Combining Early Contractor Involvement and Availability-Based Contracting in Complex Infrastructure Projects

Anne Beekers
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Graduation Thesis
Preface

This report entails a study on combining Early Contractor Involvement and Availability-Based Contracting in complex infrastructure projects. It is the result of my graduation internship at AT Osborne and it serves as the final document for the master Construction Management and Engineering as well. Thereby, my days as a student have come to an end. I have enjoyed the CME master, which fitted well to my broad interest in legal, financial and managerial issues and infrastructure projects.

Therefore, I consider the possibility to graduate at AT Osborne on procurement and contracting as a great experience. Not only did it offer an interesting way to learn more about these subjects, it also turned out to be the best graduation environment I could wish for. I received many freedom, opportunities and support, got a unique inside look into many large projects and above all, I had a fantastic time. Many thanks go out to the colleagues who have assisted and guided me through this period. In particular Pelle de Wit and Paul Brinkman, my enthusiastic company supervisors, for our many meetings and the nice days in Amsterdam. Your critical views and pragmatic ideas forced me to overcome lacking nuances and ensured that my research stayed in line with practice. Special thanks I owe to Rudolf Rijkens: Although you were not an official supervisor for my thesis, your contribution has been of indispensable value for my research.

In addition to this, I would like to thank my supervisors from the TU Delft, Fred Hobma, Martijn Leijten and Alexander Verbraeck for their assistance. You were deliberately chosen for your knowledge and personality and it definitely did not prove me wrong. I learned a lot from your scientific ideas and the constructive feedback proved to be very usable. Also I am grateful for the contribution of the interviewees and workshop participants. Your input was essential for the execution of my research and I enjoyed the sessions a lot. You have provided insights and interesting stories that enlarged my enthusiasm about this field even more.

I would like to conclude with a more personal note by thanking my dear family and friends for the support and all the nice moments in the past years. Especially my parents and Jaap for the unconditional trust, you gave me the confidence to graduate. And last but definitely not least: Bas, thank you for everything!

Anne Beekers, September 2012
Summary

This report contains a graduation research about the combination of Early Contractor Involvement (ECI) and Availability-Based Contracting (ABC) in complex infrastructure projects. It is conducted at consultancy and management firm AT Osborne and constitutes the completion of the Construction Management & Engineering Master at Delft University of Technology.

The occasion of this investigation is found in the fact that currently no combination of ECI and ABC is found in Dutch road projects, which might imply a missed opportunity for the public client to add value. As a result, a struggle can be noticed about its applicability within the public client, because on the one hand they do not dare to apply these approaches simultaneously due to expected difficulties, but on the other hand policy resulting from the investigations of both the Ruding and Elverding committee steers them to do combine ECI and ABC. Therefore, this research is executed in order to detect whether and how additional value can be created with the combination to provide direction for the public client. The research delineation is based on this occasion, with procurement before Draft Route Decision (Interweaving Models 1 & 2) as delineation of ECI and DBFM contracts as chosen interpretation of ABC. The field of application is national road projects with Rijkswaterstaat as public client. The theory of uncertainties is used as scientific framework to structure the investigation.

Following from the topicality of the subject and the rather new nature of both developments, literature about this combination is lacking and no information can be gained from combined cases in the Netherlands. Therefore, the research strategy implies a practical, qualitative and specific methodology. This entails the collection of scientific information from several fields of research and the gaining of practical information from both interviews and cases. After an extensive analysing phase the findings are used as input for a new model design. Due to the lacking existence of experiences with this combination, the model cannot be tested in a real-life situation, thus the findings and the model are validated in a workshop with a group of experts, to ensure valid conclusions and recommendations.

The main research question that is answered by performing this research is:

**How can ECI and ABC be combined in complex infrastructure projects in order to create added value for the public client?**

First an analysis on the separate approaches of ECI and ABC is executed. Several complementing aspects are identified, namely the controllability as a result of the private ability to manage projects properly, which leads to an acceleration of procedures in ECI projects and execution within time and budget from the ABC approach. Optimisation is realised as well from the private creativity in ECI projects and the integration of activities in ABC. Also the long-term relationship as a result of the involvement of the market in an early stage and the awarding of one single contract for design, build and maintenance activities is considered to be a complementing aspect. Conflicting aspects are found in the contrast between fencing-off the contract in the ABC approach vs. the broad solution space in ECI projects and in the requirement of committed funding at the final bid in ABC vs. Early involvement before Draft Route Decision when no financial party is willing to provide funding due to the high amount of uncertainties in this phase.

Uncertainties have a considerable role in the combination of ECI and ABC because both approaches require uncertainty management: On the one hand risks that threaten the project need to be handled properly, on the other hand opportunities need to be exploited in order to create added value.
The best way to deal with uncertainties requires identification in an early stage. Conflicting aspects need to be prevented and complementing aspects have to be used in order to mitigate risks that threat the project result and to realise added value from the opportunities.

In deciding whether the combination of ECI and ABC can create added value in projects, the possibilities and difficulties need to be clear in advance as they determine the additional value that can be achieved with it. Preconditions need to be identified as well because they have to be met in projects that are suitable for the combination.

The opportunities in the combination of ECI and ABC in projects are found in the following aspects:

- **Innovation**  
  As a result of the creativity of the market that is used as input early in the process (ECI).

- **Acceleration of procedures**  
  Following from the interweaving of the public planning and private tendering procedure (ECI).

- **Lifecycle optimisation**  
  The addition of maintenance in the contract ensures a focus on long-term 'value for money', which implies better project results for a certain budget (ABC).

- **High availability**  
  As result of the payment mechanism that is based on the availability of the road (ABC).

- **Realisation within time and budget**  
  Following from commercial interests projects are strictly managed (ABC).

The identified risks in the combination are grouped in the next issues:

- **Institutional difficulties**  
  Projects need support from involved public parties to ensure execution.

