore problems in the briefing process can partly be seen as a consequence of different goals among actors. Existing literature on the subject of briefing always focusses on one of the actors, for example studies by Kwak et al., 2009; Adnan et al., 2012; Yu, et al., 2010 and Shen et al. 2003 examined the clients involvement in the briefing process, whereas studies by Ng et al. (2009), Kumaraswamy et al (2001), Yaweli et al. (2005) Eskerod et al. (2008) examined the contractors involvement and finally studies by Zwemmer et al (2009), Otto (2007), Edelenbos, et al. (1998), van Buuren et al. (2008) examined the public-private companies' and municipalities' involvement. This research is trying to add the individual respondents experience approximated in the years of work and experience with innovative contracts in order to improve the understanding of overall actor preferences. To an even greater extent, the individual choice of respondents will try to help establishing a certain actor's preference. Multinomial logistic regression (MNL) will be used to analyse the individual's preferences concerning the briefing process. A discrete choice experiment will be set-up to predict choices of public-private companies, municipalities and contractors regarding the briefing process.

This research uses MNL to analyse the data of actors involved in the briefing process of large scale infrastructural DBFM or D&C projects as a quantitative tool for mapping preferences of potential actors. Hence, the reader will be informed about current problems in the briefing process and the necessity for quantifying the preferences of the contractor, municipalities and public-private companies. In addition this is supported by introducing MNL in relation to the problem at hand. Therefore the theoretical background of the MNL method will be discussed also, since MNL is used in the context of discrete choice modelling (DCM), a detailed procedure of the use of DCM in relation to the briefing process will be given. As a result the MNL analysis will identify the preferences of the different actors concerning the briefing process and will lead to a better understanding of the various actors' preferences concerning the interpretation of the process.

#### **4.3 Contractors', municipalities' and public-private companies' preferences towards briefing**

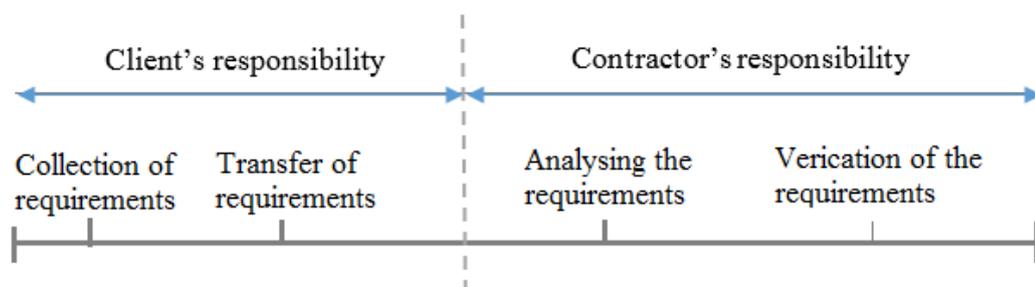
Over the last decades, the complexity of infrastructural projects has increased dramatically (Lenferink et al., 2013; Arts, 2007). It has resulted in more tasks and responsibilities for the contractor, since he is responsible for not only the realization but also the design and possible financing and maintenance depending on the integrated contract. This means that contractor's involvement has shifted to an earlier phase of the project. The idea for the shifting role of the contractor is that the public sector is under the impression that the contractor is more capable of managing all of the phases of the project, for he has more knowledge concerning the construction sector. However in practice, many problems arise in the collaboration between contractor and other actors like municipalities and public-private companies.

In this paper, an actor is: "...an individual or an aggregated social entity (collective actor) that has the ability to make autonomous decisions and act as a unit" (Pahl-Wostl, 2005). By extension a company or sector is a collective actor with overall accepted rules for group behaviour and can therefore be regarded as a single entity. Actors involved in the briefing process are: contractors, municipalities,

public-private companies and the client. The aim of the discrete choice experiment is to determine the preferences towards the briefing process of public-private companies and municipalities in projects with a DBFM or D&C contract. The contractor can use this knowledge to improve his chances of the brief being approved by the municipalities and/or public-private companies. The municipality and public-private companies can use this knowledge for a better understanding of the briefing process and see how communication can be improved. Knowing the desired mix of attributes that this target group is looking for, will help all actors to improve this process in the future. As is previously indicated, the focus in this research is on contractors, municipalities and public-private companies that have dealt with the process of the requirements analysis in the past.

Since the briefing process knows many different phases which are all important to the overall feasibility of the project, to get a better understanding of the briefing process, all the phases are defined subsequently and illustrated in figure 7.

Figure 7, phases of the briefing process



Accordingly, the first step of the briefing process is collecting the requirements for the infrastructure owned by actors such as municipalities and public-private companies (Edelenbos & Klijn, 2009). Realizing large scale infrastructural projects in the Netherlands means that other structures also have to be adjusted or reconstructed along the way. These structures are mostly owned by public-private companies and/or municipalities. As part of the integrated contract, the requirements are set-up functionally, which means that the requirements describe which functions have to be realized instead of describing a solution (ter Huerne & Veenliet, 2006). Therefore allowing the contractor to find the most efficient and economical solution (Lenferink & Tillema, 2013). When all the requirements are collected and documented, they are then transferred from the client to the contractor that has been granted the tender. The contractor in his turn is responsible for analyzing the requirements and verifying them together with the municipality or public-private company (Bogers, van Meel, & van der Voordt, 2008).

However in practice, the contractor makes his design according to the requirements without consulting the municipality or public-private company, validation of requirements by these actors is very important, since the contractor cannot commence realization before the requirements are verified and validated (Interview Christine, Appendix). Therefore the total briefing process consists out of many steps, tasks and responsibilities for all actors involved.

As can be found in figure 7, there is a big difference in the goals and means of the private and public actors. All four actors involved have been assigned different roles in the proces, but they are mostly unaware what tasks and responsibilities come with it. The contractor is responsible for designing, constructing, financing and maintaining the project as is stipulated by the contract. This implies that he has many risks concerning every part of the project (Lenferink & Tillema, 2013). By contrast, the municipalities and public-private companies are only present for a small time in the project and consequently only want their structure to be build according their requirements.

Within the briefing process certain steps can be taken to ensure that all actors are satisfied with the adopted strategy. Because integrated contracts have not been introduced until very recently, it is important to look at which characteristics of the respondents can influence the strategy that is applied in the briefing process. Actors' preference play a significant role in their behaviour, therefore MNL is used to analyse the individual choice of the respondents.

#### 4.4 Using MNL to discover choice behaviour and attribute preferences

Discrete choice modelling (DCM) is a method that describes the choices that decision makers make between alternatives of products and services (Hensher, et al., 2005) The DCM method allows the researcher to determine which impact products or services have on different target groups (Hensher, Rose, & Green, 2005).

There are two types of data and data collection methods available to determine the preferences of target groups, namely: revealed or stated preference data. The latter is used in this research, because stated preference data is most useful when there is almost no data available for newly introduced variables (Hensher, Rose, & Green, 2005). Since no comparable research has been done before, respondent's observations from an experimental environment have to be used. Revealed preference data relies on data that is already present, which is not the case for this research. To understand the MNL model, it is necessary to understand the goal of the discrete choice experiment and which terms play a role in it.

Discrete choice modelling relies on respondents making a choice between two or more alternatives. These alternatives are characterized by different attributes and attribute levels and the respondent has to make a decision based on these attributes. To make a decision, the respondents place certain emphases on the individual attributes, but also on the group of attributes which is called the alternative, this weight is named 'utility'.

Utility ( $U_i$ ) says something about how much an alternative is preferred (Hensher, Rose, & Green, 2005). The random utility theory, assume that an individual  $n$  will base the preferred choice amongst  $i$  alternatives with attributes  $j$  within a choice situation on the alternative with the highest utility. The respondent will choose for alternative  $i$ , if and only if  $U_i > U_j \forall j \neq i$  (Train, 2009). With DCM the individual will evaluate the set of alternatives rationally. With each alternative the utility associated within a choice situation is represented by a utility function, see equation 1 (Hensher, Rose, & Green, 2005).

$$U_i = V_i + \varepsilon_1 \quad (1)$$

Where:  $V_i$  is the indicated structural utility associated with alternative  $i$ . This component can be measured as it is related to the alternatives in the choice situation.  $\varepsilon_i$  is the error term, which is known to the individual respondents, but not to the researcher.  $V_i$  can be calculated using equation 2.

With

$$V_i = \beta_0 + \sum_j \beta_{jk} * X_{ijk} \quad (2)$$

Where:  $\beta_0$  is the constant term, indicating on average the role of all unobserved sources of utility;  $\beta_{jk}$  is the parameter associated with attribute  $j$  and level  $k$ ;  $X_{ijk}$  is the effect coded attribute-level  $k$  of attribute  $j$  of alternative  $i$ .  $\beta_{jk}$  in its turn can be calculated using equation 3.

With

$$\beta_{jk} * X_{ijk} = v_{ijk} \quad (3)$$

Where:  $v_{ijk}$  is the part-worth utility associated with alternative  $i$ , with attribute  $j$ , with regard to level  $k$ . The constant term  $\beta_0$  is equal to the mean of the observed alternative ratings.  $\beta_0$  indicated the general attitude towards a certain alternative. This attitude can either be positive or negative. The bigger the value of  $\beta_0$ , the more influence it has on the overall preference (Hensher, Rose, & Green, 2005). Finally to get insight in the probability that a certain alternative is chosen above another, utility will be derived from models that estimate choice behavior. There are several options for this. The model most likely to suit this research is MNL.

Multinomial logit (MNL) model is the most basic and widely used model for analyzing discrete choice modelling. It has a short estimation time and can be easily calculated using the SPSS program.

$$P_i = \frac{e^{V_i}}{\sum_i e^{V_i}} \quad (4)$$

Where in equation 4,  $P_i$  is the probability that alternative  $i$  is chosen. The data that the MNL model provides results in multiple data sets where the preferred choice of all individuals can be effective predictors of actors' preferences.

#### 4.5 Experimental design

This paper uses DCM to see what the contractors', municipalities' and public-private companies' preferences are concerning the briefing process. Knowing the preferences of public-private companies and municipalities can be of useful for the contractor, since he can use this knowledge for future projects. Likewise the preferences of contractors can be usefull for public-private companies and municipalities, since they will understand how the contractor approaches this process. Consequently this research will create more awareness and give recommendations to all actors involved in integrated contracts. And will give an answer to the main research question:

*What are the preconditions for improving the briefing process of an infrastructural project with an integrated contract, and how can contractor combine these preconditions with the public-private companies' and municipalities' interests?*

To collect the data, a discrete choice experiment has to be created. The design proposed by Hensher et al. (2005) is used for the design of the experiment in this research. For the experiment it is necessary to describe the settings of a decision moment. Therefore several characteristics remain constant through the entire questionnaire. First, the experiment will collect the reponses of persons working for public-private companies, municipalities and contractors. Secondly, only respondents with involvement in infrastructure projects are asked to answer the questionnaire. Finally, for the project a DBFM or D&C contract had to be used. The study therefore relies on stated preference data.

Besides describing the settings of the experiment, a decision has to be made whether the alternatives have to be labeled or not. Hensher et al. (2005) defines unlabeled alternatives as not giving any information to the decision maker. Since this research will include a hypothetical choice between two alternatives both existing out of six interchangeable attributes, for this experiment the alternatives will be unlabeled and will include alternative 1 and 2.

The findings of the literature study together with the input of expert interviews (Appendix) led to a list of attributes, see chapter 3.4 literature review. A total of sixteen attributes were found that were of an impact. Because this is too much for the respondent to consider all at once, the number of attributes have been brought to six by merging different attributes with each other and selecting the most important attributes per phase of the briefing process, see table 5. Of the sixteen attributes found in literature, many were correlated or had similar definitions. Also, for some attributes it was

not able to divide them into attribute levels, because it would have led to an overall ambiguous and vague questionnaire. All six attributes represent either a phase or a responsibility and together make up a realistic scenario on which the actor can base their decision.

In practice, a discrete choice experiment (DCE) contains less than ten to ensure that respondents are able to consider all attributes listed when making their choice (DeShazo and Fermo, 2002). Furthermore, Mangham et al. (2008) state: “the greater the number of attributes, the greater the cognitive difficulty of completing a DCE. With too many attributes, the participants may be encouraged to apply a simple decision rule in which they base their response on a single or subset of attributes. In establishing attributes, it is also important to avoid conceptual overlap between two or more of the attributes, known as inter-attribute correlation, since it would prevent the accurate estimation of the main effect of a single attribute on the dependent variable.”

#### 4.5.1 Attributes

The selected attributes that are used within this questionnaire are presented in table 5 and the six most important attributes are defined and discussed separately in this paragraph.

*Table 5, six attributes that will be used in the DCE*

<b>Attribute</b>	<b>Attribute level</b>	<b>Description</b>
<b>Timing first meeting (pre-requirements)</b>	During design phase After granted tender During tender	Timing the first meeting is crucial to reviewing the requirements. Several phases of the project are possible.
<b>Flexibility list of requirements</b>	Not fixed Fixed before realization phase Fixed before design phase	Fixing the requirements ensures more certainty for the contractor, flexibility allows changing needs of the shareholder to be fit in
<b>Department in charge of analyzing requirements</b>	Design department Stakeholder management department Systems engineer	Defines which department should be in charge of handling the analysis of the requirements.
<b>Requirement types</b>	Requirements based on building estimate Requirements based on performance Requirements based on functionality	In projects different type of requirements are used. Traditional building estimates were used to write down the requirements. Now functional and performance requirements are being used which tell what the requirements should have for function, but does not describe it specifically.
<b>Validation of requirements</b>	By client, municipalities and/or public-private companies By contractor, municipalities and/or public-private companies By client, contractor, municipalities and/or public-private companies	Validation of the requirements is intended to ensure that the product or service meets the operational needs of the private companies and municipalities. It is an important step in the briefing process. Without validation the contractor cannot commence construction
<b>Training for DBFM or D&amp;C in PPP</b>	No training Use guideline Use workshop	Shareholders are often unaware about the contents of the contract and the impact it has on them as an organization. Is training necessary? And if so, how?

Starting off with the ‘timing for the first meeting concerning the pre-requirements’. Before the tender phase, the client collects and documents the requirements from the public-private companies or municipalities. As is stipulated by the integrated contract, the contractor is forced to review the documented requirements together with the surrounding actors after the tender is granted (Chao-Duivis, Koning, & Ubink, 2011). However, in practice requirements are directly used for making the design without consulting public-private companies and municipalities (Interview Christine Davidse, Appendix). Bahill and Briggs (2001) propose that the process of reviewing the requirements with the shareholder should be undertaken directly after the tender is granted. This usually means that the

process is controlled better and the collaboration with the shareholder improves. Therefore, the attribute levels represent three different scenarios. Firstly, there is the situation in which the contractor meets the shareholder during the design phase, this often happens in practice (Interview Verdoorn, Appendix). Then there is the prescribed form by the client, where the contractor discusses the requirements with the shareholder directly after the tender is granted (Rijkswaterstaat, 2010). Finally, there is the optimal form, where the shareholder is met during the tender. During interviews with experts (Appendix), many proposed the option to talk with the shareholder in an earlier phase which in turn can lead to a better collaboration. Although this is currently not possible by regulations of the contract, it would be good to consider.

Next is the 'flexibility of the list of requirements' (Othman, et al., 2004; Yu, et al., 2007). Several scholars discuss this. Yu et al. (2007) used a questionnaire to investigate the significance of several variables in the briefing process. Results of the questionnaire show that determining the moment the list of requirements becomes fixed is very important and should be determined by the client. As a result the research proposes two moments in time when it can become fixed, before sketch design and before detail design. However, Bogers, van Meel, & van der Voordt (2008) believe that the list of requirements due to changing needs of the shareholder has to be flexible throughout. They consider the list of requirements a live and dynamic document that develops iteratively from an initial document in a series of stages.

Following, is the 'department in charge of analysing the requirements' (de Schepper, et al., 2014; Rezaiea, et al., 2009). Traditionally, within the contractors' organization, the design department was in charge of analysing the requirements and making the design accordingly. However, due to the introduction of the integrated contracts, the requirements are not based on a building estimate, but are written down functionally. Therefore it requires a different way of working, as is discussed earlier. More meetings with the shareholders are necessary to understand the needs and preferences of these surrounding actors. These meetings are organized and attended by the project stakeholder management department. They are to have a lot of contact with the shareholder and therefore have much knowledge about their interests and are able to formulate the requirements better. Nevertheless the client recommends the use of systems engineering for analysing the requirements (Rijkswaterstaat, 2010). Systems engineering is an interdisciplinary field of engineering that focuses on how to design and manage complex engineering systems over their life cycles (Bahill & Briggs, 2001). Consequently in practice the systems engineer should be in charge of analysing the requirements.