- **Legal difficulties**  
  Tendering principles need to be guaranteed by the government in processes and contracts.

- **Financial difficulties**  
  Committed private funding requires clear risk analyses and thereby a limited amount of uncertainty.

Strategic preconditions that have to be met in order to find a window of opportunity for the combination are:

- **Institutional consensus**  
  Public entities admit the problem and recognise the necessity for the project.

- **Complex project**  
  The market is needed to solve a certain complexity as the public client is not able or willing to do so.

- **Capable client**  
  The government is able to guarantee tendering principles circumstances and criteria.

- **Capable market**  
  Private parties have the required knowledge and experience to deliver input.

There is an opportunity for combining ECI and ABC when these four preconditions are met. This is shown in an abstract model: The C4 Model with Compulsory Conditions for the combination. The model consists of two axes: The horizontal axis represents conditions based on supply and demand, the vertical axis shows the options with a certain role for the client.
Perceptions of involved actors are identified as well because it predicts the desirability of a combined application of ECI and ABC. Findings about this topic show a relation with the professional role of parties and ideas about the combination can be coupled to their perceptions about the separate approaches. A striking finding here is the fact that experts expect difficulties in their own knowledge field and see opportunities for application in others, that are subsequently invalidated by others. This is considered as a signal that ABC and ECI cannot easily be combined because tricks need to be applied in order to realise a successful combination. The added value of the combination is therefore perceived to be questionable as there might be other possibilities to achieve the assumed advantages.

Although the realisation of added value with the combination of ABC and ECI is not broadly recognised as a result of the many difficulties that have to be faced and the advantages of the separate approaches that are questioned, a model is designed to provide solution directions that enable a combination of the two approaches. Four directions are identified:

- **Maximizing Planning Solution Space**
  Broadening solution space in such a way that creative ideas from consortia will fit the Draft Route Decision in order to pass procedures quickly and to ensure financial close within the validity of the bid.

- **Postponed Funding**
  Postponing of funding activities with potentially varying partners to a moment that parties are willing to participate in projects, as the party that is best able to execute the funding is responsible for it. This can f.i. be realised with a dept funding competition or the splitting of short- and long-term funding.
• **Stepwise Procurement: Partnership >> Price**
  Selection on partnership and pricing in competition as this fits the abstractness of the early phases better and detailing happens in a one-to-one situation.

• **Provisions for Risk Settlements**
  Contract close is executed with regulations to compensate parties in case of alterations. This option parries the assumed difficulties, f.i. by roll-over commitments or margins/assumptions.

These directions are composed in an abstract model as a plan of approach for projects that are considered to be suitable for the combination: The ‘P4 Model for Project Planning’. This model consists of two axes: The horizontal axis represents solutions with a phasing element in it, the vertical axis shows the amount of freedom in the contract. The model does not claim to be complete, because this field is still developing, so the model is consciously exposed in an open, outwarding structure as shown in the figure and can be extended when new findings are gained in the future.
Recommendations for future projects have been developed as well:

- **Application of the combination**
  Is only recommended when preconditions are met in interweaving model 2 in projects that show an assumed added value that is considerably higher than the extra costs from the private funding and the one-to-one negotiations. The P4 model for Project Planning should be used to provide direction for application.

- **Selection of a direction for the combination**
  The P4 models' directions seem to be equally applicable in general, so in projects a group of experts must take project specific elements in consideration in the decision;

- **Role of the government**
  The governments' role as a facilitator must be acted professionally by ensurance of the tendering principle of transparency, objectivity and competition already from the start as the combination is complex.

- **Perceptions of involved actors**
  These have to be kept in mind as it increases the probability of proper identification of risks and opportunities and thereby the realisation of added value.

When these recommendations are kept in mind in the future the likelihood of a successful application of the combination of ABC and ECI increases, which might result in the realisation of added value in new projects.
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1 Introduction

1.1 Context

Observing large infrastructure developments from the last years in the Netherlands, it can be stated that stakeholders and private contractors are playing an increasingly important role in public projects. Developments like integrated contracts for project execution and the early involvement of market parties in projects are widely applied, because they are considered to be beneficial for all parties and the project result (Ministerie van Infrastructuur en Milieu, 2012). Although the public client seems enthusiastic about these developments, there might be an opportunity to create additional value in projects.

1.1.1 Practical Occasion

Currently Rijkswaterstaat, the executive arm of the Ministry of Infrastructure and Environment for the road network (Rijkswaterstaat, 2012), struggles with the combination of Availability-Based Contracting (ABC) by means of DBFM (Design-Build-Finance-Maintain) contracting and Early Contractor Involvement (ECI). It is unclear whether these two forms can be applied simultaneously, so integrated ECI with ABC projects have not been realised yet in the Netherlands. This could imply that possible additional value for the client is not realised. Therefore, Rijkswaterstaat as a public client has commissioned AT Osborne in 2010/2011 to investigate ECI and develop practical solutions to implement it within both the Ministry of Infrastructure and Environment and Rijkswaterstaat, resulting in the report ‘MIRT & Markt’ (Rijkens, 2012).

AT Osborne consultants have been employed in an innovative pilot project since 2011 as well to apply these new insights to a real life case. This case is the ‘A1/A28 Hoevelaken’ project. For many years already, this traffic point is placed in the top 25 of Dutch traffic jam statistics, which shows the blocking effect of this point on the traffic flow in the broader area of Utrecht and the Randstad. A plan is developed to extensively change this situation: The A28 and A1 road will be enlarged and the junction will be improved to realise a better traffic flow (Rijkswaterstaat, 2012). In order to execute this project with optimal results, ECI was chosen as a suitable approach. In this project, with an estimated project value of about 680 million euro (including VAT), the market and the stakeholders will be involved in an innovative way. Originally it was intended to combine ECI and ABC, but resulting from the risk that in the short available time no practical and acceptable solution for the combination could be developed, it was decided that for this project the combination was too premature. Instead, ECI with a combination of plan development and D&C in one contract will be applied in this project. Because continuation of the uncertainty whether ECI and ABC can be combined in a practical way is a highly undesirable situation, a research about possible ways of combining these approaches in a practical manner is highly relevant and topical.