The fourth attribute is the 'requirement types' (Bogers, et al., 2008; Blythe, et al., 2001; Juaim, et al., 2011). Bogers et al. (2008) argue that there is a lack of a proper structure in the documents concerning the requirements. The true ambitions or needs of the municipality or public-private company are ignored, due to an overload of technical specifications. Traditionally a building estimate was given to the contractor and he should make a design accordingly (Verweij, 2015). However, due to the introduction of the integrated contracts, more use is made of functional requirements, which means that the requirements describe which functions have to be realized instead of describing a solution (ter Huerne & Veenvliet, 2006). It offers more freedom to the contractor to make an efficient and innovative design, but can also be seen as vague and ambiguous to the contractor (Adnan, Bachik, & Supardi, 2012). Therefore more use is made of performance requirements. These requirements offer more information to the contractor, since the requirements are described in more detail. Choosing one requirement type will not exclude the other types, but a choice has to be made the choice for one type that is leading.

Furthermore, 'validation of the requirements' is a subject of controversy (Tang, et al., 2013; Zhang, 2005). Validating the requirements is an important step in the briefing process, since the contractor can only commence the realization when the requirements are validated by the municipality or public-private company (Koster & Hoge, 2008). Validation is intended to ensure that a product, service or system meets the operational needs of the shareholder. As is stipulated by the integrated contract, the contractor and shareholder have to reach an agreement on the requirements before moving on to the realization phase. Therefore much time is spent on reaching consensus. Previous studies propose more involvement from the government, functioning as an objective participant in the process (Bahill & Briggs, 2001). In practice the contractor now has to reach an agreement with the shareholder (Interview Christine, Appendix). However, more involvement from the client would mean that he should reach an agreement with the contractor and the shareholders and function as a monitoring organization with the authority to end differences between the two parties.

Finally the 'training for DBFM and D&C in PPP' is something that is much referred to in the literature (Yu, et al., 2007; Lindahl, et al., 2007; Tang, et al., 2013). Lindahl et al. (2007) argue that more effort should be made on educating and training of municipalities and public-private companies in the construction sector. Yu et al. (2007) agrees by saying that: "a structured or facilitated workshop will improve communication among actors involved." By organizing a workshop the communication among all project participants can be improved, since all the parties know exactly what is and what is not in the contract (Yu A. , Shen, Kelly, & Hunter, 2007). The amount of time it takes to develop the brief is frequently underestimated, because the client is very eager to find a direct solution. Holding workshops with qualified facilitators and stakeholder may save time and improve communication in the briefing process as they are simultaneously able to discuss the requirements of the project (Yu A. , Shen, Kelly, & Hunter, 2006). In practice, however, the interviewees (Appendix) argue that this would mean a lot of time is spend on educating the shareholders which could be better spend on defining the requirements. Many surrounding actors will not be frequently involved in large infrastructural projects, therefore giving no training or handing out a guideline in their opinion, would be sufficient.

The levels of the attributes represent the range of actual or preferred alternatives for the decision maker. All of the attributes in this experiment have three levels and are described with a nominal scale. Because some attributes could be ambiguous to some respondents it is necessary to have non-linear utility across the attribute levels. Relationships between the attributes would otherwise be unnoticed. Therefore, three is the minimal number required to estimate non-linear ship (Hensher, Rose, & Green, 2005).

#### 4.5.2 Type of design

Now that the attributes and their subsequent levels have been identified, it has to be established what kind of design is suitable for this experiment. Following the guideline of Hensher et al. (2005), the first choice is based on the preference for a full factorial or fractional factorial design. A full factorial design covers all possible combinations and to calculate all the possible combinations the following formula is used:  $L^A$ , where L is the number of attribute levels and A the number of attributes. For this research a total of:  $3^6 = 729$  treatment combinations is possible. To be able to let respondents answer 729 treatment combinations, either a large group of respondents is necessary or more time per respondent is crucial. Therefore, from a practical perspective a fractional factorial design is used for this research.

Figure 8, Design index (Hahn & Shapiro, 1966)

1 Experimental Plan Code Number	2 Total Number of Variables	3 Number of Variables at				4 Number of Tests Required	5 Are All Main Effects Independent of 2 Factor Interactions?	6 Number of Independent Two-factor Interactions Under Assumed Model	7 Residual Degrees of Freedom	8 Master Plan #	9 Using Columns Number	10 Columns From Which 2 Factor Interactions Can Be Estimated
		2 Levels	3 Levels	4 Levels	5 Levels							
19a	6	0	6	0	0	18	No	0	5	6	1,2,3,4,5,6	None
19b	6	0	6	0	0	27	No	3	2	8	1,2,5,10,11,13	AC: 1,2,7
19c	6	0	6	0	0	81	Yes	10	28	13	1,2,5,6,11,38	AC: 1,2,5,6,11
19d	6	0	6	0	0	81	Yes	12	20	13	1,2,5,6,11,31	MAO: 1,2,5
19e	6	0	6	0	0	243	Yes	15 (All)	170	MS#4	Fig. 13	All

The number of treatment combinations for a fractional factorial design is based on the study of Hahn et al. (1966), as can be seen in figure 8. The amount of attributes that is used has an influence on the treatment combinations. This research has a total of six different attributes, each having three levels, resulting in eighteen treatment combinations, see figure 8 (Hahn & Shapiro, 1966). Letting respondents answer to eighteen treatment combinations is easier than asking them to choose from 729 treatment combinations. The more variables that need to be estimated for the experiment, the more treatment combinations are required for the experiment.

The next decision that had to be made regarding the research, is to use labeled alternatives or unlabeled alternatives. Because for this experiment it is not required to have some sort of identification for the alternatives, the alternatives will be unlabeled.

In figure 8, in column 5 and 6 the terms: 'main effects' and 'independent two-factor interactions' have been used. Explanations for both terms are as followed. According to Hensher et al (2005) a main effect is defined as: "the direct independent effect of each attribute upon the response variable, choice. The main effect, therefore, is the difference in the means of each level of an attribute and the overall or grand mean. An interaction effect is an effect upon a response variable, choice, obtained by combining two or more attributes which would not have been observed had each of the attributes been estimated separately."

According to Hahn and Shapiro (1966) independent two-factor interactions are defined as: "this indicates the number of two-factor interactions which can be estimated independent on main effects and other estimable two-factor interactions. The number indicated gives the total number of such interactions." The experiment will only estimate the main effects as no interaction between the chosen attributes are considered to be relevant. The master plan that will be used from the research of Hahn and Shapiro (1966) is plan 6.

The experiment will estimate non-linear effects by using dummy or effects coding. Hensher et al (2005) suggest that by using dummy coding the data is perfectly confounded to the base level of an attribute with the grand mean. Each attribute that will be dummy coded will also be perfectly confounded with the grand mean. However, with dummy coding it can be unsure what is measured. Therefore it is better to use effects coding over dummy coding, because with effects coding there is no perfect confounding of the base attribute level with the grand mean of the utility function.

Yet another important aspect to consider is whether to use the no-choice alternative in the experiment. Because the objective of the study is to assess the impact of the relationships the different attribute levels have on choice, the no-choice alternative is likely to have a negative effect upon the experiment (Hensher, Rose, & Green, 2005). Furthermore, Hensher et al (2005) state: "the only information obtained from a non-choice alternative is that the decision maker would prefer not to choose any of the available alternatives. We obtain no information as to why this may be the case, however." Therefore the no-choice alternative is not used in this DCE.

### 4.5.3 Generated experimental design

The research of Hahn and Shapiro (1966), figure 8, showed that with six attributes with each three levels, eighteen treatment combinations are sufficient to do the experiment. For this experiment there is made use of the design matrix generation option in the statistical model SPSS 22. This plan is based on the number of attributes and their levels and can be used to translate all of these attributes into a workable and clear design matrix, see table 6. The explanation of the symbols are defined in table 7.

Besides looking at the design matrix, there also has to be assessed whether the attributes are statistically independent, which is done by doing a correlation test, see table 8. Orthogonality between the attributes is the first basic criterion in the generation process. Optimal designs optimize the amount of information obtained from a design and are considered statistically efficient. By using an orthogonal design generated by SPSS, the amount of information obtained from a design is optimized (Hensher, Rose, & Green, 2005).

Table 6, Design matrix of DCE

Treatment combination	TF	FB	RA	RT	VR	TS
1	0	0	2	1	2	1
2	0	1	0	2	1	2
3	0	2	1	0	0	0
4	1	0	0	0	0	2
5	1	1	1	1	2	0
6	1	2	2	2	1	1
7	2	0	2	0	1	0
8	2	1	0	1	0	1
9	2	2	1	2	2	2
10	0	0	0	2	2	0
11	0	1	1	0	1	1
12	0	2	2	1	0	2
13	1	0	1	1	1	2
14	1	1	2	2	0	0
15	1	2	0	0	2	1
16	2	0	1	2	0	1
17	2	1	2	0	2	2
18	2	2	0	1	1	0

Table 7, Explanation symbols

	Symbol	Explanation
1	<b>TF</b>	Timing first meeting pre-requirements
2	<b>FB</b>	Flexibility list of requirements
3	<b>RA</b>	Department in charge of analyzing requirements
4	<b>RT</b>	Requirement types
5	<b>VR</b>	Verification of requirements
6	<b>TS</b>	Training for DBFM or D&C in PPP

Table 8, correlation test

Correlation matrix	TF	FB	RA	RT	VR	TS
<b>TF</b>	1					
<b>FB</b>	0	1				
<b>RA</b>	0	0	1			
<b>RT</b>	0	0	0	1		
<b>VR</b>	0	0	0	0	1	
<b>TS</b>	0	0	0	0	0	1

#### 4.5.4 Choice sets

The next step of the experimental design is to generate the different combinations of choice sets from where respondents will make their decision. A choice set consists out of different treatment combinations, on which the respondent has to choose the alternative which he/she prefers. In total there are eighteen treatment combinations, which are presented as nine choice sets of two alternatives. These choice sets are created by randomizing the treatment combination, this is done in excel, see table 9.

Table 9, generated choice sets

Generated choice sets			
Choice set	Set	Alt. 1	Alt. 2
<b>1</b>	1	1	17
<b>2</b>	1	2	5
<b>3</b>	1	3	18
<b>4</b>	1	6	10
<b>5</b>	1	4	12
<b>6</b>	1	7	13
<b>7</b>	1	8	11
<b>8</b>	1	9	15
<b>9</b>	1	14	16
<b>10</b>	2	1	3
<b>11</b>	2	2	7
<b>12</b>	2	9	15
<b>13</b>	2	4	17
<b>14</b>	2	5	18

Each alternative/treatment combination act as an independent hypothetical scenario. After generation labels were assigned for each alternative in the form of “Alternative 1” and “Alternative 2”. An example of the choice set is shown in figure 9. An overview of the entire questionnaire is attached in Appendix C.

Figure 9, Example of a questionnaire

**Welk alternatief geniet uw voorkeur?**

<b>Kenmerken</b>	<b>Alternatief 1</b>	<b>Alternatief 2</b>
Eerste contact tussen aannemer en stakeholder	<i>Na gunning tender</i>	<i>Tijdens tender</i>
Flexibiliteit van de eisenspecificatie	<i>Staat vast voor ontwerp</i>	<i>Staat niet vast</i>
Verantwoordelijk voor het analyseren van de eisenspecificatie	<i>Ontwerpafdeling</i>	<i>Systems engineering afdeling</i>
Mate van functionaliteit	<i>Specificatie op basis van bestek</i>	<i>Specificatie op basis van bestek</i>
Overeenstemming op de eisenspecificatie moet verkregen worden door	<i>Opdrachtgever opdrachtnemer en belanghebbende</i>	<i>Opdrachtnemer en belanghebbende</i>
Training stakeholder	<i>Verstrekken leidraad</i>	<i>Geen training</i>
<b>UW KEUZE:</b>	<input type="radio"/>	<input type="radio"/>

**4.6 Results**

The constructed questionnaire that was set-up provides data for modelling the choice behaviour of the respondents. This paragraph will describe the collection and the analysis of the data. Paragraph 4.6.1 describes the data collection approach of the experiment. Furthermore, paragraph 4.6.2 describes the descriptive analysis of the survey. Finally in paragraph 4.6.3 the results are analysed using the multinomial logit model (MNL).

**4.6.1 Data collection**

Several approaches have been used to invite respondents answer the questionnaire. The data was gathered using the ‘Berg Enquête System’, an on-line survey tool. The questionnaire was open for public from 16/06/2015 until 02/07/2015. The first approach was to address the employees working for contracting organizations in the MaVa project. This was done by sending a group e-mail to all persons that could have been involved in the briefing process. Furthermore, together with the project stakeholder manager of the MaVa project the most important shareholders of the project were selected to fill in the questionnaire. Finally, the last approach to reach out to persons involved with the briefing process in integrated contracts was to put several messages in Linked-In groups that had something to do with integrated contracts, which contain groups of municipalities or public-private companies.

For the research to be sufficiently valid the most cited rule of thumb for the number of respondents necessary is developed by Xu & Yuan (2001):

$$n > K ((K - k) + 1) \cdot 5 \quad (5)$$

Where *K* is total number of parameters (sum of all attribute levels), *k* is total number of attributes and *ratio* is the relation between the number of parameters and the number of respondents which is a value between 5 and 10. Equation 6 shows the proper amount of respondents for this research.

$$65 > (((18 - 6) + 1) \cdot 5 \quad (6)$$

Because the research includes the choices made by three groups: public-private companies, municipalities and contractors it is necessary to have 65 respondents for every group involved (Hensher, Rose, & Green, 2005).

Unfortunately, only 149 questionnaires are completely filled in and this is not sufficient considering the rule of thumb by Xu & Yuan (2001). There could be several reasons for the high amount of unfinished questionnaires, firstly the questionnaire was open for public for about two weeks which

is a very short time period, secondly the respondents found the questionnaire hard to fill in and the final reason could be that it was not interesting enough for shareholders to fill in. However, with about 50 respondents per sector, the data that is gathered can be used for the MNL model and will give a solid representation about the preferences for the different target groups.

## 4.7 Descriptive analysis

In this section the collected information will be described. It follows, then that in this paragraph information is presented about: the socio demographic characteristics of the respondent group.

### 4.7.1 Description of the research sample

The questionnaire was accessed 235 times. A total of 203 respondents have filled in the section about their social demographic actors and only 149 have filled in the complete questionnaire. The personal characteristics of these 149 respondents are collected at the start of the questionnaire. Table 10 shows the percentages of the different socio demographic factors of the respondents.

Table 10, descriptive characteristics

<b>Research sample</b>			
<b>Personal characteristics</b>			
<b>Working for:</b>		<b>Experience integrated contracts</b>	
Public sector	39,6%	D&C	32,9%
Private sector	38,9%	DBFM	57,7%
Public-private sector	21,5%	DBM	9,4%
<b>Duration employment</b>		<b>Experience with briefing process</b>	
< 10 years	33,6%	Yes	98%
10-14 years	17,4%	No	2%
15-20 years	24,8%		
> 20 years	24,2%		
<b>Organization employed</b>		<b>Shareholder for MaVa A15 project</b>	
Municipality	18,8%	Yes	17,7%
Province	2,0%	No	82,3%
National Government	5,4%		
Contractor	26,8%		
Project development	1,3%		
Not-for profit	2,0%		
Construction management	6%		
Construction consultancy	13,4%		
Utility company	11,4%		
Transport sector	7,4%		
Other	5,4%		

From table 10 can be concluded that the respondents working for public and private sector have been more willing to fill in the questionnaire oppose to public-private sector. In this research sample, most of the respondents have only been working within their sector for less than ten years (33,6%), but there is a small difference with the group that is working in their sector for over twenty years. This means that the results reported on later in this chapter can show a great difference based on this characteristic, because of the difference in education of the target group. Where people tend to

be more classical trained in the past, nowadays students are more educated about the total building process and all the accompanying tasks and responsibilities.

Looking at the characteristics of the organization employed column, most of the people who filled in the questionnaire are employed at a contracting organization. Almost half of the respondents has experience with the DBFM contract and one third of the respondents with D&C contracts. Furthermore, 98 percent of them acknowledges having experience with the briefing process, the respondents that do not have experience are excluded from the questionnaire. Finally, less than eighteen percent declared to be a shareholder in the MaVa A15 project. Although this characteristic is not useful for this research, a small customer satisfaction survey is conducted for the A-lanes A15 project organization, but is not part of this research.

#### 4.8 Model analysis

Respondents working for contractors, municipalities and public-private companies were asked about their preferences concerning the briefing process in the questionnaire. The results of the descriptive analysis show that many of these respondents have been affected or working on a project with an integrated contract and most of the respondents have experiences with the briefing process.

The present research is based on the nominal choice data that is gathered with the questionnaire. Nominal choice data attempts to model the decision process of an individual or segment in a particular context. Finally leading to a situation where an alternative is chosen or not. The alternative that is chosen produces the highest level of utility. In this case there is direct information about the order of preferences.

To enable to estimate preferred levels of attributes in the mode, the attribute-levels are coded. There are mainly two general ways to code the attribute levels, first is using dummy coding and the second approach is to use effect coding. As is mentioned before in this research, the use will be made of effect coding, since the differences between the attribute levels can be made more apparent than with the use of dummy coding. The attributes are recoded based on the scheme in table 11.

Table 11, effect coded attributes

Attribute	Level	Level number	Indicator 1	Indicator 2
Timing first meeting (pre-requirements)	During design phase	1	-1	-1
	After granted tender	2	0	1
	During tender	3	1	0
Flexibility list of requirements	Not fixed	1	-1	-1
	Fixed before realization	2	0	1
	Fixed before design	3	1	0
Department in charge of analyzing req.	Design department	1	-1	-1
	Shareholder management	2	0	1
	Systems engineering	3	1	0
Requirement types	Based on building estimate	1	-1	-1
	Based on performance	2	0	1
	Based on functionality	3	1	0
Validation of requirements	By client, municipality or public-private company	1	-1	-1
	By contractor, municipality or public-private company	2	0	1

	By client, contractor, municipality and/or public-private company	3	1	0
Training for DBFM or D&C in PPP	No training	1	-1	-1
	Guideline	2	0	1
	Workshop	3	1	0

In this research, Nlogit 5 was used to estimate the parameters of the preference models. With the results of the evaluation sets, the utility of each alternative can be estimated. For each attribute-level, parameter  $\beta$  can be estimated. To derive the part-worth utilities of the levels, the parameters are multiplied with the coded values which are determined in table 11. In table 12 the part worth-utility calculation of the attributes is shown.

Table 12, calculation of part-worth utility

Attribute level	Indicator 1	Indicator 2	Derived part-worth utility
1	-1	-1	$\beta_1 * -1 + \beta_2 * -1$
2	0	1	$\beta_1 * 0 + \beta_2 * 1$
3	1	0	$\beta_1 * 1 + \beta_2 * 0$

#### 4.8.1 Model estimations

Data analysis is done by using the Multinomial Logit Model (MNL). For choice experiments with three unlabeled alternatives, the utility for each alternative is based on the following choice model estimation (Hensher, Rose, & Green, 2005):

$$U_{(1)} = U_{(2)} = U_{(3)} = B_0 + (\text{Coefficient TF})^2 + (\text{Coefficient FB})^2 + (\text{Coefficient RA})^2 + (\text{Coefficient RT})^2 + (\text{Coefficient VR})^2 + (\text{Coefficient TS})^2$$

Where  $B_0$  is a constant defined as the base alternative, representing the utility of undefined attributes.  $B_0$  indicates the general attitude towards the proposed briefing process alternative. The attitude can either be positive or negative, this is indicated by the attributes' coefficient. If  $B_0$  its value is positive, the utility of the proposed alternative starts from a value higher then 0, hence indicating that the alternative is of interest and the group of respondents is positive towards this type of alternative. When  $B_0$  is negative it is the other way around. Also, the bigger the value of the  $B_0$  coefficient, the more influence it has on the overall preference (Hensher, Rose, & Green, 2005)

To analyze the data gathered, an MNL model is generated and parameters were estimated for the target groups. The modelling process will give insights in the differences between the different sectors: public, private and semi public-private, but also between the different organizations in these sectors namely: contractors, municipalities and public-private companies and finally also there will be analyzed what the years of experience and the experience with different forms of PPP contracts say about the preferences concerning the briefing process.

For this research the choice has been made to only use the MNL model to analyze the data, since this method gives the best representation. For all the models, a 95% confidence interval is used to identify the significant parameters. All the calculations and modelling tasks are executed with computer program Nlogit 5.

#### 4.8.2 General preference

The first analysis is that of the general preference of all the respondents concerning the briefing process. Before the data can be interpreted it is recommended to test the model goodness-of-fit. The results of this fitting test can be found in table 13.

Table 13, model fitting information

Model		-2 log likelihood	-2 LL function	Chi critical
Intercept only	<b>LL<sub>c</sub></b>	-924,75		
Final	<b>LL<sub>0</sub></b>	-877,57	94,36	21.03
Pseudo R <sup>2</sup>	<b>0,0510</b>			

From table 13 can be concluded that the pseudo  $r^2$  for this model is 0,0510. Since this is less than 0,1 this implies that the model is considered weak (Hensher, Rose, & Green, 2005). However for this research the pseudo  $r^2$  is accepted, because this research will provide meaningful information about the preferences of different sectors concerning the briefing process. Moreover, the log likelihood statistic equals 94,36. To determine whether the estimated model is better than the base model, the -2 LL function value is compared to a chi-square statistic with the degrees of freedom used in the experiment, which is twelve in this case, because six attributes times two degrees of freedom. From the chi-square distribution table (Department of statistics, 2015), with twelve degrees of freedom and a confidence interval of 95% the -2 LL value has to exceed the chi critical value of 21,03, since the log likelihood function is 94,36 the specified model is better than the base model.

To investigate the preferences from various respondents working for public and private sector, it is necessary to calculate the significant value of the attributes and the levels of multiple attributes. For this, effect coding is used. The results are displayed in table 14 and the original output of the Nlogit model in appendix B.

Table 14, parameter estimates general preference sectors

Variable	Coefficient	Significance
<b>TF1</b>	0,276	0,000
<b>TF2</b>	-0,207	0,001
<b>FB1</b>	0,214	0,000
<b>FB2</b>	0,0867	0,144
<b>RA1</b>	0,0717	0,205
<b>RA2</b>	-0,162	0,006
<b>RT1</b>	-0,021	0,682
<b>RT2</b>	0,131	0,033
<b>VR1</b>	0,174	0,007
<b>VR2</b>	-0,109	0,070
<b>TS1</b>	0,184	0,001
<b>TS2</b>	0,026	0,640

The results of table 14, show that all attributes show at least one level that is of significance. Significance implies that the values in the 'significance' column, see table 14, is smaller then 0,1. Since all the attributes show significance, all of them can be used for the analysis of the preference.

Looking at the general part worth utility displayed in graphs in table 15. The table shows many differences with the original idea of the author about the distribution. When the experimental design was made, different levels were coupled with the preference of all the respondents. The basic idea

was that all of the graphs showed a steady increasing line, but the graphs in table 15 all show different lines.

Table 15, general part-worth utility

Attributes	Levels and labels	B	Std. Error	Sig.	Graphs
Timing of first meeting (pre-requirements)	[TF=-1] During design	-,069	.	.	
	[TF=0] After granted tender	-,207	,061	,001	
	[TF=1] During tender	,276	,065	,000	
Flexibility list of requirements	[FB=-1] Not fixed	-,301	.	.	
	[FB=0] Fixed before realization	,087	,059	,144	
	[FB=1] Fixed before design	,214	,058	,000	
Department in charge of analyzing requirements	[RA=-1] Design department	,090	.	.	
	[RA=0] Stakeholder man dep.	-,162	,059	,006	
	[RA=1] Systems engineering department	,072	,057	,206	
Requirement types	[RT=-1] Specification based on building estimate	,110	.	.	
	[RT=0] Specification based on performance	,131	,062	,033	
	[RT=1] Specification based on functionality	-,021	,052	,68	
Validation of requirements	[VR=-1] By client, municipality and/or public-private company	-,065	.	.	
	[VR=0] By contractor, municipality and/or public private company	-,109	,060	,069	
	[VR=1] By client, contractor, municipality and/or public private company	,174	,065	,007	
Training for DBFM or D&C in PPP	[TS= -1] No training	-,210	.	.	
	[TS= 0] Use guideline	,026	,056	,639	
	[TS=1] Workshop	,184	,056	,001	

As mentioned before all the attributes show significance and therefore can be used for the analysis. When starting with the first attribute ‘timing of the first meeting (pre-requirements), all of the respondents chose during tender as the most preferred option. This result was expected from doing the literature study and from the interviews with the experts, see appendix A. However, ‘during design’ is slightly preferred over ‘after granted tender’ this was not an expected result. Several

scholars proposed that the contractor should not have the first meeting with the shareholder during the design, because it would be too late in the process. However the results of this questionnaire show that the shareholders and contractors participating prefer the timing of the first meeting during the design phase, reason for this can be that they have a positive experience with this in the past.

The second attribute to be discussed is 'flexibility list of requirements'. The graph of this attribute, see table 15, shows a gradually increasing line which corresponds with the allocation of the levels for the attribute in the experimental design phase. The results show that all of the respondents prefer to have the list of requirements fixed before the design phase commences. This is no surprise, since all the interviewed experts showed a preference for defining the list of requirements in an earlier phase, as a result the contractor can make its designs according to the demands that are set and has more certainty this will change during the process, increase in time and budget is therefore less of a risk.

Furthermore the respondents had to state their preference about the department in charge of analyzing the requirements. Results show that the respondent's opinions are divided on this subject. There is a slightly higher level of preference for the design department than for the systems engineering department. One reason can be that the respondents still prefer the design department to handle the requirements, since they also have to use them for making the design. Using multiple departments for the analysis, processing and designing can lead to unsuccessful transfer of the documents and mistakes in the design.

A novelty with the use of the integrated contracts is the use of the functional requirements. The fourth attributes shows the preferences for the 'requirement types'. Surprisingly, most of the respondents preferred the option: 'specification based on performance' over using functional requirements. Functional requirements have been subject to much debate over the last years. Many practitioners are still not used to work with this method. Interviewed experts also believed that less has to be specified functionally, so contractors can make better estimates and there is less ambiguity of the listed requirements.

Next attribute to be discussed is the 'validation of requirements'. As was expected the most preferred to choice was 'by client, contractor, municipality and/or public-private company'. The results show that all respondents are demanding a more active role of the client, by being more involved in this process.

Finally, the attribute 'training for DBFM or D&C in PPP' shows the graph supporting the initial hypothesis the best that all shareholders and contractors have to be properly trained for working with the integrated contracts. Organizing a workshop will allow the shareholders to be more knowledgeable for what is in store for them. When the shareholder is more educated about the total process of the integrated contract, he will understand the situation all the parties are in.

In conclusion, then the general preferences show some surprising outcomes oppose to the initial notions gathered from literature and doing the interviews with the experts. Although this general preference can tell much about the general

#### 4.8.3 Preferences of public and private sector

Because respondents working in the public and private sector have different mindsets with regard to the briefing process, it is interesting to look at the differences between these two sectors. This paragraph describes the modelling process to investigate these preferences.

Also for these preferences the MNL model is used to analyze the data concerning the respondent's preferences. Therefore the model goodness-of-fit also is tested. The results of the models fitting test can be found in table 16. The results are split between the public and private sector model.

Table 16, model fitting information different organizations

<b>Model public sector</b>		<b>-2 log likelihood</b>	<b>-2 LL function</b>	<b>Chi critical</b>
Intercept only	<b>LL<sub>c</sub></b>	-364,77		
Final	<b>LL<sub>0</sub></b>	-348,88	31,78	21.03
Pseudo r <sup>2</sup>	0,044			

<b>Model private sector</b>				
Intercept only	<b>LL<sub>c</sub></b>	-359,88		
Final	<b>LL<sub>0</sub></b>	-326,17	67,42	21.03
Pseudo r <sup>2</sup>	0,094			

From the fitting test in table 16, the pseudo r<sup>2</sup> value for the public sector model is 0,044 and for the private sector model it is 0,094. This means that both models are considered weak, because the value is smaller than 0,1. However, the pseudo r<sup>2</sup> value is accepted because this model will provide meaningful information about the general preferences of different organizations active with integrated contracts in the Netherlands. When looking at the log likelihood statistic, both -2 LL function values are higher than the chi critical value, thus the specified models are better than the base models.

The data has been analyzed using the Nlogit 5 program. In appendix B the original output is supplemented. Table 17 and 18 show the summarized data. The output of the public sector model, table 16, shows three attributes that are of significance, these are: timing of first meeting (pre-requirements), flexibility list of requirements and training for DBFM and D&C in PPP. In contrast the private sector model shows significance for all the attributes, thus explaining more about the preferences of this sector.

Table 17, parameter estimates public sector model

<b>Public sector model</b>		
<b>Variable</b>	<b>Coefficient</b>	<b>Significance</b>
<b>TF1</b>	0,20	0,044
<b>TF2</b>	-0,193	0,051
<b>FB1</b>	0,214	0,022
<b>FB2</b>	0,166	0,079
<b>RA1</b>	0,049	0,590
<b>RA2</b>	-0,047	0,611
<b>RT1</b>	0,076	0,366
<b>RT2</b>	-0,008	0,936
<b>VR1</b>	0,038	0,71
<b>VR2</b>	-0,090	0,334
<b>TS1</b>	0,199	0,027
<b>TS2</b>	0,187	0,033

Table 18, parameter estimates private sector model

<b>Private sector model</b>		
<b>Variable</b>	<b>Coefficient</b>	<b>Significance</b>
<b>TF1</b>	0,402	0,000
<b>TF2</b>	-0,342	0,001
<b>FB1</b>	0,227	0,020
<b>FB2</b>	0,038	0,700
<b>RA1</b>	0,068	0,463
<b>RA2</b>	-0,261	0,009
<b>RT1</b>	-0,034	0,686
<b>RT2</b>	0,288	0,005
<b>VR1</b>	0,31	0,005
<b>VR2</b>	-0,132	0,192
<b>TS1</b>	0,234	0,011
<b>TS2</b>	-0,052	0,573

From the parameter estimates in table 17 and 18, the total part-worth utility for all the attribute levels have been calculated accordingly. In table 19 the part-worth utilities for the public sector model are displayed.

Table 19, part-worth utilities of public sector model

Attributes	Levels	Estimate	Significance
<b>Timing of the first meeting (pre-requirements)</b>	During design	-0,007	-
	After granted tender	-0,193	0,05
	During tender	0,20	0,04
<b>Flexibility list of requirements</b>	Not fixed	-0,380	-
	Fixed before realization	0,166	0,08
	Fixed before design	0,214	0,02
<b>Training for DBFM or D&amp;C in PPP</b>	No training	-0,386	-
	Use guideline	0,187	0,03
	Workshop	0,199	0,03

The public sectors results, table 19, does not show many surprising outcomes. The utility per attribute is divided according to the initial notion. Only the first attribute shows a deviating result, 'after granted tender' is rated lower than 'during design' for the timing of the first meeting. This could be explained by the fact that because in the discrete choice set, other attributes were favored above this attribute. Another reason for this result can be, that the public sector consists out of several organizations, these organizations all have different preferences. Unfortunately this is not shown in these sector preferences.

Table 20, part-worth utilities of private sector model

Attributes	Levels	Estimate	Significance
<b>Timing of the first meeting (pre-requirements)</b>	During design	-0,06	-
	After granted tender	-0,342	0,001
	During tender	0,402	0,000
<b>Flexibility list of requirements</b>	Not fixed	-0,365	-
	Fixed before realization	0,038	0,70
	Fixed before design	0,227	0,02
<b>Department in charge of analyzing requirements</b>	Design department	-0,329	-
	Stakeholder management department	-0,261	0,009
	Systems engineering department	0,068	0,463
<b>Requirement types</b>	Based on building estimate	-0,26	-
	Based on performance	0,29	0,005
	Based on functionality	-0,03	0,69
<b>Validation of requirements</b>	By client, municipality and/or public-private company	-0,177	-
	By contractor, municipality and/or public private company	-0,132	0,193
	By client, contractor, municipality and/or public private company	0,309	0,005
<b>Training for DBFM or D&amp;C in PPP</b>	No training	-0,229	-
	Use guideline	-0,05	0,574
	Workshop	0,234	0,01

#### 4.8.4 Comparison public and private sector model

The results from the respondents working in the private sector, see table 20, shows significance for all the attributes. Almost all of the attribute levels' part-worth utility are distributed according to what was expected on forehand. However, two attributes show a slight difference in the distribution of the part-worth utility. First, the respondents show more preference for 'during design', oppose to 'after granted tender' with the timing of the first meeting. The respondents from the public and private sector think alike when it comes down to the timing of the first meeting. Both prefer 'during tender' the most, but second they prefer 'during design' above 'after granted tender'.

The second attribute that is significant in both models is the 'flexibility list of requirements', also these results are similar to each other. However, the results from the private sector model shows a more distinct hierarchy of levels. Finally, the results from the attribute: 'training for DBFM or D&C in PPP' is the same for both private and public sector models. The respondents from the public sector are more reluctant to use a guideline than the respondents from the private sector. This could be explained by the fact, that the respondents from the public sector, which mostly are shareholders have encountered in practice that they need to be more educated in the use of the integrated contracts. They are feeling the need to organize a workshop oppose to using a guideline, which in practice still is not sufficient to understand the total process by them.

#### 4.9 Conclusion

The on-line questionnaire has been accessed 235 times and led to 149 completed questionnaires. This is less than the 65 respondents per group that was necessary. Reaching out to respondents has proved to be very difficult and the short time period of only two weeks gathering the questionnaires was also an added burden. Furthermore, filling in the questionnaire has proved to be difficult for some respondents and led to some incomplete questionnaires, which had to be removed from the pool of data. Notwithstanding the respondents who had filled in the questionnaire have provided valuable data concerning the preferences towards the briefing process.