1.1.2 Scientific Occasion

In addition to this empirical occasion, the focus on innovative approaches in complex projects can also be found in official documentation. Since many construction projects are facing poor performance results on different aspects such as economy, environment and public support (Flyvbjerg, Bruzelius, & Rothengatter, 2003), the Ministry of Infrastructure and Environment has recently devised new binding policies about involving private parties to accomplish an improved duration, cost and quality control in the implementation of infrastructure projects. The policy is the result of two studies, both conducted by expert panels commissioned by the government, about efficiency and effectiveness in the development and realisation of construction projects.
'On the right track' from the 'Ruding Committee' is the first advice, which concerns a study on private financing in infrastructure projects. It states that more private funding should be used for infrastructure projects. This advice has resulted in the 'Market, unless..' policy, which implies that private funding should be used, unless there is a good reason to deviate from this idea (Commissie Private Financiering van Infrastructuur, 2008). Several contract forms can be used for this type of partnering. In the Netherlands most national infrastructure projects are nowadays executed by means of a DBFM (Design-Build-Finance-Maintain) contract.

The other policy is set by the 'Elverding Committee', in their advice about the acceleration of decision-making in infrastructure projects. This report states that the market should be involved in all stages of the project, in order to benefit from their expertise and creativity in public projects (Rijkswaterstaat, 2011). It mainly advocates the early involvement of stakeholders and contractors in the project because it will ensure a smoother progress and a better product (Commissie Versnelling Besluitvorming Infrastructurele Projecten, 2008). This recommendation resulted in the 'Faster & Better' policy.

As implementing organisation, Rijkswaterstaat follows these policies given by the Ministry of Infrastructure and Environment. The endeavour to execute these policies can be found in their Rijkswaterstaat business plan (Rijkswaterstaat, 2011), so this public party aims to involve private parties in an early stage in complex road project, often by engaging a cooperation. As stated before, fulfilment of these policies by means of Availability-Based Contracting combined with Early Contractor Involvement has not been executed yet, which shows a gap in the applicability of the policies and therefore the scientific relevance of this research.
1.2 Structure

This report concerns my graduation research about combining Availability-Based Contracting and Early Contractor Involvement in complex infrastructure projects. The structure of this document is schematised in Figure 1.1. First the research design will be discussed, where a distinction is made between research content and research methodology. Successively the problem statement, research objectives and research questions are described here, then the research methodology is discussed and motivated as a framework for the further report.

Chapter 3 concerns a literature study on uncertainties as the scientific framework of the thesis, a distinction between risks and added value is made here, because it frames the research in a later stage. Next the report will elaborate on the most important topics of this research: Chapter 4 discusses Availability-Based Contracting (ABC), it entails theory and experiences from practice about Public-Private Partnerships, ABC and DBFM contracting, related to risks and opportunities in complex infrastructure projects. In Chapter 5 theory and practical experiences about Early Contractor Involvement (ECI), procurement & tendering and interweaving are investigated, analysed and linked to risks and opportunities to add value.

Chapter 6 combines the two topics. The input from the previous chapters and additional information from literature, cases and personal insights from experts are used in order to identify the difficulties and opportunities in the combination of ECI and ABC. Afterwards, Chapter 7 concerns the designing part of my research. By using the gained information, a model is developed as a framework of directions for future projects to create value with the combination of ECI and ABC. The usefulness of the model is validated in an interactive workshop with experts, to ensure the provision of a practical tool for future projects.

Finally, conclusions and recommendations are drawn and the graduation project and process are evaluated. Statements are made about the content and the quality of the research as a validation and reflection on the total research.
2 Research Design

2.1 Research Content

This research consists of two main topics in the field of complex infrastructure projects, namely timing and contracting, related to the uncertainties to identify value they create. The combination of these topics is the conceptual model of my research. The interpretation of my conceptual model is the specification of my research: Combining the timing of procurement, Early Contractor Involvement (ECI), with the type of contracting, Availability-Based Contracting (ABC), in order to create additional value and thereby a higher client satisfaction. The conceptual model is shown in Figure 2.1.

2.1.1 Problem Statement

There are two policies from the Dutch government, 'Market, Unless..' based on the Ruding Committees' advice and 'Faster & Better', resulting from the advice given by Committee Elverding, which indirectly imply the use of both ECI and ABC. Since both advices were given in 2008, the first projects are currently executed in line with those policies, so the first experiences can now be evaluated. At first glance, these policy documents seem to complement each other, but practice raises the question whether these two views can be combined. Strangely enough, no simultaneously applied ECI and ABC construction projects can be found yet, which can probably be explained by the difference in the usual timing and because public parties fear difficulties in the risk allocation and private financing, but no serious investigation on this topic has been performed yet. This is recognised as being a problem and thereby a chance for the Dutch government by its executive Rijkswaterstaat, because projects might be developed and realised in a more optimal manner than currently happens (Rijkens, 2012). Added value can be created both with the separate approaches of ECI as ABC, but the lacking combination could mean a lacking added value of both approaches. The hypothesis is that the application of ECI with ABC could lead to a better project result and a higher client satisfaction. It is a practical issue, for which no scientific solution can be found either. Therefore, the problem statement is twofold and described in Box 2.1.
2.1.2 Research Objective

The problem that will be investigated in this research is the lacking application of ECI with ABC in complex construction projects. The research investigates whether these two approaches should be applied simultaneously and if combining their advantages creates a significant additional value for the client. The goal in this research, as shown in Box 2.2, is to identify the tensions, opportunities and thereby possible added value in ECI and ABC, to finally develop recommendations for combining ECI with ABC for future projects.