Many respondents from public and private sector have filled in the questionnaire, but less from the public-private sector. Persons working for contractors have proven to be the most cooperating by filling in the questionnaire, but also persons working for municipalities have provided much data. The results of the questionnaire have been analyzed using the Multinomial Logit (MNL) model. The MNL model is used to analyze and compare data from respondents working in the public and private sector. Unfortunately only the sector model showed enough significance, the other socio-demographic factors showed very little significance, since the groups were too small.

The general preference model included the preference of all respondents. All attributes show significance and are therefore used in the analysis. The general preference model shows some surprising outcomes, which were not expected initially. All attributes consisted out of three levels, which were ranked on forehand by the author. Therefore the first level was the most unlikely to be chosen and the third level the most likely by the respondent. As a whole, the preference of respondents show differences with what was expected from the literature study and expert interviews. For example the general preference towards the 'department in charge of analyzing the requirements' is that this should be done by the design department, although literature prescribes the use of the systems engineering department. The stakeholder management department is least favorited in this model. Also the attribute 'requirement types' shows an unexpected result, namely the use of 'specification based on performance' is ranked the highest, oppose to 'specification based on functionality'. However, this notion is supported by the many problems faced using functional requirements found in the literature study and also in the interviews with the experts. All experts

feel that changes have to be made within the contract, they feel that requirements have to be set-up functional where it is possible, but if there is already an efficient solution then this must be used.

Looking at the differences between the models for respondents working in the public sector oppose to the private sector. Both models show almost the same outcomes. It seems that on average the respondents from the public sector are more positive towards 'training for DBFM or D&C in PPP', this could mean that they want to be better educated in the use of the integrated contract, since it is not been done in satisfied way. Similarity between both groups is that they both prefer to have the first meeting concerning the pre-requirements to be during design oppose to after the tender is granted. This could be explained by the fact that respondents found other attributes to be more favorable, leaving this attribute to be less chosen.

In general the chosen attributes support the hypothesis that changes have to be made in the briefing process to ensure satisfaction for all parties involved. Shareholder and contractor prefer to have the timing of the first meeting during the tender phase, although this is not possible now the client can make a small adjustment to the contract so this is possible in the future. Also the use of functional requirements in the contract is a point of discussion. Results from the questionnaire show that respondents prefer to have a specification based on performance, while the use of functional requirements in some cases challenge the contractor to come up with an creative and innovative design, unfortunately in practice it leads to much discussion between shareholder and contractor. Therefore recommended is to use functional requirements where this can lead to improvements and otherwise use tried and tested methods.

## 5. Conclusion and recommendations

The use of integrated contracts in infrastructural projects can have several benefits such as higher quality for the same price, shorter project lead time, a higher level of innovation during the design and construction and less responsibilities for the client. Although many papers report on the beneficial and positive aspects of these integrated contracts. In practice, many projects show overruns in time and costs which causes for friction between the actors involved. One of the bottlenecks in the planning and development of infrastructural projects is the briefing process. Many actors such as municipalities, public-private companies, contractors and clients tend to have different goals during a project. In order to indicate the possible actors' behavior, partly influenced by their goals, this research offers an insight into the preferences of these actors concerning the briefing process. The following paragraphs will answer the main-research question accordingly: *What are the preconditions for improving the briefing process of an infrastructural project with an integrated contract, and how can a contractor combine these preconditions with the public sectors' interests?*

### 5.1 Societal relevance

The literature review and the information obtained from interviews, see appendix A, reported on many problems in the planning and execution of integrated contracts. Many problems originate from the fact that the total building industry still has to get used to their new roles and responsibilities in the integrated contracts. Where traditionally the contractor his sole responsibility was the construction of a project, nowadays he has gained various responsibilities and this means more risks. Dealing with these responsibilities asks a different mindset of the contractor, for example he has to communicate and collaborate more closely with the shareholders, since neglecting these groups means possible resistance and overruns in time and budget.

Validation of the requirements is something that happens to late in the process. Various experts explained that more effort is necessary from the contractor to establish contact with the shareholder. More collaboration and cooperation is needed to understand the needs and preferences of the public-private companies and municipalities. By earlier engagement of the contractor, for example during the tender, the contractor can make a better assumption for design and budget. This is also supported by the data from the questionnaire, the public and private sector want the first meeting during the tender. Something that is not standard now, but can be made in the future by the client.

Furthermore from the discrete choice experiment the use of functional requirements in integrated contracts is also not preferred by most of the respondents. Various experts already expressed their discontent about the functional requirements, because in most cases it can lead to ambiguity and much discussion between all parties involved. Therefore the experts proposed a different usage of functional requirements. It has to be used where innovation and creativity by the contractor is guaranteed, when this is not the case proved methods have to be used. This will lead to less discussion between contractor, shareholder and client.

There are many professionals in the construction sector who have worked with the traditional model of procurement their whole professional career. Consequently it is very hard for some practitioners to get used to working with integrated contracts. These contracts require a different approach oppose to traditional contracting. Where traditional contracts ask a project management approach, the integrated contract requires a process management approach. The additional tasks and responsibilities within the contract are diverse and requires a totally different way of working. Contractors are getting used to this new type of contracting, but this process moves very slowly.

More effort by client and contractor is needed to accelerate this process. This can be done by organizing workshops and creating more awareness and transparency during the projects.

## 5.2 Scientific relevance

Investigating the preferences of several actors involved in the briefing process using discrete choice experiment is unique in this field. No research like this has been done on the subject in the Netherlands, therefore the results reported in this paper are very helpful for contractors, clients and shareholders active in this field. Not all of the attributes showed significance analyzing the data using Multinomial Logit (MNL) model, however the attributes that showed significance in the two models showed some surprising outcomes not corresponding with the literature.

The reported problems are: actors involved in these type of projects often have different views about the execution which stems from the fact that public actors find it very hard to formulate clear and functional requirements. As part of the integrated contract, the requirements are set-up functionally, which means that the requirements describe which functions have to be realized instead of describing a solution. Therefore allowing the contractor to find the most efficient and economical solution. The process of collecting, documenting, analyzing and validating the requirements of the public-private companies and municipalities is also referred to as: briefing.

An extensive literature review resulted in a list of sixteen attributes of importance regarding the briefing process. The attributes had to be brought down to a smaller number, because later on in the process questionnaires were sent to respondents using the discrete choice experiment. With too many attributes the participants may be encouraged to apply a simple decision rule in which they base their response on a single or subset of attributes, instead of all the attributes in the choice set. From these sixteen attributes, six attributes were selected by merging all of the very important attributes and assigning them to important aspects of the briefing process. Six attributes have come forward to be most important these are: timing of the first meeting (pre-requirements), flexibility list of requirements, department in charge of analyzing requirements, requirements types, validation of requirements and training for DBFM and D&C in public-private partnerships. The discrete choice experiment showed that all of the selected attributes showed significance and therefore are rated important by daily practitioners.

## 5.3 Beneficiary relevance

The beneficiary relevance of this research can be found in the fact that this research has gathered, collected and documented all the relevant information on the briefing process in integrated contracts in the Netherlands. Furthermore, multiple experts have been interviewed on the subject that has led to valuable information. All of which can be of interest to not only the contractor and shareholder, but also for the client. In the literature review and the undertaken interviews the role of the client is questioned. These type of contracts have been introduced by the client to be able to function more like an asset manager and thus allowing him/her to have more time planning and maintaining all the projects. However, all of the involved actors question the effectiveness of this system and propose for the client to have a more active role during the total project. Public-private partnerships can only thrive when there is close collaboration between all the parties and all information is shared openly.

Gradually, contractors are realizing that it is not only about the construction of a product, but it is delivering a service. Apart from designing, financing and constructing, the contractor is also in some cases responsible for maintenance for a period up to 30 years. In complex infrastructural projects the common understanding that the contractor is responsible for maintenance as well is missing. This common understanding is missing within different divisions and also with the builders. As a result,

there is no or little added value for choosing the integrated contract. The contract and its implications have to be understood by the total organization for it to succeed.

In addition one of the problems with these complex infrastructural projects is that segments of the projects are owned by surrounding actors. Reconstruction of the road means that segments of third-party owners also have to be adjusted accordingly. For these projects separate agreements have to be made between the contractor and shareholder. Although the contractor is responsible for maintenance for the total project in DBFM projects, the segments owned by shareholders are not included in the maintenance contract with the client. When work on these segments is completed, the project is then handed over to the owner. Transferring the work over to the responsible organization is not that easy. Shareholders have to verify and validate the execution before the work is done. Sometimes shareholders are not approving the construction before extra tasks have been executed. This can lead to budget and time overruns for the contractor. Interviewed experts therefore propose for improving the regulations on this subject. Consequently to also include the segments owned by the shareholders in the maintenance contract of the DBFM contract the contractor has with the client.

#### 5.4 Recommendations

The integrated contract is known to include many discrepant interests of all actors involved. Because the research is not only confined to illustrate the preferences of the different target groups, this sub-chapter will also give recommendations about how to improve the briefing process. Therefore two of the sub-research questions will be answered

*How can the contractor improve its success chances in the briefing process?*

Results of the discrete choice experiment showed that all attributes showed significance in the analysis. One of the attributes where the contractor can exert influence on is 'department in charge of analyzing requirements', the results show that the design department is preferred more than other departments. Furthermore respondents from the public sector model prefer to have the list of requirements fixed before the design phase starts. This means that earlier engagement by the contractor with the shareholder is necessary to improve its success chances.

*How can the briefing process be improved in order that municipalities and public-private companies can use this model to formulate requirements that have a better chance of being implemented by contractor?*

Problems in the briefing process occur because of collaboration between all parties involved and ambiguity in the contract. Attributes not only concern contractor, municipality and public private company, hence the client also plays an important role within the integrated contract. The 'timing of the first meeting' is preferred by all respondents to be earlier on in the total process. Furthermore the use of functional requirements have to be reconsidered. There is many resistance from public and private actors towards this way of specifying the requirements. Experts propose to use functional requirements only when this can lead to creative and innovative solutions and otherwise use specifications based on performance or building estimate. Also more effort has to be made to train the shareholder for DBFM or D&C in public-private partnerships. When more knowledge is gained about the contract, the shareholder will be more aware about his tasks and responsibilities and can eventually lead to better collaboration with the contractor and client.



## 6. Discussion

In this chapter the findings of the research are discussed. The results in the light of previous research is highlighted and in addition this chapter provides limitations of the research and opportunities for further research on the subject.

When searching for relevant information on the subject, there has been concluded that not much research is performed on this specific topic in the Netherlands. Therefore this study adds insights concerning the briefing process in infrastructural projects with integrated contracts. Furthermore this study also reports on the preferences of professionals working for different sectors that are affected by this process. Results show that respondents working within public and private sector do not show many differences in their beliefs. Most of the claims made in the literature study and perceptions of the expert in the interviews are therefore supported by the discrete choice experiment. Although the results of this research help to improve the briefing process for future projects, this study has some limitations.

For example one limitation is the fact that the questionnaire was only open for two weeks to be filled in. Reason for this was that making the experimental design took longer than expected and also that enough time had to be allocated for the data analysis phase. Although much effort has been made to create awareness for the questionnaire with the use of LinkedIn, related websites, colleagues it only resulted in 149 completely filled in questionnaires. Unfortunately, this was less than what was hoped for. Consequently the data could not be split into respondents working for contractors, municipalities and public-private companies, because the attributes would not be significant enough.

Another limitation of the research is the significance of some attributes. With the general preference and private sector model, all the attributes were significant. However, the public sector model only showed significance with three attributes. As a result the comparison between the public and private sector model could only be based on three attributes instead of all attributes.

In addition for this research a discrete choice experiment has been set up, using attributes that were selected from literature and also from the interviews with the experts. During the experiment, many respondents felt that filling in the questionnaire was a hard task to do, since they did not understand the concept of the discrete choice method or could not make a substantiated choice. Therefore the discrete choice method might not be the most effective method to be used for future research.

The research offers much information about how the briefing process is conducted in infrastructural projects in the Netherlands. The interviews and questionnaires have provided much data about the preferences of public and private sector respondents. However the initial idea of this research was to map the preferences of contractors, municipalities and public-private companies. Since the amount of respondents was too low for these groups, more research can be done in this field.

Finally, the culture in the construction sector is changing, but this change is moving very slowly. More research and awareness on this subject will help improve the efficiency of the contracts and will ensure better cooperation throughout.

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## 8. Appendices - Appendix A – Interviews

### Appendix A1 Interview Christine Davidse

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Geïnterviewde:	C. Davidse
Organisatie:	A-lanes A15
Afdeling:	Omgevingsmanagement
Functie:	Projectmanager
Datum:	03.03.2015
Tijd:	10.00
Locatie:	Seattleweg 15, Pernis
Duur:	60.00

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Christine Davidse is omgevingsmanager bij het consortium A-lanes A15, dat de verbreding van de A15 en de bouw van enkele kunstwerken als taak heeft. Zij is als omgevingsmanager vanaf het begin betrokken geweest bij het DBFM project.

#### **Als ik u vraag naar een exacte invulling, 'definitie' van het begrip omgevingsmanagement , hoe zou uw omschrijving dan luiden?**

Het is een erg breed begrip, het beste is omgevingsmanagement te beschrijven als het in kaart brengen van de omgeving van het project en alle belangen van de stakeholders die daarbij betrokken zijn. Bovendien ervoor zorgen dat er vanuit de organisatie waarin je werkt een duidelijke 'mindset' is dat behalve het fysieke bouwen er ook organisaties buiten het project bestaan die gemanaged dienen te worden. Waarbij je jezelf voortdurend afvraagt of alle belangen die er spelen ook voldoende meegenomen worden.

#### **Hoe kijkt u aan tegen de plannen van Rijkswaterstaat om het omgevingsmanagement steeds eerder en in toenemende mate over te laten aan de markt? Waarom?**

Dat vind ik een goede trend, maar daardoor ligt wel oneerlijke concurrentie op de loer. Wanneer private partijen eerder bij het werk betrokken worden dienen alle andere partijen die mee concurreren ook aanwezig te zijn, zodat iedereen dezelfde informatie heeft om zijn aanbieding te maken. Maar het zou erg positief zijn voor het project wanneer aannemers eerder bij het project betrokken worden. In het A15 project heeft incorrecte informatieoverdracht vanuit Rijkswaterstaat (RWS) over de eisen van de stakeholders ervoor gezorgd dat er veel tijd is verspild met het maken van tekeningen op basis van onjuiste informatie. Wanneer de tekeningen dan gepresenteerd werden aan de stakeholders wekte dit veel frustratie vanuit de stakeholder, gezien hij een ander beeld voor ogen had.

#### **Denkt u dat het de kwaliteit van het omgevingsmanagement ten goede komt wanneer Rijkswaterstaat ervoor kiest om deze taak over te dragen aan de markt? Om welke reden denkt u dit?**

De kwaliteit van het ontwerp en het hele proces dat met de stakeholder op deze manier wordt aangegaan zal beter verlopen. In een eerder traject ben je dan al bekend met de wensen en eisen van de stakeholder en je weet waar de knelpunten liggen. Dit kom je dan niet gaandeweg het project tegen, wat zorgt voor veel vertraging en frustratie van beide kanten.

### **Wat zijn de belangrijkste factoren waardoor de omgevingsmanager zijn taken zo goed mogelijk uit kan voeren?**

Het is belangrijk dat er vanuit het aannemersconsortium meteen duidelijkheid is over het belang van het omgevingsmanagement. In het MaVa A15 project is dit risico in het begin nog erg onderbelicht geweest. Ik was de enige omgevingsmanager op het project en na wat weerstand vanuit de stakeholder, is het belang van omgevingsmanagement erkent vanuit de aannemer en zodoende diende ik bij elk gesprek tussen aannemer en stakeholder en RWS aanwezig te zijn. Uiteindelijk is dit onmogelijk voor één persoon, daarom ben ik gaan aandringen om een afdeling in te richten met meer personen die zich allemaal één doel stellen, namelijk een goede omgang met de stakeholders. Alle communicatie tussen partijen verliep altijd via ons, het is belangrijk dat de stakeholder een bekend iemand ziet en dat hij zodoende bekend raakt met die persoon. Ook niets ten nadele van andere medewerkers van het project, maar soms mist er in de organisatie nog weleens iets van tact bij sommige personen. Stakeholders reageren daarop, door gewoon niets meer van zich te laten horen. Wat uiteindelijk erg nadelig is voor het hele project.

### **Hoe vindt de overdracht tussen de omgevingsmanager van RWS en van de private partij plaats?**

In het voortraject vindt er een stakeholderonderzoek plaats vanuit RWS, de omgevingsmanager identificeert alle betrokkenen en gaat gesprekken aan met die stakeholders. In die gesprekken komt naar voren hoe zij bij het project betrokken zijn, welke contractvorm wordt toegepast en welke consequenties dat heeft, een van de consequenties is dat de stakeholder zijn eisen functioneel moet opstellen. De stakeholders worden dan bekend gemaakt aan de aannemer en de eisenset wordt daarna ook overgedragen. Verder heeft er in dit project geen overleg plaats gevonden en is de aannemer aan de gang gegaan met het maken van de tekeningen op basis van de eisenset.

Eennmaal klaar met het ontwerp op basis van de functionele specificaties wordt deze dan getoond aan de stakeholder. Met sommige stakeholders zijn daarna verschillende gesprekken geweest waarin verbeteringen werden doorgevoerd en deze waren ook erg meewerkend, maar sommige stakeholders begrepen niets van dit proces en vroegen zich af waarom de aannemer niet eerder langs is geweest. Immers de stakeholder heeft bepaalde ideeën over het ontwerp en dat ziet ze totaal niet terug in wat er nu op tafel ligt. Concluderend kan worden gezegd dat dit proces beter gecoördineerd had kunnen worden vanuit RWS. Meer gesprekken dienen er tussen RWS en de aannemer te volgen waarin de eisen en gesprekken met de stakeholder worden belicht en dat er exact wordt besproken wat er in het voortraject is besproken, dit zorgt voor meer duidelijkheid bij alle partijen. Het beste zou natuurlijk zijn wanneer de aannemer eerst in gesprek was gegaan met de stakeholder, maar die cultuuromslag in de bouw moet nog gerealiseerd worden.

### **Wat is volgens u de definitie van functioneel specificeren?**

Functioneel specificeren is het opstellen van eisen en wensen van de stakeholder op een manier dat de aannemer veel vrijheid geeft om het ontwerp naar zijn eigen hand te maken. De aannemer wordt immers geacht door zijn expertise, problemen in kaart te kunnen brengen en verbeteringen aan te geven waar nodig. De oude systematiek van het RAW bestek is al erg dateert, we zijn tegenwoordig meer service gericht bezig en daarbij niet alleen letten op een goede uitvoering, maar ook het onderhouden van het werk voor meerdere jaren.

### **Hoe kan het doel van functioneel specificeren worden omschreven?**

Het doel van functioneel specificeren is het maken van een innovatief, creatief maar bovenal efficiënt ontwerp. Doordat de aannemer veel vrijheid krijgt, kan hij hierop sturen.

### **Worden de doelstellingen gehaald?**

Op dit moment heerst er nog erg veel onduidelijkheid over het functioneel specificeren, vanuit RWS moet hier echt meer aandacht aan besteed worden. De stakeholder is vaak niet bekend met het begrip en daarom is hij vaak niet op de hoogte van wat het inhoud. Vaak zijn de stakeholders nog erg gericht op het uiteindelijke product en zijn zij gewoon opzoek naar een oplossing voor een probleem, dit zorgt voor veel frictie tussen aannemer, RWS en stakeholder.

### **Hoe functioneel specificeren op het moment wordt toegepast, is dat een juiste werkwijze? Zo nee, hoe kan dit gewijzigd worden?**

Op dit moment is het werken met functioneel specificeren nog erg lastig. Vanuit RWS willen ze deze systematiek implementeren, maar je merkt in de praktijk dat stakeholder en aannemer nogal wat problemen ondervinden met deze manier van werken. De stakeholder beschikt over te weinig informatie van het onderwerp om het goed te begrijpen en de aannemer denkt er vaak te lichtzinning over. Vanuit RWS zou het misschien een goed idee zijn om bepaalde cursussen aan te bieden voor aannemers hoe ze hiermee om dienen te gaan. En voor de stakeholders kan dit ook interessant zijn, of het moet tijdens het gesprek nadrukkelijk besproken worden.

### **Hoe is het proces van functioneel specificeren verlopen in dit project? En wat zijn de belangrijkste knelpunten geweest?**

Het is in dit project erg moeizaam geweest om met de stakeholder tot een akkoord te komen. Om hierover meer te begrijpen is het verstandig om je eerst een en ander te vertellen over hoe een functionele specificatie wordt geanalyseerd en wat er dan uiteindelijk nodig is om het systeem te realiseren.

Allereerst worden alle wensen en eisen van de stakeholder overgedragen van RWS naar de aannemer. De aannemer heeft in het contract met RWS de afspraak dat de ontwerpen en de plannen eerst geverifieerd en gevalideerd worden door de stakeholder alvorens met de realisatie gaat beginnen. Het gaat hierbij om uitvoeringsovereenkomsten (UVO), dit is een overeenkomst tussen aannemer en stakeholder alvorens men met de realisatie gaat beginnen, daarbij worden voor sommige werken ook opleverovereenkomsten (OLO's) afgesloten, hierdoor wordt gecontroleerd of dat hetgeen wat gebouwd is ook daadwerkelijk is wat de stakeholder voor ogen heeft. Met veel infrastructuurprojecten heb je namelijk te maken met allerlei verschillende grondgebieden. Het ene stuk behoort tot de gemeente en een andere stuk is weer particulier in bezit. Om een verbreding als de A15 mogelijk te maken is het soms nodig om andere kunstwerken (zoals viaducten, tunnels) aan te passen, deze zijn vaak in eigendom van derden. Deze kunstwerken worden dan ook meegenomen in het plan, maar worden na uitvoering meteen overgedragen aan de eigenaar. De aannemer is dus niet verantwoordelijk voor het jarenlange onderhoud. Hier wringt dan ook de schoen, omdat het meteen wordt overgedragen zal de eigenaar liever zien dat er een bepaald product wordt opgeleverd in plaats van dat de aannemer iets op eigen houtje gaat ontwerpen.

**Welke aspecten uit de omgeving hebben invloed op Functioneel specificeren? (bijv: eisen,wensen, besluitvormingsdocumenten, inspraak?)**

Er zijn in de omgeving een aantal aspecten die van belang zijn als we het over het proces van functioneel specificeren hebben. Zo zijn de organisaties die ermee te maken hebben, hier nog onvoldoende bekend mee. RWS vindt het ook erg moeilijk om zich te mengen in een discussie tussen de aannemer en de stakeholder. Vooral omdat RWS vindt dat beide partijen er samen uit moeten komen. Dit zorgt voor meer strijd en zorgt er uiteindelijk voor dat beide partijen niet meer met elkaar praten.

Ook het feit dat er tegenstrijdige eisen worden benoemd, maakt het moeilijk voor de aannemer om op basis hiervan een ontwerp te maken. Het feit dat de stakeholder overall inspraak op moet hebben is uiteraard zijn goed recht, maar dit zorgt ervoor dat het gehele project meteen tijd verliest. Het gaat immers om aansluitingen van bruggen en tunnels over de Rijksweg. Vaak kan er niet begonnen worden met de aanleg van iets nieuws zonder het oude te slopen of te verbouwen, hiervoor dient toestemming te komen van de stakeholder.

**Welke factoren zijn van belang bij het functioneel specificeren?**

Binnen het functioneel specificeren zijn een paar aspecten van belang. Al eerder hebben we het over de UVO's en de OLO's gehad, dit zorgt ervoor dat het erg moeilijk wordt voor de aannemer om een akkoord te bereiken met de stakeholder. Daar komt nog eens bij dat RWS geen enkele moeite doet om de zaken tussen beide partijen te sturen, aangezien zij tegenwoordig volgens het "markt ... tenzij" principe werken. Het zou voor toekomstige projecten makkelijker zijn als RWS zich meer betrokken opstelt en niet erop zou wijzen dat het DBFM contract betekent dat zij de handen ervan af mogen houden.

Ook het type contract is van belang in functioneel specificeren, hoe groter het contract des te meer stakeholders en dit betekent meer groepen waarmee rekening gehouden moet worden. Omdat het MaVa project een groot en complex project is waren er erg veel tegengestelde belangen, vaak doordat stakeholders een andere opvatting hadden over het werk van de aannemer.

## Appendix A2 Interview Hans Bruinsma

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Geïnterviewde:	H. Bruinsma
Organisatie:	Rijkswaterstaat
Afdeling:	Omgevingsmanagement
Functie:	Projectmanager
Datum:	24.04.2015
Tijd:	15.00
Locatie:	De Holle Bilt 22, De Bilt
Duur:	56.00

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Hans Bruinsma is Senior adviseur projecten bij Grontmij en heeft in zijn loopbaan veel projecten begeleidt die met een integraal contract op de markt worden geplaatst. Hij heeft een duidelijke mening als het aankomt op deze nieuwe contractvorm.

### **Bent u enthousiast over de koers die de overheid inslaat met het integraal aanbesteden van projecten?**

In de bouw vind een cultuuromslag plaats van projectmatig naar procesmatig werken. Termen als total ownership of costs en life cycle approach worden veel gebezigd, maar worden in de praktijk niet vaak goed toegepast. Toch is er wel de wil om te veranderen, zowel de overheid als ook de private sector denkt dat het tijd is voor een verandering. Maar deze verandering vindt te snel plaats en dit zorgt voor veel onzekerheid bij alle partijen.

Er moet veel meer worden gekeken naar de functie die het systeem moet leveren in plaats van te kijken naar welke eisen moeten worden voldaan. Tevens moet eerst worden gekeken of er al een bestaande oplossing is die past, dit in tegenstelling bij elk project opnieuw het wiel uit proberen te vinden.

Het integrale karakter van de projecten wordt in de praktijk ook teveel over het hoofd gezien. Er wordt gekeken naar de bouw en het onderhoud voor een periode van 25 jaar, maar er wordt niet gekeken naar de overige 75 jaar dat een gebouw nog mee dient te gaan. De totale levensduur van de projecten worden niet meegenomen in het hele proces. Er wordt alleen maar gekeken naar een klein deel van het project en daarna is de beheerder verantwoordelijk voor het werk dat er ligt. De beheerder is vaak niet te spreken over de kwaliteit waarmee dit werk is gedaan en denkt dan ook vaak dat hij het zelf met een hoger kwaliteitsniveau had kunnen realiseren.

In projecten vergeet men vaak de helft. Daardoor wordt er niet goed gekeken naar de capaciteit en de uitbreidbaarheid van het project. Door de populatiegroei en de afname van ruimte in Nederland moet er daarom slimmer worden nagedacht over deze problemen, die overigens niet alleen spelen op nationaal niveau, maar ook wereldwijd van belang zijn. Dit zijn erg gevoelige thema's in de dagelijkse praktijk. Steden worden groter en de vraag naar meer wegdek blijft toenemen. Het bouwen van duurzame kunstwerken of wegen die makkelijk uitbreidbaar zijn, zal daarom belangrijker worden. Het werken met RAW bestek is inmiddels bijna totaal in de ban gedaan, maar deze systematiek heeft er wel voor gezorgd dat infrastructuur over het algemeen langer meegaat.

### **Vindt u dat de RAW bestekken vaker moeten worden toegepast?**

Het is niet zozeer dat RAW bestekken moeten worden toegepast, maar vaak wordt iets op een functionele wijze uitbesteed waar vaak al oplossingen voor zijn. Het heeft geen zin om dus op zoek te gaan naar een creatieve oplossing, omdat de potentie in totaal al volledig benut is. Ga dus eerst na of er al een beproefde oplossing is, voordat er weer een creatief idee bedacht wordt.

### **Wat vindt u van de veranderende rollen van alle partijen?**

De heer Bruinsma is vrij sceptisch als het aankomt op de nieuwe contractvormen en de toepassing daarvan. Projecten worden uitgevoerd met als uitgangspunt dat de aannemer veel vrijheden verwerft, maar in de praktijk is het tegenovergesteld het geval. Dit komt omdat alles fixed price wordt aanbesteed, daarom kan het meer gezien worden als een soort van lastenverzwaring, immers de verantwoordelijkheden van de aannemer zijn zeer omvangrijk. Opdrachtnemer is verantwoordelijk voor alles: ontwerp, financiering en onderhoud. Dit was eerst de verantwoordelijkheid van de opdrachtgever. Natuurlijk heeft het ook enkele voordelen, maar over het algemeen wordt het contract gezien als een soort wurggreep voor beide partijen.

Als voorbeeld haalt de heer Bruinsma de aanleg van een geleiderail aan. In het contract kan vermeld staan dat de opdrachtnemer verantwoordelijk is voor de veiligheid van een weg. Er zijn verschillende manieren om die veiligheid te waarborgen. Zo zijn er bij het voorbeeld van de heer Bruinsma verschillende opties om de auto te laten stoppen op het moment dat hij naast de weg beland. Een van die opties is het verbreden van de berm, zodat de auto geleidelijk in snelheid kan minderen. Dit is de veiligste optie, maar ook de meest prijzige, immers moet er meer asfalt gelegd worden en moet de berm worden onderhouden. Daarom worden er vaak geleidrails naast de weg aangelegd. Deze stoppen de auto ook, maar deze oplossing heeft als risico dat de auto weer terug de baan op wordt gelanceerd met alle risico's van dien. Veelal zal de opdrachtnemer kiezen voor de laatste optie, niet omdat het veiliger is, maar omdat het goedkoper is. Dit is niet gedaan met de weggebruiker of beheerder in gedachte, maar omdat het volgens het contract mogelijk is.

Concluderend kan gesteld worden dat de opdrachtgever en –nemer elkaar in de wurggreep houden. Immers de opdrachtgever komt er met dit soort contracten vaak bekocht af. Door het contract wordt er veel vrijheid gegeven aan de opdrachtnemer, echter ware vrijheid en creativiteit ontbreekt want vaak wordt de opdrachtnemer toch een bepaalde kant op geduwd.

### **Wat zijn belangrijke knelpunten tussen opdrachtnemer en stakeholder die verholpen zouden moeten worden?**

Het meest belangrijke bij dit soort project is dat alle betrokken inzichtelijk krijgen hoe het proces eruit ziet en alle termen en definities snappen. Dit wil zeggen dat functionele specificaties door betrokkenen begrepen en geaccepteerd worden, alvorens er wordt verder gegaan met de volgende fase. Dit houdt in dat er tijdig geverifieerd en gevalideerd moet worden. Dit gebeurt in de praktijk nog te weinig. Ook weten betrokkenen niet wat er besproken wordt en dit zorgt voor veel onbegrip over en weer.

Vroeger werd er met de traditionele manier van aanbesteding veel meer rekening gehouden met de beheerder. Ook waren bouwwerken dan niet voor een periode van 25 jaar van onderhoud berekent, maar voor een volle levensduur van plus minus 100 jaar afhankelijk van het type bouwwerk uiteraard. Door de geïntegreerde contractvormen is er vooral de noodzaak om deze 25 jaar door te komen en het werk dan over te dragen. Dit is echter niet de juiste manier van aanpak.

Daar komt nog eens bij dat infrastructuur van derden dat wordt aangepast, direct wordt overgedragen aan deze beheerder. Hij/zij is dan direct verantwoordelijk voor het onderhoud, dit zorgt voor veel strijd tussen aannemer en stakeholder.

## Appendix A3 Interview Jan Leenheer

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Geïnterviewde:	J. Leenheer
Organisatie:	ProRail
Afdeling:	Projectorganisatie district Rotterdam
Functie:	Projectmanager
Datum:	29.04.2015
Tijd:	10.00
Locatie:	Delftseplein 27, Rotterdam
Duur:	50.00

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Jan Leenheer is project manager bij ProRail en is nauw betrokken geweest bij de aanbesteding en de realisatie van het A-lanes A15 project. Met zijn achtergrond in de petrochemische aannemerij heeft hij ook veel ervaring in de bouwwereld en vormt daardoor dus een goed aanspreekpunt voor het A-lanes A15 project. ProRail levert een service die vrij uniek is in Nederland, zij beheren namelijk het gehele spoornetwerk van Nederland.

### **Vanaf wanneer bent u betrokken bij het project?**

In juli 2010 is Jan Leenheer betrokken geraakt bij het project. Verschillende aannemersorganisaties zaten toen nog in de aanbestedingsfase en tijdens die periode zijn ook de eerste gesprekken met Rijkswaterstaat gevoerd. Rijkswaterstaat (RWS) heeft toen aan ProRail kenbaar gemaakt dat ze een DBFM contract wilden toepassen en welke implicaties dat met zich mee brengt.

Wij hebben als Pro Rail een overeenkomst met RWS voor onder andere de botlekbrug. De verhoudingen zijn dusdanig dat A-lanes A15 een partij is, dat is gecontracteerd voor het MaVa project. Wij hebben echter met RWS een raakvlakovereenkomst. Deze overeenkomst voorziet voornamelijk in de afbouw van de nieuwe spoorweg van de botlekbrug en daarnaast heeft A-lanes A15 een aantal keren dichtbij het spoor moeten bouwen en daarvoor zijn verschillende regels en wetgeving van invloed. Normaal zegt de regelgeving dat wanneer een partij in de buurt komt van het spoor dat er dan een ProRail projectmanager ingeschakeld worden. In dit geval is daar een aanvullende overeenkomst gemaakt, omdat A-lanes A15 een partij is die een spoorgecertificeerde aannemer is. Samen hebben we daarom afspraken gemaakt dat het werk gewoon door A-lanes A15 uitgevoerd mocht worden worden maar wel met begeleiding/verantwoordelijk voor ProRail projectmanagers.