**Research Objective:**
Identify whether and how added value can be created by combining ECI with ABC in infrastructure projects, in order to contribute to the practical and scientific knowledge in this field of research.

Box 2.2 - Research Objective

2.1.3 Research Questions

The research objective as described in Box 2.2 has been transformed into a workable main research question that is shown in Box 2.3. The conceptual model, consisting of ECI, ABC and added value and the field that is subject to the research, complex infrastructure projects, as well as the problem owner, the public client, are combined in a tangible research question.

**Research Question:**
How can ECI and ABC be combined in complex infrastructure projects in order to create added value for the public client?

Box 2.3 – Main Research Question

This research question contains the whole graduation research, therefore several relevant sub questions have been set up in order to structure the research. The research activities that will be performed are coupled to those questions; Literature studies on specific topics and interviews will be executed in order to answer the sub questions. They can be found in Box 2.4.

**Sub Questions:**
- On which aspects are ECI and ABC complementing or conflicting?
- What is the role of uncertainties in combined ECI and ABC projects and what is the best way to deal with them?
- What are the possibilities, difficulties and preconditions in combining ECI and ABC?
- What is the perception of public and private parties about combining ECI and ABC?
- Which added value can be created by combining ECI and ABC?

Box 2.4 - Sub Research Questions

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**Practical Problem Statement:**
Currently ECI is not executed in combination with ABC in the Netherlands, which is unsatisfying for the public client, because it might be a missed opportunity as the possible added value of this integration has not been accomplished.

**Scientific Problem Statement:**
A clear scientific framework or theory about the execution of ECI with ABC does not exist, which is a knowledge gap in this field of research.
2.1.4 Delineation of the Research

In performing research delineation of the topic is of major importance, since it is a critical success factor in the feasibility of the process. Output can only be considered reliable when sufficient suitable activities are undertaken and validated (Verschuren & Doorewaard, 2007). In the previous sections several relevant topics concerning the graduation research have been discussed. In order to execute a proper investigation, definitions must be clarified at the start-up to avoid possible ambiguities and misinterpretations. Therefore, a delineation has been executed in this paragraph by describing the most important terms in Table 2.1.

<table>
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<th>Definition</th>
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<tr>
<td>Infrastructure Projects</td>
<td>National road projects with a project value of more than 60 million euro.</td>
</tr>
<tr>
<td>ECI</td>
<td>Early Contractor Involvement, in this research the focus is put on the models where procurement takes place before the Draft Route Decision.</td>
</tr>
<tr>
<td>ABC</td>
<td>Availability-Based Contracting, this research focusses on DBFM contracts.</td>
</tr>
<tr>
<td>Value</td>
<td>Value of the outcome of the project for the public client, resulting from the way risks and opportunities are handled.</td>
</tr>
<tr>
<td>Added value</td>
<td>Additional value from the combination of two approaches compared to the value of these approaches if they are applied separately.</td>
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Table 2.1 - Delineation of Terms

A short additional motivation of this delineation and its implications for the research are given below:

- Infrastructure projects: Only road projects are investigated to keep the research executable in time, this implies that the public client is Rijkswaterstaat, which currently struggles with the ECI/ABC combination. ProRail is missing in this research, but results are probably also of use for them. The 60 million amount is chosen because the Ministry uses this standard to distinguish large and smaller projects. The combination will not be applied in smaller projects because of the high transaction costs;
- ECI is focussed on the Interweaving Model 1 & 2 where tendering and awarding takes place before the Draft Route Decision. This decision is demand-based and will be explained in Chapter 5. Nothing is missed here since the other models have been investigated extensively all ready;
- ABC is delineated into DBFM (Design-Build-Finance-Maintain) contracts due to the fact that this contract form is most applied in the Netherlands. Therefore, the assumption that many projects will be executed with a DBFM contract in the future is realistic, it will be discussed in Chapter 4;
- Value is defined as value for the client, an explanation of this specific value resulting from uncertainties will be given in Chapter 3;
- Added value is based on the value definition in Chapter 3 and the interpretation in Chapter 6.

The delineation as mentioned in Table 2.1, is shown visually in the extended conceptual model. The transformation from conceptual model to detailed objective is schematised in Figure 2.2.
2.1.5 Relevance for AT Osborne

AT Osborne is an independent multidisciplinary firm that solves spatial issues. It provides managerial and consultancy activities in the fields of Real Estate, Infrastructure, Spatial Development and Environment, Legal & Contracting and Interim activities. This research is executed for the Infrastructure department, which focuses on all kinds of consulting and process- and project management activities, for instance during the whole lifecycle of complex road projects. Activities are mostly commissioned by public clients. Since applying ECI and ABC simultaneously is a new development in the construction market, the executive arm of the government, Rijkswaterstaat is currently struggling with the implementation of this combination. Because AT Osborne aims to positively distinguish itself in knowledge and skills from its competitors, developing early knowledge about this topic is interesting from a commercial point of view for them. Relevance for AT Osborne is twofold, it can be separated in relevance for both consultancy and managerial use.

Relevance for AT Osborne Consultancy Activities
This topic is relevant and actual for Rijkswaterstaat, which is a client for AT Osborne. This research can help AT Osborne further advancing their knowledge base and consultancy activities concerning this topic.

Relevance for AT Osborne Management Activities:
The outcome of this research aims to smoothen the process and result of future projects, so it can also be beneficial for AT Osborne managers on complex projects.
2.2 Research Methodology

The research is conducted by following a research strategy. Three core decisions were made in order to choose the suitable research strategy:

- Performing a broad or specific research?
- Applying a quantitative or qualitative approach?
- Performing a practical or literature based research (Verschuren & Doorewaard, 2007)?

The topicality and the content of the subjects of this research can best be caught in a practical, qualitative, specific research. There is a gap in theory about combining ECI with ABC, so most relevant knowledge and insights were gained from experiences and projects.

Due to this practical nature of the research activities and the existence of a clear client, a client-oriented methodology that is based on a practical approach can best be applied in this investigation. The method of Business Problem Solving (BPS) is selected as a proper methodology to execute this research. This method is suitable because it keeps the clients’ interests in mind by focusing on performance, design orientation, theory-based application and validation (Van Aken, Berends, & Van der Bij, 2007), which is exactly the set-up and goal of my investigation. By using the method of BPS a research model is designed. This model has been set up around the conceptual model and realising the objective. This can be separated in different research phases, namely theory, practice, design, validation and conclusion. The phases and activities are shown in Figure 2.3, the arrows represent the couplings between the different activities.

![Figure 2.3 - Research Model in Phases](image)
The successive phases of the model are described and explained below:

2.2.1 Phase 1: Theoretical Phase

In the theoretical phase a distinction is made between the exploratory research and the literature research. The exploratory phase takes place to set up the research and write a research proposal, the literature phase entails a deeper literature research. The two types are described below:

**Exploratory Research:**
The exploratory research is performed to select a proper thesis subject and a suitable research methodology. In this phase interaction between empirical and scientific research that leads to a research objective that has relevance for both practice and science is considered to be the goal. Therefore, several books, scientific articles and practical reports and manuals about different topics were reviewed. Relevant topics for this phase were: complex projects, PPP & DBFM, ECI & Interweaving, procurement & tendering and risk theory, since these are the corner stones of my graduation research. In addition to this, several conversations with experts from AT Osborne were organised in order to determine the relevance and topicality.

**Literature Research:**
A deeper and more thorough literature analysis is performed in the literature research phase on the relevant topics as mentioned in the paragraph above. Therefore, these topics are justified in this paragraph:

- Because ABC and DBFM are key elements of my specific research, an extensive analysis is performed on **PPP, ABC & DBFM**. The characteristics, opportunities and risks are of major importance in my thesis.
- ECI Interweaving Models 1 & 2 are the other key elements in my research. Therefore, a thoroughgoing investigation is done on **ECI & Interweaving**. Especially the characteristics, opportunities and risks from Interweaving Models 1 & 2 are discussed.
- Because of the hypothesis that the Finance-component in DBFM is the main difficulty in combining ABC and ECI, literature about **Project Finance** is analysed as well in order to gain more knowledge about this topic.
- Legal regulations play a facilitating role in project development. Since the key elements in my research are taking place in this phase, a study on **Procurement & Tendering** is essential.
- Since the scientific framework is based on uncertainties and thereby several risk and opportunity theories, literature analyses on **Uncertainty, Risks & Opportunities** is an important part to gain scientific value.
- Other countries like the UK started to apply ABC and ECI much earlier then the Netherlands did, so more literature about these topics can be found here (Bult-Spieer & Dewulf, 2006). Additionally, input from area development is also relevant, because the national legislation is comparable with the legislation in infrastructure developments and involvement of actors in a very early process is applied in several projects in this field. Therefore **developments in other fields** is subject to my literature review.

After analysing the specific literature, cross linking between the subjects can provide insights and can help in the development of a new model. This activity can make my research relevant in a scientific and practical way because patterns could be identified, so it entails an essential part of my research.
2.2.2 Phase 2: Practical Phase

Experiences from practice will be gained in two ways: By studying cases and by consulting experts. Experts in the specific fields and representatives of both public and private parties on projects are interviewed and general case studies are performed in order to gain knowledge and insights about the possibility to combine ECI with ABC. Figure 2.4 shows the relevant parties that are interviewed in my research. The experts from public and private parties are interviewed about their perceptions and insights about ABC and ECI related to specific construction projects. Their input is used as illustrating examples in boxes and processed in the perception parts in the main text.

Of course, the selection of interviewees is of major importance in this kind of research. Opinions from 22 people are gained, they were selected on research related experiences and on current professional function. The interviewees can be found in Appendix B. This part is executed in Dutch because of the used language in the interviews. The interview reports are excluded from the public version of this thesis for privacy reasons.

Experiences on Cases
Cases can provide practical insights and are therefore suitable for my research. The motivation to investigate cases is found in the fact that there is an increasing number of complex projects, these projects' successes are important for the society and currently fail too often. Additionally it can be stated that the literature about ECI and ABC is sparse and that this method is needed to gain enough information (Merrow, 2011). Six cases with different scopes are investigated since no combined ECI-ABC cases can be found in the Netherlands yet: Three ABC cases, A12 LuVe, A15 MaVa and 2nd Coentunnel, an ECI case, A2 Maastricht and two combined projects abroad: M25 in UK and A11 in Belgium. This is shown in Figure 2.4.

Experts' Consultation
The selection of experts is based on another criteria, interviewees should have an overall idea gained from knowledge about more cases and literature theories. Their input provides a helicopter view about the combination of ECI and ABC, which makes the cross linking of information and the pattern finding an easier task. Public, private and independent experts are interviewed and an internal expert meeting is organised for this purpose.
2.2.3 Phase 3: Design Phase

In the design phase the outcomes from literature, the case studies and interviews with the different parties are confronted with each other. Challenges, preconditions and opportunities are identified and used as input for a new model to combine ECI with ABC in complex construction projects. The goal in this activity is to develop such a framework that experts in the field recognise it as a useful instrument that provides direction in projects where ECI and ABC might be combined in the future.

2.2.4 Phase 4: Validation Phase

The usefulness of the designed model is tested because proper research needs to be validated (Verschuren & Doorewaard, 2007). Due to the fact that no combined ECI with ABC cases have been executed yet in the Netherlands, there is no possibility to validate the research findings and the newly developed framework on an existing case. Still it is essential to perform a proper validation on the research findings and design. Therefore, an interactive workshop is set-up where the investigations and the findings are criticized by a group of experts in a way that their expertise is used in an optimal manner. The outcome of this meeting results in a valid model and validated conclusions and recommendations.