Veel discussies zijn dan ook in een begin stadium gevoerd over de aanleg van de Botlekbrug. Gezien de grootte van dit project en het feit dat de brug een belangrijke schakel vormt tussen de Randstad en de tweede Maasvlakte is ProRail er alles aan gelegen om dit project zo veilig mogelijk uit te voeren. Nadat de eerste schets van de brug door de architect was gemaakt, was een van de eerste geconstateerde problemen: het contra gewicht van de brug. ProRail houdt namelijk vast aan het principe dat dit contragewicht nooit boven de spoorleiding mag hangen. Wanneer er zich namelijk een situatie voor zou doen dat dit contragewicht op het spoor valt, dan zou dit een groot probleem betekenen voor al het treinverkeer en mogelijk de veiligheid van de spoorgebruikers aantasten. Echter na veel overleg is door ProRail hier toch een ontheffing voor verleent en mocht het ontwerp zoals het was gemaakt, worden gerealiseerd.

### **Hoe verliep de communicatie met A-lanes A15?**

Over het algemeen goed. Veel van de communicatie verliep met Christine Davidse, de omgevingsmanager van het MaVa A15 project. Echter hetgeen waarbij de samenwerking echt op de

proef werd gesteld is bij de botlekbrug. Hier is dan ook een raakvlakovereenkomst voor getekend. Tussen RWS en A-lanes A15 is er een DBFM, maar eigenlijk is het een beetje lastig in het proces dat er tussen ons en A-lanes A15 geen overeenkomst is gesloten, in welke vorm dan ook. Wij stemmen heel veel af met A-lanes A15 over de techniek enzovoort, maar als er bijzondere punten zijn die dan consequenties hebben in tijd en geld dan moet het toch altijd via RWS gespeeld worden. Dus daar loopt de communicatie niet zo. Als A-lanes A15 ook tegen iets aanloopt dan gaat dat ook via RWS, dat is de contractuele verhoudingen binnen dit project.

Omdat ProRail ook betrokken is geweest bij het project van de Betuweroute weten we hoe complex het allemaal is in het havengebied. Waarbij ik heel veel dingen herken waar A-lanes A15 nu ook tegen aanloopt, bijvoorbeeld het stakeholder management. Bij het project Betuweroute hebben we bijvoorbeeld ondervonden dat als je een spoorlijn in de haven wilt aanleggen dan kom je op andere partijen hun grondgebied. Daarbij stuit je altijd op onderliggende infra, het risico is vrij groot dat er iets mis gaat daarom dient er een goede afstemming plaats te vinden. Dan kan een stakeholder best wel eens zijn eisen en wensen op tafel leggen want ja, ze weten dat jij door moet met je project en binnen de Betuweroute was er ook wel budget voor gereserveerd. We zijn tegen heel veel dingen aangelopen, is dat nou wel reëel met de verlegging van kabels en leidingen. Maar als je door moet met het project dan kan het lastig zijn om de stakeholders mee zien te krijgen.

### **Is er tijdens de dialoofase gesproken met Pro Rail rondom de botlekbrug?**

De allereerste keer toen ik betrokken raakte bij de botlekbrug was dat een overleg tussen RWS en A-lanes A15. Het betrof een vragen uurtje voor A-lanes A15 om een prijs te kunnen vormen. Dat was ergens in mei. Toen zag ik daar een plaatje van de huidige botlekbrug waarbij je ook ziet dat het contragewicht boven het wegdek hangt, waar dan Botlek op staat. Er is ooit een keer bij Pro Rail een aanvaring geweest met een boot en een brug. Toen is het contragewicht eruit geschoten, op het spoor terecht gekomen en daarbij zeer veel problemen gecreëerd.

Toen heeft Pro Rail gemeend een ontwerpvoorschrift wat daar voor staat aan te passen. Dat moet voldoen aan allerlei voorschriften. Uiteindelijk dacht ik toen ik het eerste keer het plaatje zag dat is NOT done, in de spoorwereld om voor zo'n grote brug op die plaats een contragewicht aan te brengen. Dat was de eerste aanvaring die we hadden. Nou ja, bleek dat er in eerdere fase er is gecommuniceerd met RWS in de vorm van een presentatie met architect erbij, om te laten zien hoe ze de brug gaan vormgeven. Toen heeft RWS gezegd: "prima ga door met dit ontwerp". Voor A-lanes A15 was dat het punt, we gaan verder met het geen wat RWS destijds ja tegen heeft gezegd. Niet wetende dat het niet strookt met het ontwerpvoorschrift. Toen is toch het project doorgegaan en is het toch gegund aan A-lanes A15. En zijn we in eerste instantie direct gestart. Op directieniveau met A-lanes A15 en RWS gezeten van: "is het mogelijk om toch te gaan voor het contragewicht om ontheffing over te krijgen". Dat heeft heel lang geduurd, maar uiteindelijk is daar wel recent de ontheffing verleend om toch een contragewicht brug aan te leggen. Dat was het eerste moment dat ik met het project te maken kreeg.

### **Hoe heeft u de samenwerking met A-lanes A15 ervaren?**

De samenwerking met A-lanes A15 is over het algemeen goed verlopen. Elke twee weken is er een overleg geweest tussen het technisch personeel van beide bedrijven en dit heeft geleid tot veel vertrouwen tussen beide organisaties. Deze overleggen werd dan gevoerd met betrekking tot het ontwerp en er is dan ook goed te zien wanneer beide partijen goed met elkaar samenwerken dat er dan veel meer gebeurt.

### **Hoe ervaart u deze nieuwe contractvormen?**

De verandering in de bouw is ook ProRail niet onbekend. Zij hebben als opdrachtgever ook een project in de markt gezet met een geïntegreerd contract. De ervaring die zij hieruit hebben meegenomen is dat het voor de opdrachtgever soms lastig is om niet al teveel erbij betrokken te willen raken. Uiteraard is het contract zo vormgegeven dat de opdrachtgever alleen wordt gezien als facilitator en financier en dat verder alle rollen en verantwoordelijkheden bij de opdrachtnemer liggen. Toch heeft de heer Leenheer opgemerkt dat je op sommige momenten echt bij wijze van spreken “op je handen moet gaan zitten” om niets te gaan doen. Er was een sterke drang om op bepaalde momenten in te grijpen, wat uiteindelijk ook is gebeurd, maar door het contract is dit eigenlijk niet de bedoeling. Toch ziet hij daarom dat het contract iets gewijzigd wordt en dat opdrachtgever vaker iets meer sturing geeft binnen het gehele project. Door de complexiteit en de omvang van zulke projecten is het voor opdrachtnemer vaak erg lastig om rekening te houden met alle (tegengestelde) belangen van alle betrokkenen. Sinds Rijkswaterstaat verantwoordelijk is voor het beheer, onderhoud en de realisatie van het bestaande wegennetwerk is zij al in gesprek met alle partijen. Door dit langdurige contact met al deze organisaties en personen is het voor hen daarom ook iets makkelijker om in te zien welke belangen zij allemaal vertegenwoordigen.

### **Heeft ProRail veel te maken gehad met het functioneel specificeren van werk? Waar A-lanes A15 aan had moeten voldoen?**

Het bijzondere is aan dit project met name aan de brug. ProRail heeft sowieso voor project als deze een eisen specificatie. Waarin heel veel wordt verwezen naar dikke pakken van ontwerpvoorschriften. Dat is binnen ProRail best strak geregeld voor onderbouw, bovenbouw en draagconstructies zijn er allerlei voorschriften. Daar is heel bewust een keuze gemaakt van laat A-lanes A15 de onderbouw verzorgen en laat dan het contractteam van pro rail laat de bovenbouw realiseren en ontwerpen. Daar is de vraagspecificatie op toegespitst. Puur op de onderbouw en waar die onderbouw aan moet voldoen. Dan praat je over toleranties. De grootste brug van Europa van zijn soort. Dan mag daar maar een aantal millimeter verschil in zitten in de breedte maar ook in hoogte. Als die brug sluit dan moet die veilig bereikbaar zijn conform de ontwerpvoorschriften.

### **Wat vindt u van de rol van RWS binnen dit project?**

Over het algemeen is het vrij stroef verlopen. Ik kan niet oordelen waar dat precies aan heeft gelegen. Een van de dingen is dat de communicatie vrij laat is opgestart. Met name vanuit RWS is dit laakbaar, uiteindelijk is de rol wel opgepakt. Of dat nou aan RWS ligt of A-lanes A15 die te laat komen valideren dat weet ik niet. Ik denk dat de overleggen die geweest zijn, ook wel enige tijd daarvoor gevoerd kunnen worden. Waardoor we knelpunten eerder hadden kunnen signaleren.

### **Wat vind u van de ontwikkeling dat de markt meer betrokken word?**

Ik kan weinig zeggen over hoe het gele proces tussen RWS en A-lanes A15 is verlopen. We hebben er weinig mee te maken gehad. Wij hebben wel ervaren dat communicatie langer duurt dan normaal. Bijvoorbeeld met betrekking tot de ontwerpvoorschriften waar je aan moet voldoen. In principe is het zo wij deze zak met geld daarvoor over hebben. Met ProRail moet de aannemer dan afstemmen alvorens hij kan starten met zijn werk. We hebben als Pro Rail met zo'n soort overeenkomst ook veel moeite gehad dat de aannemer op sommige elementen nog niet bij was. En dan wil je eigenlijk bijsturen maar het mag niet in zo'n contract. Dan moet je meer doen dan je lief is om het tot een succes te maken. Je wilt ingrijpen, maar door het contract mag dat niet. Toch heb je uiteindelijk een belang in het goed verlopen van het project. Als opdrachtgever zou ik bewust soms wel gaan sturen om het uiteindelijk doel te behalen en meer een rol naar je toe te trekken.

Als ik kijk vanaf de zijlijn als zo'n contract tot stand komt denk ik wel dat A-lanes A15 heel veel zaken zijn tegen gekomen onderweg die wij destijds als Betuweroute ook tegen kwamen. Alleen hadden wij daar een beschikking over meer hulp vanuit de opdrachtgever, van A-lanes A15 wordt geacht dat dit in hun offerte zit qua afstemming met stakeholders.

### **Wat ziet u als belangrijke knelpunten in het proces?**

Een van de belangrijke knelpunten waar in principe elk project mee te maken heeft is het verloop van mensen naar andere projecten. In de aanbestedingsfase worden er vaak hele slimme oplossingen bedacht door ontwerpers of project managers, deze personen worden later weer op een ander werk gezet. Dit zorgt ervoor dat hetgeen wat bedacht is, niet wordt uitgevoerd door de bedenker maar iemand anders die er waarschijnlijk weer een andere kijk op heeft resulterend in een ander ontwerp of inefficiënte uitvoering.

Dit gebeurt ook regelmatig in de uitvoeringsfase, verloop van personeel kan ervoor zorgen dat het aanspreekpunt verdwijnt en vervangen wordt door iemand anders. De band tussen die twee personen moet dan weer worden opgebouwd evenals het vertrouwen.

Ander knelpunt is de rol van Rijkswaterstaat. Zij willen zich heel erg profileren als facilitator van de bouw en willen al het technische in principe aan de markt overlaten. Toch heeft Rijkswaterstaat in het initiatief nog wel wat rollen en verantwoordelijkheden met betrekking tot communicatie stakeholders. Dit zou eerder opgepakt moeten worden.

## Appendix A4 Interview Joop Verdoorn

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Geïnterviewde:	J. Verdoorn
Organisatie:	Havenbedrijf Rotterdam
Afdeling:	Projectorganisatie
Functie:	Projectmanager
Datum:	22.04.2015
Tijd:	15.00
Locatie:	Wilhelminakade 909, Rotterdam
Duur:	55.00

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De heer Verdoorn is betrokken geweest bij het project A-lanes A15 als projectmanager van Havenbedrijf Rotterdam N.V. Daarbij is hij het aanspreekpunt geweest voor zowel Rijkswaterstaat als de aannemersorganisatie over het uit te voeren werk en het ophalen van de wensen en eisen. Tevens is hij betrokken geweest bij het voortraject van het project. Bij het project ben ik vertegenwoordiger vanuit het havenbedrijf die de uitvoeringsovereenkomst moet borgen. Dat ze daar doen wat we afgesproken hebben en dat we daar krijgen wat we beloofd hebben te krijgen. Ik ben sinds de zomer van 2009 betrokken bij dit project, toen is de uitvoeringsovereenkomst getekend.

### **Hoe stond het havenbedrijf erin met het opzetten van de DBFM overeenkomst?**

Vanuit het havenbedrijf en de gemeente Rotterdam was er veel scepsis over het gebruik van de contractvorm DBFM. Het project werd door beide partijen als te complex bestempeld en met name omdat deze contractvorm relatief nieuw is. Het havenbedrijf drong aan om RAW bestek te gebruiken voor dit project, maar RWS heeft vast gehouden aan het geïntegreerde contract en is niet van plan geweest om dit te wijzigen, ondanks alle bezwaren.

Nadat besloten is om DBFM toe te passen en de aannemersorganisatie het werk gegund was, heeft het havenbedrijf aangeboden om te helpen met het verwerken van de eisen en mogelijke technische kennis en expertise te verlenen aan het project. Hier is de aannemersorganisatie echter te weinig op in gegaan.

### **Hoe is de samenwerking tussen aannemer en stakeholder verlopen?**

Door het opstellen van de uitvoeringsovereenkomsten (UVO's) en het valideren van de opleveringsovereenkomsten (OLO's) is het contract uiteindelijk uitgelopen op een explosief mengsel waar de belangen van alle partijen zo groot zijn en waar alle partijen geen concessies willen doen. Ten eerste is het ophalen van de eisen van het havenbedrijf niet of onvoldoende gebeurd. Aannemer heeft op basis van de eisen die RWS heeft opgehaald zijn ontwerpen gemaakt en gepresenteerd aan het havenbedrijf, die hebben deze afgekeurd en daardoor is het proces spaak gelopen. De aannemer is uiteindelijk begonnen met de voorbereidingen te treffen voor de werkzaamheden aan verschillende kunstwerken en wegdelen, maar ontwerpen waren toen nog niet gevalideerd. Dit heeft ook voor zeer veel onrust gezorgd aan de kant van de stakeholder, immers mocht er nog niet begonnen worden met de realisatie voordat de ontwerpen gevalideerd waren door de stakeholder. Uiteindelijk heeft dit proces twee jaar lang geduurd en heeft beide partijen veel kopzorgen bezorgd.

### **Wat is de rol geweest van RWS?**

De rol van RWS in dit project wordt door de stakeholder als zeer slecht ervaren. Natuurlijk omdat het advies voor het wisselen van contract vooraf geweigerd werd, maar daarna zijn er ook meerdere momenten geweest waar havenbedrijf en ook aannemer om hulp vroegen van RWS. Maar waar RWS

zijn rol als facilitator uiterst serieus heeft genomen, daarbij veelal wijzend naar het contract en het feit dat de aannemer verantwoordelijk is voor de uitvoering van het project. Dit wordt door het havenbedrijf als zeer laagbaar ervaren, immers zijn dit soort contracten sinds vorig decennium op de markt en moeten alle partijen nog wennen aan dit principe van aanbesteden.

Tevens is de technische kennis van Rijkswaterstaat als zeer gering ervaren door de stakeholder. Weinig technische kennis betekent dat RWS de belangen niet naar behoren kan behartigen aangezien zij de benodigde kennis niet in huis hadden. De rol van de opdrachtgever en de begeleiding daarvan wordt daarom benoemd als mogelijkheden waar kansen liggen om te verbeteren in de toekomst.

### **Heeft RWS geleerd van deze situatie?**

Daar zijn we nog over in discussie. Er is natuurlijk wel geleerd. Dat zie je nu ook aan de financiële situatie van Ballast. Dus ook daar zit RWS met het vraagstuk: hoe verwerken we dat leergeld in de aanpak bij de Blankenburg? Daar hebben ze in ieder geval begrepen dat de aannemer eerst het ontwerp moet maken en dan pas start buiten met de voorbereidingen. Een van mijn grote bezwaren voor de DBFM en D&C contractvorm is dat de doorlooptijd wordt verkort door parallel te gaan werken, dat wil zeggen door al buiten te beginnen en tegelijkertijd te ontwerpen. Daarbij dus in de praktijk misschien zelfs al kunstwerken te bouwen zonder validatie van het ontwerp.

In werkelijkheid is het idee van heleboel vrijheidsgraden voor de aannemer al deels weg, omdat hij al een inschrijving heeft gedaan en het budget vastligt. Dus hij kan allerlei ideeën al niet meer in praktijk brengen. Vaak kom je ook in de praktijk de situatie tegen dat de aannemer alvast begint met de voorbereidingen voor het werk. Wanneer het werk dan uiteindelijk niet gevalideerd wordt met de stakeholder, dient het voorbereidende werk gesloopt te worden. Dit levert veel tijdsverlies en discussie op. Dat is iets dat wij al wisten en dat kregen wij er niet doorheen. We hebben toen op een gegeven moment aangedrongen op een evaluatie bij de start de blankenburg verbinding en daar heb ik ook nog een keer heel nadrukkelijk gezegd dat het idee van vrijheidsgraden en functioneel specificeren, die aannemer in werkelijkheid helemaal niet bestaat op die manier.