2.2.5 Phase 5: Concluding Phase

The last research phase is the final aspect in the graduation research. This part aims to fulfil the research objective and to provide an answer to the research question. This is the phase where all information is identified, analysed and transformed into a new model that is already validated. Conclusions are drawn and recommendations for the future are made for the public client here.

2.2.6 Reflection of Project and Process

After these research phases a final graduation process step is executed, namely the reflection phase. This contains an evaluation on the process and project as followed in the graduation period and a critical review of the practical and scientific relevance of the outcome.
3 Scientific Framework: Uncertainties

3.1 Introduction

A scientific framework as guidance in the research can be an important aspect of the graduation thesis since it ensures a structured content. The theory about ‘uncertainties’ is considered to be a suitable scientific framework: It consists of two major aspects, namely the negative risks that are considered to be a threat and the positive opportunities to add value, which can easily be related to the thesis subject, and enough literature can be found about these issues. Subsequently this chapter will elaborate on uncertainties, risks threatening the project, opportunities to add value and the applicability for the thesis.

3.2 Uncertainties

The concept of uncertainties is used as a starting point of the scientific framework. This is motivated by the fact that uncertainties are inherent to constantly changing construction projects. Timing and scope are often subject to these changes during the project life cycle. In the PMBOK risks are described as uncertain events, a distinction is made between risks with positive and negative effects in the following definition:

“Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objective, such as time, cost, scope, or quality (i.e., where the project time objective is to deliver in accordance with the agreed-upon schedule; where the project cost objective is to deliver within the agreed-upon cost; etc.). A risk may have one or more causes and, if it occurs, one or more impacts.” (PMBOK, 2004)

Versteegen and Rijkens do describe the specific term of ‘uncertainty’. They also state that uncertainty can have a negative or a positive effect on the project execution, which means that a distinction can be made between ‘risks’ and ‘opportunities’ to add value as shown in Figure 3.1 (Versteegen & Rijkens, 2007).

Due to the negative perception that parties in construction projects have, the project ‘risk’ from the PMBOK definition is used in this thesis as project ‘uncertainties’, where uncertainties with a negative effect are called ‘risks’ that are considered to be a threat, uncertainties with a positive effect are in my thesis ‘opportunities’ to add value, and therefore referred to as ‘added value’.

Since the terms imply the same content, literature about risks is used for the negative effects of risks and the opportunities to add value. The use of terminology with the additional components as used in this thesis is summarised in Figure 3.1. The specific applicability to the thesis subjects is described in the last paragraph of this chapter.
3.2.1 Risks threatening the Project

In addition to managing projects on quality, scope, time and costs, projects need to be managed on risks, integration and urgency (Turner, Huemann, Anbari, & Bredillet, 2010). This implies that an extensive and comprehensive risk analysis should be performed on all aspects of the complex field, because risk-taking is a core element in innovative and dynamic projects. This theory is suitable because projects have become more complex in the last decades (Giddens, 1999). Since project risk is a key element in successful project management, sharply formulating risks eases the development of a suitable risk-handling strategy. This can be executed successfully by subsequently listing the ‘cause’ of the risk, the risk ‘event’ and the ‘consequence’ of the risk on the project objectives (Verbraeck, Some guidelines for describing project risk, 2009). Even more important than the risk identification, is the way these risks are managed.

There are several strategies to mitigate the risks, this is drawn in Figure 3.2 and the specific methods are described here: Risks can be avoided or reduced by blocking the causes, in this way risks are eliminated because of a scope change or the probability and impact of the cause is treated. The other option is to block the consequences after a risk event, by transferring the risk to another party or to accept the risk and make a plan to deal with the risk in case the event occurs (Verbraeck, 2012).

Dealing with risks often brings some extras that have to be kept in mind. When mitigations are performed to reduce or transfer the risks, there is still some little risk left, because they can simply not be deleted, this is called the residual risk or the post-mitigation risk. The mitigations can also contain the blocking of the causes as a solution to deal with the risk. The specific risk is then avoided, but often new causes can be identified from those mitigations that entail other risks. Those are called secondary risks and this strategy is not acceptable when the secondary risks are too high (Verbraeck, 2012).

3.2.2 Opportunities to Add Value

Positive effects of uncertain events can be considered as opportunities to add value to the project. Developing a strategy to ensure a fulfilment of the adding value-opportunities can happen by identifying the ‘causes’, ‘events’ and ‘consequences’ (Verbraeck, Some guidelines for describing project risk, 2009). Different strategies to create additional value from opportunities are linked to the characteristics, namely the options of exploiting, sharing, enhancing and accepting the opportunities. In succession this implies taking the opportunity yourself or transfer it to others, increasing the probability or the impact of the opportunity, or accepting it in case it occurs (Verbraeck, 2012).

3.3 Applicability for the Thesis

In this thesis a research is executed to found out whether and how Early Contractor Involvement (ECI) and Availability-Based Contracting (ABC) can be combined in order to create a synergy for the public client. Using theory about uncertainties, more specific about risks and opportunities to add value, as a scientific framework is considered to be a suitable method to structure the research. The theory is useful because of the strong relationship with complex projects and the focus to add value from the combination. In my thesis this implies that a good combination of contracting and procurement can lead to more value for the client. Therefore, coupling the threats from risks and the added value from opportunities to the thesis specific components, can
be a suitable method to determine whether synergy for the client can be created with combining ECI & ABC. The content specific linkage of theory with the thesis subject can be motivated as follows:

3.3.1 Availability-Based Contracting (ABC) and Uncertainties
The use of a DBFM contract implies a private funding to execute the public infrastructure project. Therefore, the quantification of risks, and thereby the risk allocation between public and private parties, is an important part of the negotiations amongst parties. An appropriate distribution of the risks between the public and private sectors is the most beneficial for the community. In large projects, especially in an early project stage, the risk identification and quantification is a difficult issue due to the number of uncertainties and the high complexity in different fields. Too often, this leads to an underestimation of the risks and hereby a disturbed risk allocation. Public parties tend to accept too many risks to ensure that the project proceeds when negotiations are uncomfortable. This can result in lacking capabilities, resources or knowledge to manage the risks properly, which can bring the assumed value of DBFM into jeopardy (Loosemore, 2007).

3.3.2 Early Contractor Involvement (ECI) and Uncertainties
ECI implies an important role for contractors and stakeholders in the project. This makes projects more complex because economic, social, political and environmental issues become of major influence in the project development. Sociologists Ulrich Beck and Anthony Giddens argue that the society has modernised and has become a ‘risk society’ because developments and thence risks are associated with human activity. Risks can not only be found in project specific aspects but in the society as a whole. Therefore, the coupling between risk theories and complex construction projects is logical (Flyvbjerg, Bruzelius, & Rothengatter, 2003). Also, the influence of other issues, and thereby of human behaviour, has increased, so the comparison between project and society is striking.

Due to the fact that in ECI Interweaving Models 1 and 2 the tendering and awarding takes place before the Draft Route Decision, ECI implies the existence of many uncertainties because many information is unknown and assumptions can change in the early phases of project development. This is shown in Figure 3.3 that graphs the project process as a dynamic reduction of uncertainty through time.

![Figure 3.3 - Uncertainties in Projects (2011); adapted from 'Managing Construction Projects'](image-url)
4 Availability-Based Contracting (ABC)

4.1 Introduction

For many years, construction projects have been characterised by a poor image of time and budget overruns. The construction industry is forced by new national policy to change significantly the last decades in order to terminate this malicious tradition. Private participation, including co-financing, seems to be an effective method to accomplish an improved time, cost and quality control in the implementation of infrastructure projects. A major difference in this approach compared to the traditional way, is that the project goal is better kept in mind by the public client than before, because achieving results serves the public interest the best. Obtaining a long-lasting project result is therefore more important than specifying a detailed execution plan for the works. In other words, private parties receive more freedom in the execution of road works, because they simply have to ensure a high availability of the road. Also in terms of finance achieving this ultimate project goal is kept in mind as contractor payments are based on availability. Since mainly focusing on the goal can be considered as a key element of the new construction industry set-up as desired result from new policy, the associated Availability-Based Contracting (ABC) is subject to my graduation research. Because ABC implies an integrated Design-Build-Finance-Maintain (DBFM) contract in most Dutch infrastructure projects, ABC is delineated to DBFM. This chapter first explains the concept of Public-Private Partnerships (PPPs), then ABC and DBFM are extensively discussed, to subsequently end with a practical view on these topics, illustrated by examples from three cases and a comparison between literature and practical findings.

4.2 Public-Private Partnerships

Since infrastructure projects are implemented to serve the public interest, the government is as a representative and initiator the most important player in the development of new projects. The last years the ministry encourages a development of closer cooperation between the governmental and commercial parties during the whole lifecycle of construction projects. This collaboration can be summarised as a so-called ‘Public-Private Partnership’ (PPP). A PPP is a temporary organised collaboration between public and private parties, founded to realise a specific project with input of resources and risk acceptance from both parties. The idea in this cooperation is that partnering will create considerable added value to the project, which can mainly be found in financial, process-based and external aspects of the project (Bult-Spiering, Blanken, & Dewulf, 2005). The limitations of the public approach are covered by the advantages of a private approach (De Koning & Sproncken, 2001).

The United Kingdom has played a pioneer role in the development of PPP: In the early 1990’s a Private Finance Initiative (PFI) model was developed here, which entailed and encouraged a more important role for the private contractor. This quickly changed into PPP, and due to the good project results that were achieved with it, PPP became the new standard for the execution of infrastructure projects here. About ten to fifteen years ago, the Dutch government became enthusiastic about the PPP idea as well. After performing extensive research in this field, they gradually started to implement PPP in Dutch construction projects (Koppenjan, 2008). Also in the Netherlands it resulted in a positive attitude towards this development, so several complex national projects are currently in execution in a PPP. Nowadays even a trend in governmental policy can be found for increasing application of PPP, for instance in the State Budget, implying that there are a lot more PPP projects to come.
PPP is a broad definition that entails many possibilities in the risk and fund sharing ratio between public and private parties. Therefore, several interpretations can be grouped under the PPP-umbrella. The most common forms from an international perspective are shown in Figure 4.1.

<table>
<thead>
<tr>
<th>Fully Public Sector</th>
<th>Fully Private Sector</th>
</tr>
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<tbody>
<tr>
<td>Traditional Public Contracting</td>
<td>Service Contracts</td>
</tr>
<tr>
<td>Design Build Maintain</td>
<td>Design Build Maintain</td>
</tr>
<tr>
<td>Concession (DBFM/O)</td>
<td>Joint Ventures</td>
</tr>
<tr>
<td>BOT Private Party Develops Project</td>
<td>Full Divestiture</td>
</tr>
<tr>
<td>Build Operate and Invest</td>
<td>Privatisation</td>
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<tr>
<td>Public Service Provision</td>
<td>Public Service Provision</td>
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<tr>
<td>Public Provider</td>
<td>Private Provider</td>
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<tr>
<td>Government Defines Project</td>
<td>Private Party</td>
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<tr>
<td>Government Role</td>
<td>Enabler</td>
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<td>Investment Responsibility</td>
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<td>Passive Private Investment</td>
<td>Equity</td>
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<td>Passive Public Investment</td>
<td>Debts</td>
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<td>Passive Public Investment</td>
<td>Guarantees</td>
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<td>Public Investment</td>
<td>Grants</td>
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</tbody>
</table>

Figure 4.1 - Forms of PPPs; Bennett Et Al. (1999); adapted from SPM9431 Course TU Delft, Lecture 2

Figure 4.1 shows the different interpretations between fully private and fully public sector projects, based on the amount of investment responsibility and the interpretation of the role of the government. From an international point of view these PPP forms all match the PPP definition.