### **Denkt u dat RWS zich meer met de situatie moet bemoeien?**

De opdrachtgever zit in zo'n situatie heel lastig. Je moet niks doen want anders ga je verantwoordelijkheid naar je toe trekken. Als je ziet dat een aannemer worstelt met een bepaalde ontwerpogave waar misschien gezien alle tegengestelde eisen die nog onderweg moet gaan ophalen. Dat die erachter komt dat kan helemaal niet wat ik hier moet maken. Toen ik nog bij RWS gedetacheerd zat, jeukten mijn vingers om dan wat te doen. Maar dat is niet meer. De technuten zitten niet meer aan tafel. De aannemer moet in zijn rol groeien, word er dan gezegd. Dan kan het dus zijn dat het twee jaar lang blijft liggen als ontwerpogave en achteraf blijkt het echt niet te kunnen.

### **Wat vindt het Havenbedrijf van de organisatie van A-lanes A15?**

Bij zowel A-lanes A15 als Havenbedrijf en Gemeente Rotterdam hadden zo iets van te voren dit is een bijna "mission impossible" met alle kabels en leidingen die daar heel dicht op elkaar gepropt zitten, met name bij de Botlekbrug. Daarom hebben wij als organisatie tijdens een stakeholder sessie ergens in februari 2011 onze hulp aangeboden. We wilden eigenlijk doen wat wij van RWS verwachtten, omdat wij al het idee hadden dat gaat daar niet vandaan komen. Maar dan zie je hoe bij A-lanes A15 het eigen proces centraal staat, dus daar werden we ook lichtelijk gefrustreerd van. Daar was niet het gevoel van misschien ook wel terecht hoor want dat kan ik moeilijker beoordelen want ik ken de

situatie bij de opdrachtgever beter dan bij een aannemer. Maar daar was zo erg gericht op het eigen proces dat er niet heel veel openheid was om te kijken van wat bedoelen ze nou eigenlijk bij het gemeentelijk havenbedrijf. Toen hadden wij zoiets van: "als je onze mensen mee laat kijken en denken, met 20 a 30 jaar ervaring in de haven en de projecten die daar spelen, ben je veel sneller klaar dan als je het zelf gaat verzinnen met mensen ingevlogen uit Limburg en de Veluwe en weet ik waar die de eerste keer met deze haven te maken hebben". Voordat je de container met documenten door hebt genomen en daarbij hebt geanalyseerd welke eisen er allemaal zijn en de eisen uiteindelijk begrijpt. Dan ben jij al een half jaar verder en nog niets opgeschoten.

### **Op dat aanbod zijn ze niet in gegaan?**

Nee. Ik denk dat ze het ook nog wel geprobeerd hebben maar dan zie je ook dat de dynamiek in zulke organisatie vrij groot is. De organisatie van aannemer groeit heel snel van 150 man naar 600 man in een jaar tijd. Dat is een heel groot deel zzp'er en inhuur. Die hebben allemaal 'eigen winkeltjes'. Er valt veel tussen wal en schip. Dus die hebben ook de neiging tot het eigen proces. Dat heeft A-lanes A15 ook al. Die zitten ook onder een zware druk mede door het strakke budget. Het komt er soms gewoon niet uit dan. Dat vertaalt zich dan dat dingen blijven liggen dat ze na 2 jaar opgepakt worden en soms dan te laat zijn en allerlei problemen oplevert. Dat is mijn perceptie van de werkelijkheid.

### **Kunt u een specifiek voorbeeld dat belangen tegen elkaar aan botsen en de interactie niet goed liep met de aannemer?**

Wat voor de aannemer lastig was, was de insteek van RWS. Bij raakvlakken met onze objecten was afgesproken dat de aannemer eerst de eisen op zou halen bij het Havenbedrijf en dan zou er een opleveringsovereenkomst gemaakt. Die maak je voordat je buiten gaat beginnen. Ik denk dat het misschien twee keer zo echt is gegaan, de overige keren is het vaak niet gebeurd. Het heeft anderhalf jaar a twee jaar geduurd voordat de aannemer zoiets had, zo zit het contract dus blijkbaar in elkaar dat ik eisen moet ophalen. Er was gewoon eerst een heleboel weerstand, mede omdat het verzwarende eisen waren. Dat kon ik me helemaal voorstellen, want dat had ik zelf ook gedacht kunnen hebben. Zo weinig eisen meekrijgen en dan merken dat je nog allerlei eisen krijgt, dat werkt demotiverend. Maar een opleveringsovereenkomst of een voorstel: dit wordt het ontwerp en zo gaan we het faseringsgewijs uitvoeren en zo leveren we het op, dat was er ook nog steeds niet. Dus we hebben regelmatig moeten zeggen, start dan maar met de bouw. Daar ontstonden ook de eerste irritaties bij het Havenbedrijf. Het is namelijk niet aan ons om vast te stellen hoe het contract in elkaar zat en op een gegeven moment dacht ik dan ook, ze zoeken het maar uit.

### **Zijn er factoren die in de lijst missen?**

Op de vraag of er factoren missen geeft meneer Verdoorn er twee. De eerste is dat er in geïntegreerde contractvormen veelal de illusie heerst dat er veel vrijheid is voor de aannemer, terwijl dit in werkelijkheid niet het geval is. Hoewel de doorlooptijd vrij lang is door het onderhoud dat de aannemer moet plegen wil de opdrachtnemer graag zo snel mogelijk klaar zijn met de realisatie omdat hier bepaalde financiële voordelen aan vast zitten. Ook krijgen ze een planning opgelegd door de opdrachtgever waaraan voldaan moet worden, dit zorgt ervoor dat het ontwerp en realisatie veelal door elkaar lopen zoals eerder besproken. Dit zorgt voor conflicten met stakeholders en opdrachtgever, immers stakeholders hebben de macht om een project doorgang te geven of te weigeren dmv het UVO en OLO systeem.

Tweede punt van discussie was dat naarmate de complexiteit van het project toeneemt de mankracht binnen de projecten ook moeten toenemen. Dit zorgt over het algemeen voor minder communicatie en een slechtere samenwerking in zijn ervaring.

## Appendix A5 Interview Xenia Hageman

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Geïnterviewde:	X. Hageman
Organisatie:	Strukton
Afdeling:	Omgevingsmanagement
Functie:	Omgevingsmanager
Datum:	28.05.2015
Tijd:	13.00
Locatie:	West kanaaldijk 2, Maarssen
Duur:	58.00

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Xenia Hageman is omgevingsmanager in dienst van Strukton en heeft tijdens haar loopbaan veel te maken gehad met geïntegreerde contractvormen bij projecten. Zo heeft zij bijvoorbeeld meegewerkt aan het project A12 Utrecht-Veenendaal en de A2 bij Maastricht.

### **Als ik u vraag naar een exacte invulling, 'definitie' van het begrip omgevingsmanagement, hoe zou uw omschrijving dan luiden?**

Omgevingsmanagement is het vakgebied binnen de bouwsector die zich vooral bezig houdt met het in kaart brengen van de stakeholders en de bijbehorende belangen beheren.

### **Hoe kijkt u aan tegen de plannen van Rijkswaterstaat om het omgevingsmanagement steeds eerder en in toenemende mate over te laten aan de markt? Waarom?**

De nieuwe contractvormen zoals ze op dit moment in de markt gezet worden kennen veel voordelen voor aannemingsorganisaties, opdrachtgevers en stakeholders. Wanneer projecten op de juiste manier benaderd worden door al deze actoren, zoals bijvoorbeeld bij het project A12, dan kan er een grote efficiency slag behaald worden. In dit project verliep de communicatie binnen de driehoek: opdrachtgever, opdrachtnemer en stakeholder uitstekend. Uiteindelijk is het project eerder opgeleverd dan gepland en is de projectorganisatie bekroond met verschillende prijzen, waar voornamelijk de samenwerking geroemd werd.

Belangrijkste factoren waarom het bij dit project wel goed verliep was dat alle partijen op de hoogte waren wat er moest gebeuren en daarbij hadden uitgestippeld hoe men daar moest komen. Tevens wist men af van wederzijdse belangen en die werden voor het merendeel door iedereen gerespecteerd. Een goede verstandhouding tussen projectdirecteuren van aannemingsorganisaties en Rijkswaterstaat is daarom een belangrijk aandachtspunt. Beide partijen moeten het eens zijn over de te bevaren koers.

Natuurlijk moet er daarbij ook draagvlak gecreëerd worden in de omgeving en daarom vind ik het een goede zaak dat er meer aan de private sector wordt overgelaten. Inmiddels zijn we alweer zo'n 15 jaar bezig met geïntegreerde contractvormen en naast de vele negatieve berichten zijn er ook zeker veel positieve verhalen die de ronde doen over deze geïntegreerde contractvormen.

### **Denkt u dat het de kwaliteit van het omgevingsmanagement ten goede komt wanneer Rijkswaterstaat ervoor kiest om deze taak over te dragen aan de markt? Om welke reden denkt u dit?**

Door alle bouwprocessen over te laten aan een organisatie zorg je voor professionalisering van de sector. Wanneer de risico's van tevoren bekend zijn en deze risico's realistisch benaderd worden, dan moet het voor de markt geen probleem zijn deze te dragen. Echter zie je in de praktijk nog teveel consortiums die voor een lagere prijs aanbesteden dan waarvoor er gebouwd kan worden, wanneer

risico's dan toch opspelen tijdens het bouwproces zorgt dit voor grote problemen bij de bouwers. De grootste taak is daarom voor de opdrachtgever om aanbestedingen goed door te lichten.

**Hoe functioneel specificeren op het moment wordt toegepast, is dat een juiste werkwijze? Zo nee, hoe kan dit gewijzigd worden?**

Het functioneel specificeren wordt op dit moment niet op de juiste manier aangepakt, er is vaak teveel onduidelijkheid bij alle betrokken partijen over de te volgen koers. Voor de stakeholder is het vaak onduidelijk wat er bedoeld wordt met functioneel specificeren en dit resulteert vaak in onenigheid in latere fasen van het project. Stakeholders zijn namelijk wel eigenaren van een stuk infrastructuur en willen altijd dat hun wensen en eisen zoveel mogelijk worden ingewilligd.

Bij de aannemingsorganisaties begint het besef langzaam te ontstaan dat deze manier van werken aardig wat efficiency voordelen kan hebben, maar het wordt op dit moment nog steeds niet goed aangepakt.

## Appendix A6 Interview Jacqueline te Lindert

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Geïnterviewde:	J. te Lindert
Organisatie:	Rijkswaterstaat
Afdeling:	Omgevingsmanagement
Functie:	Projectmanager
Datum:	15.06.2015
Tijd:	10.00
Locatie:	Griffioenlaan 2, Utrecht
Duur:	53.00

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Jacqueline te Lindert is omgevingsmanager bij Rijkswaterstaat. Als projectmanager heeft zij meegewerkt aan verschillende projecten waarbij de geïntegreerde contractvorm is toegepast.

### **Als ik u vraag naar een exacte invulling, 'definitie' van het begrip omgevingsmanagement, hoe zou uw omschrijving dan luiden?**

Omgevingsmanagement houdt in dat de omgeving tevreden gehouden moet worden. Het tevreden houden van de omgeving begint steeds een belangrijkere rol aan te nemen in de dagelijkse bouwpraktijk. Door de nieuwe contractvormen wordt er vanuit de opdrachtgever verwacht dat hij meer aan de markt overlaat. Waaronder het tevreden houden van de omgeving.

### **Rijkswaterstaat is de laatste jaren een nieuwe weg ingeslagen door meer verantwoordelijkheden over te laten aan de markt. Is dit juist gebleken?**

In eerste instantie was er zeer veel weerstand vanuit de opdrachtnemers, omdat zij nog steeds vast hielden aan het oude principe waar de opdrachtgever het project helemaal specificeerde, de opdrachtnemer hieraan ging rekenen endan zou uitvoeren wanneer hij de goedkoopste bleek. In het begin zorgden deze contractvormen dan voor veel verwarring, aangezien meerwerk hier niet meer in bestond. Aannemer moet zelf ontwerpen, bouwen en mogelijk financieren en onderhouden. Dit vergt veel meer inspanning en een andere kijk op het bouwproces.

Om de projecten goed te laten verlopen is het van belang om als opdrachtgever de "scope" van het project duidelijk te hebben en alle eisen SMART te formuleren. Zodoende komen alle partijen later niet voor onaangename verrassingen te staan. Wat over de jaren duidelijk is geworden dat projecten op verschillende wijzen benaderd worden en het eindresultaat is dan ook compleet verschillend. Mevrouw te Lindert was als omgevingsmanager betrokken bij het A12 project Maarsbergen – Veenendaal. Hier is al in een vroeg stadium contact gemaakt met de stakeholders en de band is door het hele project uitstekend geweest, met name omdat het belang van stakeholder management in een vroeg stadium duidelijk was. Opdrachtgever en opdrachtnemer werkten in nauw verband samen om duidelijke afspraken te maken over gemaakte keuzes. Een groot verschil met het A15 project.

### **Wat is er belangrijk in het begin stadium van een project?**

In het begin van een project wanneer alle aannemers hun prijzen gaan bepalen is het van belang om de uitvraag goed neerzetten vanuit de opdrachtgever. Daarbij gaat de opdrachtgever met de stakeholder om de tafel zitten om een duidelijk beeld te vormen wat de eisen zijn van de raakvlakovereenkomst. Wat je dan vaak tegenkomt is dat de stakeholder weinig weet over het proces waar ze in verzeild zijn en dit dus veel inspanning betekent om de stakeholder te onderwijzen in het doen van projecten en de procedures die daarbij een rol spelen. Opdrachtgever en stakeholder gaan dan gezamenlijk op zoek naar een geschikte oplossing dat functioneel gespecificeerd wordt. Dit is echter voor de opdrachtnemer zeer moeilijk interpreteerbaar, dus gaat de opdrachtgever ook op

zoek gaat naar een minimale eis waar de aannemer later aan moet voldoen. Deze minimale eis wordt dan doorgegeven aan de aannemer, maar door het contract wordt hij/zij wel uitgedaagd om een zo goed mogelijke aanbidding te doen.

Tijdens crisis jaren zag je dat de opdrachtnemer veel risico's tot zich nam en dat hij vaak ging prijsduiken, dat wil zeggen een zo goedkoop mogelijke aanbesteding opstellen wetende dat het risico voor hem vrij groot zou zijn dat het duurder uitvalt en de winst dan slinkt of uiteindelijk uitdraait op verlies. Nu zie je dat er veel meer strategische keuzes worden gemaakt vanuit de opdrachtnemer kant op het gebied van kosten, zodat er realistische begrotingen worden opgesteld?

### **Is er al veel verschil te zien tussen projecten van toen en nu?**

Ja er is veel verschil in de benadering van projecten toen en nu. Zowel vanuit de opdrachtnemer als de opdrachtgever kant. Wat beide partijen met elkaar gemeen hebben is dat er veel leergeld is betaald, maar dat dit ertoe heeft geleid dat elk project beter is verlopen qua kosten, samenwerking en uitkomst.

### **In welke verhouding worden projecten nu aanbesteed?**

Zoals je misschien al weet zijn D&C contracten sinds 2008 de standaard geworden voor werken van Rijkswaterstaat. Waar dit vroeger nog 1/3 van de contracten was is het nu ruim meer dan de helft. Projecten op basis van RAW bestek wordt bijna niet meer uitgevoerd vanuit Rijkswaterstaat. Als opdrachtgever heeft de geïntegreerde contractvorm meer voordelen ten opzichte van de traditionele bouwmethode met de RAW methodiek.

### **Wordt er ook aandacht besteed aan het onderwijzen van lagere overheden voor het werken met de contractvormen?**

Op dit moment is Rijkswaterstaat erg druk bezig om zoveel mogelijk de geïntegreerde contractvorm toe te passen, omdat er indien deze goed wordt toegepast veel efficiency voordelen te behalen zijn. De lagere overheden: Provincies en Gemeenten proberen ook steeds meer geïntegreerde aan te besteden, maar zijn nog huiverig. Daarom helpt Rijkswaterstaat deze organisaties door te zorgen dat mensen binnen de organisatie kunnen komen lopen om te kijken hoe de opdrachtgever zijn rol moet invullen. Zodoende komen er meer opdrachten voor de markt en is er uiteindelijk één uniforme wijze waarop opdrachtgevers opdrachten aanbesteden. Dit zorgt voor veel meer duidelijkheid in de bouwsector en zorgt ervoor dat de cultuuromslag beter en sneller gemaakt wordt. Aannemers kunnen dan niet meer binnen het traditionele stramien blijven aanbesteden.

### **Van andere geïnterviewden heb ik vernomen dat er steeds meer technische kennis is verdwenen bij Rijkswaterstaat. Is dit zo, en zo ja wat is het effect hiervan geweest?**

Dat klopt er is veel technische kennis verloren gegaan binnen Rijkswaterstaat. Er zijn natuurlijk nog steeds veel mensen over die gebruikt worden tijdens de tender om de technische haalbaarheid te toetsen, maar er is inderdaad een verschuiving geweest van ouderwets projectmanagement naar een soort van process management. Dat hoort ook bij de nieuwe contractvormen, waarbij veel meer gevraagd wordt van publieke en private sector.

### **Is er duidelijk te merken binnen de organisatie van Rijkswaterstaat dat er minder technische geschoold personeel werkzaam is?**

Zoals eerder gezegd, door de huidige ontwikkelingen richting de geïntegreerde contractvorm is het belangrijk om daar ook personeel bij te hebben dat meer gericht is op het proces dan techniek. Maar Jacqueline denkt dat daar nog wel een goede mix van over is.

### **Hoe is de omgang met de stakeholder in het voortraject?**

Stakeholders zijn zoals eerder gezegd niet bekend met de geïntegreerde contractvorm en daarom probeert Rijkswaterstaat ze zo goed mogelijk in te lichten over de risico's en verantwoordelijkheden zij hebben. Daarbij kan het soms voorkomen dat de stakeholder er uiteindelijk nog steeds niet van begrijpt en dat dit een negatief effect heeft op de rest van het bouwproject. Dan kan het zo zijn dat hij door middel van vergunningen het proces probeert te vertragen wat uiteindelijk nadelig is voor de opdrachtnemer, omdat hij dan achter raakt op planning.

Alle eisen worden voor de aanbesteding opgehaald door Rijkswaterstaat en zoals eerder al besproken in functionele eisen gegoten, waarbij er wel een minimale eis is. Voor stakeholders is het soms lastig eisen functioneel te specificeren, omdat zij al een bepaald idee hebben hoe het eindproduct eruit moet zien.

### **Hoe zou dit verbeterd kunnen worden?**

Bij sommige partijen is al te zien dat ze een projectmanager van buiten aantrekken om het deelproject van hen te begeleiden. Voornamelijk Gemeenten zijn hier mee bezig, omdat zij zoveel mogelijk bekend willen raken met de methodiek en alles wat erbij komt kijken. Het aantrekken van een professional voor het begeleiden van dit traject zorgt er uiteindelijk voor

### **Is er wellicht een eerdere samenwerking mogelijk tussen stakeholder en opdrachtnemer?**

Er heerst nogal wat onduidelijkheid over wanneer de opdrachtnemer en stakeholder voor het eerst contact mogen hebben. Door tijdens de aanbestedingsfase contact te hebben tussen deze twee partijen zou het concurrentiebeding in gevaar komen. Maar tijdens verschillende projecten is er al wel overleg geweest tussen de aannemer(s) en stakeholder(s), dit kan plenair gebeuren maar ook één op één. Voor beide partijen is er dan meteen meer duidelijkheid dan dat er op papier is. Persoonlijk vind ik dit dan ook een zeer goede zaak. Eerdere betrokkenheid is bij dit soort project essentieel en het wordt voor met name de aannemer makkelijker om een goed ontwerp en bijbehorende prijs te maken, die realistisch is.

### **Wat zullen de grote veranderingen zijn in die nieuwe marktvisie van Rijkswaterstaat?**

Wat er precies in de nieuwe marktvisie komt dat weten we nog niet, maar persoonlijk denk ik dat er gekeken wordt naar hoe projecten in de afgelopen tien jaar zijn verlopen. De grootste succesfactoren en valkuilen zullen worden toegelicht en worden geïmplementeerd in nieuwe procedures en regelgeving voor de geïntegreerde contractvormen. Er zijn nog veel aspecten die verbeterd zouden kunnen worden onder andere de betrokkenheid van de opdrachtgever bij dit soort projecten, deze zou een actievere rol in kunnen nemen tijdens het proces. Zodat het gehele proces wat soepeler verloopt.

## 8.1 Appendix B - Output of Nlogit 5

### 8.1.1 General model

Discrete choice (multinomial logit) model Dependent variable: Choice  
 Log likelihood function -877.57130  
 Estimation based on N = 1339, K = 12  
 Inf.Cr.AIC = 1779.1 AIC/N = 1.329  
 Model estimated: Jul 23, 2015, 14:16:17  
 R2=1-LogL/LogL\* Log-L fncn R-sqrd R2Adj  
 Constants only -924.7512 .0510 .0424  
 Response data are given as ind. choices  
 Number of obs.= 1341, skipped 0 obs

Choice	Coefficient	Standard Error	z	Prob.  z >Z*	95% Confidence Interval	
TF1	.27641***	.06456	4.28	.0000	.14987	.40295
TF2	-.20746***	.06108	-3.40	.0007	-.32717	-.08774
FB1	.21424***	.05842	3.67	.0002	.09973	.32875
FB2	.08676	.05941	1.46	.1442	-.02968	.20320
RA1	.07170	.05663	1.27	.2055	-.03930	.18269
RA2	-.16229***	.05904	-2.75	.0060	-.27799	-.04658
RT1	-.02130	.05207	-.41	.6826	-.12335	.08076
RT2	.13140**	.06171	2.13	.0332	.01045	.25235
VR1	.17429***	.06507	2.68	.0074	.04676	.30183
VR2	-.10859*	.05986	-1.81	.0697	-.22591	.00874
TS1	.18432***	.05617	3.28	.0010	.07424	.29440
TS2	.02629	.05613	.47	.6396	-.08373	.13630

Note: \*\*\*, \*\*, \* ==> Significance at 1%, 5%, 10% level.

### 8.1.2 Public sector model

Discrete choice (multinomial logit) model Dependent variable: Choice  
 Log likelihood function -348.87521  
 Estimation based on N = 531, K = 12  
 Inf.Cr.AIC = 721.8 AIC/N = 1.359  
 Model estimated: Jul 23, 2015, 14:41:05  
 R2=1-LogL/LogL\* Log-L fncn R-sqrd R2Adj  
 Constants only -364.7766 .0436 .0215  
 Response data are given as ind. choices  
 Number of obs.= 531, skipped 0 obs

Choice	Coefficient	Standard Error	z	Prob.  z >Z*	95% Confidence Interval	
TF1	.20012**	.09948	2.01	.0443	.00514	.39511
TF2	-.19303*	.09870	-1.96	.0505	-.38647	.00041
FB1	.21423**	.09316	2.30	.0215	.03164	.39683
FB2	.16607*	.09449	1.76	.0788	-.01912	.35126
RA1	.04881	.08958	.54	.5858	-.12676	.22438
RA2	-.04718	.09270	-.51	.6108	-.22888	.13451
RT1	.07595	.08393	.90	.3655	-.08855	.24046
RT2	-.00756	.09794	-.08	.9385	-.19951	.18439
VR1	.03840	.10306	.37	.7094	-.16359	.24039
VR2	-.08953	.09276	-.97	.3344	-.27134	.09227
TS1	.19901**	.08994	2.21	.0269	.02272	.37529

TS2| .18790\*\* .08832 2.13 .0334 .01479 .36100

### 8.1.3 Private sector model

Discrete choice (multinomial logit) model      Dependent variable: Choice  
 Log likelihood function                      -326.17034  
 Estimation based on N =                      520, K = 12  
 Inf.Cr.AIC =                                  676.3 AIC/N =                      1.301  
 Model estimated: Jul 23, 2015, 15:11:39  
 R2=1-LogL/LogL\* Log-L fncn R-sqrd R2Adj  
 Constants only                                -359.8825 .0937 .0723  
 Response data are given as ind. choices  
 Number of obs.=                              522, skipped                      0 obs

Choice	Coefficient	Standard Error	z	Prob.  z >Z*	95% Confidence Interval	
TF1	.40169***	.11165	3.60	.0003	.18286	.62053
TF2	-.34175***	.09988	-3.42	.0006	-.53752	-.14598
FB1	.22732**	.09776	2.33	.0201	.03571	.41894
FB2	.03838	.09991	.38	.7009	-.15744	.23420
RA1	.06837	.09315	.73	.4630	-.11420	.25094
RA2	-.26083***	.09951	-2.62	.0088	-.45586	-.06580
RT1	-.03400	.08424	-.40	.6865	-.19910	.13110
RT2	.28795***	.10270	2.80	.0050	.08667	.48923
VR1	.30928***	.10937	2.83	.0047	.09491	.52365
VR2	-.13195	.10126	-1.30	.1925	-.33041	.06650
TS1	.23436**	.09258	2.53	.0114	.05290	.41581
TS2	-.05222	.09284	-.56	.5738	-.23419	.12974



## 8.2 Appendix C – Questionnaire



### Berg Enquête Systeem

#### Geachte heer/mevrouw,

Graag nodig ik u uit om deel te nemen aan deze vragenlijst. De vragenlijst maakt deel uit van mijn afstudeeronderzoek aan de Technische Universiteit Eindhoven.

Het invullen van de vragenlijst duurt ongeveer 10 minuten en bestaat uit 2 delen met gesloten vragen.

Het gebruik van geïntegreerde contractvormen in de civiele sector verloopt in sommige projecten stroef en veel van die problemen zijn te herleiden naar de initiatieffase van een project. In de initiatieffase worden de eisen van belanghebbenden opgehaald en gedocumenteerd door de opdrachtgever. Deze eisen worden door de opdrachtgever functioneel gespecificeerd, dat wil zeggen dat de belanghebbende aangeeft "welke functies" hij/zij primair gerealiseerd wilt zien en niet "welke oplossing". Die specificatie van eisen wordt dan door de opdrachtnemer geanalyseerd en moet worden geverifieerd samen met de belanghebbende. Dit gehele proces wordt gekenmerkt door verschillende problemen. De meest voorkomende problemen zijn door middel van verschillende kenmerken opgenomen in dit onderzoek.

Uw antwoorden worden vertrouwelijk en anoniem verwerkt. Voor vragen of opmerkingen kunt u contact met mij opnemen via [glenn.vansteeg@aiber.nl](mailto:glenn.vansteeg@aiber.nl)

Door deelname helpt u mij met mijn afstudeerscriptie. Daarvoor wil ik u hartelijk danken,

Glenn van Steeg

Volgende



### Berg Enquête Systeem

Kies de kenmerken die bij u van toepassing zijn.

#### In welke sector bent u werkzaam?

- Publieke sector
- Private Sector
- Semi publiek-private sector

#### Hoe lang bent u al werkzaam in deze sector?

- < 10 jaar
- 10-14 jaar
- 15-20 jaar
- > 20 jaar

**Bij welk soort organisatie bent u werkzaam?**

- Gemeente
- Provincie
- Nationale Overheid
- Bouwbedrijf
- Projectontwikkeling
- Not-for-profitorganisatie
- (Bouw) Managementbureau
- (Bouw) Adviesbureau
- Nutsbedrijf
- Transportsector
- Anders

**Met wat voor type geïntegreerde contractvorm heeft u te maken gehad?**

- Design and Construct (D&C)
- Design, build, finance and maintain (DBFM)
- Design, build and maintain (DBM)
- Geen

**Bent u betrokken geweest bij een project waar de eisen functioneel gespecificeerd zijn?**

- Ja
- Nee

**Bent u als belanghebbende betrokken geweest bij het MaVa A15 project?**

- Ja
- Nee



**Berg Enquête Systeem**



**Scenario**

Het volgende gedeelte bestaat uit 9 vergelijkingen van verschillende alternatieven met betrekking tot het proces van functioneel specificeren. Hierbij wordt verwacht dat u het **alternatief selecteert** dat het meest voldoet aan uw wensen.

Binnen deze verschillende alternatieven is er een tweetal *constante aspecten* waarmee u in uw achterhoofd rekening moet houden tijdens het maken van uw keuze. Deze aspecten zijn als volgt:

- 1) U moet de vragen invullen vanuit het perspectief geldende binnen uw sector
- 2) Er wordt u gevraagd hoe u het proces graag zou zien gegeven uw ervaring met het vorige project waar u aan gewerkt heeft;

## Berg Enquête System

### Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende alternatieven met betrekken tot het proces van functioneel specificeren. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Elk alternatief bestaat uit 6 kenmerken die per keuzeset veranderen, er wordt u gevraagd een alternatief te kiezen waar de gezamenlijke kenmerken u het meest aanspreken.

Hieronder ziet u een voorbeeldvraag

Welk alternatief heeft uw voorkeur?

Kenmerken	Alternatief 1	Alternatief 2
Eerste ontmoeting bespreken eisenspecificatie	<i>Tijdens tender</i>	<i>Na gunning tender</i>
Flexibiliteit van de eisenspecificatie	<i>Staat vast voor schetsontwerp</i>	<i>Staat niet vast</i>
Afdeling verantwoordelijk voor analyseren eisenspecificatie	<i>Ontwerpafdeling</i>	<i>Omgevingsmanagement afdeling</i>
Mate van functionaliteit	<i>Specificatie op basis functionaliteit</i>	<i>Specificatie op basis bestek</i>
Eisen moeten geverifieerd worden door	<i>Opdrachtgever, opdrachtnemer en belanghebbende</i>	<i>Opdrachtnemer en belanghebbende</i>
Training voor geïntegreerde contractvorm d.m.v.	<i>Workshop</i>	<i>Geen training</i>
<b>Uw keuze:</b>	O	X

Uitleg van de mogelijkheden:

*Eerste ontmoeting bespreken eisenspecificatie:* Tijdens welke fase moet het eerste contact gelegd worden tussen opdrachtnemer en belannhebbende aangaande eisenspecificatie

- \* **Tijdens tender**
- \* **Na gunning tender**
- \* **Tijdens de ontwerpfase**

*Flexibiliteit van de eisenspecificatie:* Moet de eisenspecificatie flexibel zijn of vaststaan na een bepaalde periode

- \* **Staat vast voor realisatie**
- \* **Staat vast voor ontwerp**
- \* **Staat niet vast**

*Afdeling verantwoordelijk voor analyseren eisenspecificatie:* Welke afdeling dient verantwoordelijk te zijn voor de analyse?

- \* **Ontwerpafdeling**
- \* **Omgevingsmanagement afdeling**
- \* **Systems engineering afdeling**

*Mate van functionaliteit:* Op welke basis moeten de specificaties worden vastgesteld.

- \* **Specificatie op basis functionaliteit**
- \* **Specificatie op basis bestek**
- \* **Specificatie basis prestatie-eisen**

*Eisenspecificatie moet gevalideerd worden door:* Overeenstemming over de eisen moet bereikt worden door de volgende partijen

- \* **Opdrachtgever, opdrachtnemer en belanghebbende**
- \* **Opdrachtnemer en belanghebbende**
- \* **Opdrachtgever en belanghebbende**

*Training voor geïntegreerde contractvorm d.m.v.:* Moet de belanghebbende worden onderwezen in de kunst van het specificeren? En hoe?

- \* **Workshop**
- \* **Verstrekken leidraad**
- \* **Geen training**

Er volgen nu 9 keuzesets.

Vorige

Volgende

## Berg Enquête System

### Selectie van alternatieven

Dit gedeelte bestaat uit 9 vergelijkingen van verschillende alternatieven met betrekking tot het proces van functioneel specificeren. Hierbij wordt verwacht dat u het alternatief selecteert dat het meest voldoet aan uw wensen. Elk alternatief bestaat uit 6 kenmerken die per keuzeset veranderen, er wordt u gevraagd een alternatief te kiezen waar de gezamenlijke kenmerken u het meest aanspreken.

Hieronder ziet u uw keuzemogelijkheden.

### Welk alternatief geniet uw voorkeur?

Kenmerken	Alternatief 1	Alternatief 2
Eerste contact tussen aannemer en stakeholder	<i>Na gunning tender</i>	<i>Tijdens de ontwerpfase</i>
Flexibiliteit van de eisenspecificatie	<i>Staat vast voor ontwerp</i>	<i>Staat niet vast</i>
Verantwoordelijk voor het analyseren van de eisenspecificatie	<i>Ontwerpafdeling</i>	<i>Systems engineering afdeling</i>
Mate van functionaliteit	<i>Specificatie op basis van bestek</i>	<i>Specificatie op basis van functionaliteit</i>
Overeenstemming op de eisenspecificatie moet verkregen worden door	<i>Opdrachtgever opdrachtnemer en belanghebbende</i>	<i>Opdrachtgever opdrachtnemer en belanghebbende</i>
Training stakeholder	<i>Verstrekken leidraad</i>	<i>Verstrekken leidraad</i>
<b>UW KEUZE:</b>	<input type="radio"/>	<input type="radio"/>

Vorige

**Volgende**

## Berg Enquête System

Dit is het einde van de vragenlijst.

Hartelijk dank voor uw deelname!

Met vriendelijke groet,

Glenn van Steeg