In the Netherlands a stricter definition of PPP is used: Here a distinction is made between the concession (DBFM) and the joint-venture model. The concession model is considered to be a competitive, contract-based form with a clear risk distribution and hierarchical relationship between the public client and the private contractor. The joint-venture model on the contrary, is considered to be a cooperative, collaboration-based form with an equal distribution of responsibilities and benefits between the two parties (Eversdijk & Korsten, 2009). As shown with the yellow box in Figure 4.1, the focus in this thesis is put on the DBFM/Concession model, because this PPP form is applied most in the Netherlands (PPS Kennispool, 2012).

4.3 Availability-Based Contracting and DBFM Contracts

As stated in the previous section, governments involve private parties in the funding of construction projects (Commissie Private Financiering van Infrastructuur, 2008) since it is considered to be a successful method to receive ‘value for money’ (Ministerie van Verkeer en Waterstaat, 2010). The integrated concession model with Design, Build, Finance, Maintain and sometimes Operate (DBFM/O) activities in one contract seems to be one of the preferred models nowadays used by governments: Public organisations can benefit from the private funds and construction expertise and the private sector will be ensured of a long income perspective (Hodge &
Greve, 2005). In this research, a study is applied on road infrastructure. The main goal for the public client in these type of projects is to realise a maximal availability of the road for its users. Therefore, DBFM in road projects is an interpretation of Availability-Based Contracting (ABC): The contract is designed in such a way that availability of the road has to be ensured by the contractor in an optimal manner in order to satisfy the users of the road (Carpenter, Fekpe, & Gopalakrishna, 2003). This paragraph will elaborate on the characteristics of DBFM and the differences and similarities between DBFM and the traditional RAW and D&C (Design and Construct) contract forms.

4.3.1 Characteristics of DBFM

The objective in DBFM is to realise a better, cheaper and faster public service in the field of infrastructure, by using the private creativity and innovativeness, to realise added value the public client (Koppenjan, 2008). In DBFM projects the Design, Build, Finance and Maintain aspects are integrated in one single contract in order to achieve synergy-advantages. The governments’ idea in applying DBFM is that it will trigger the contractor to adjust the Design, Build and Maintenance activities in such a way that costs are minimalized and an optimal design and execution of the project is achieved (PPS bij het Rijk, 2008). The usual interface risks between different contracts and contractors in projects are thereby eliminated and due to the long maturity of the contract and their financial involvement parties are stimulated to focus on the lifecycle, leading to a long-term qualitatively high end result.

In addition to this, DBFM implies a different role for the government because it intends to minimize the role of the client into a global controller and it increases the contractors’ latitude and amount of responsibilities. This is explained by the fact that the client provides a scope to the contractor and the contractor can decide for itself how this can best be realised. This required scope can best be described as a service since it entails a guarantee for a certain fulfilled goal or function and the way to achieve this is relatively free. Therefore, the client requires ‘functional output specifications’ for a project, in road projects ‘availability’ is the core requirement, and the private parties are expected to carry out suitable activities to achieve this (PPS bij het Rijk, 2008).

The responsibilities are transferred from the government to a private consortium then. The consortium is a combination of several private parties that are united in a Special Purpose Vehicle (SPV). The SPV is responsible for the execution of the works and is also involved in the financing of the project, but the actual execution of these activities is transferred to several other parties in agreements. In order to clarify these relationships, the organisational set-up of the SPV is shown in Figure 4.2.

![Figure 4.2 – Organisation of the SPV in DBFM Contracts](image-url)
As shown in Figure 4.2 several different parties are involved with the SPV. In national road infrastructure projects the concession granter is the public client that provides the command to the SPV, Rijkswaterstaat. This SPV is the formal organisation that has a contract with the public client to design, build, finance and maintain the project. The SPV is used as a legal entity to unite parties and transfer the responsibilities to others, so a SPV can be considered as an empty shell itself (Van Wassenaer, 2012). The works are financed through loans from a bank consortium and equity investments from its shareholders and executed by other parties through back-to-back EPC and MTC contracts (White & Case LLP, 2012). The shareholders are the private participants in the SPV that are responsible for the execution of the works (in the D&B or M contractor combinations) and for a percentage of the funding. The bank consortium is a group of banks that provides the major part of the required equity to finance the project. The consortium of contractors can be divided into a D&B and a M consortium, where the D&B consortium is responsible for the design and construction phase, which is regulated by the EPC contract, and the M consortium executes the maintenance activities in a DBFM contract, this is regulated in the MTC contract (White & Case LLP, 2012).

4.3.2 The ‘F’ in DBFM

The most striking feature of DBFM contracts is the fact that the private parties are involved in the funding of the projects. As shown before, this has a major influence on the organisational set-up and is considered to be an important reason for the added value of DBFM. This part will elaborate on the role of the ‘F’ in DBFM, it explains how the funding works and which advantages and disadvantages can be found in the involvement of banks in the consortium, to conclude with the consequences of the economic crisis on the private finance aspect in DBFM projects.

The set-up of the private consortium works as follows: First a Design-Build-Maintenance (DBM) consortium of several contractors is set-up to develop a good solution to win the tender, then a group of banks is found to provide funding for the realisation. The contractor has to invest about 10% of the project sum from their private equity, the banks are necessary for provision of the remaining 90% of the requisite equity to fund the project. The bank group executes a financial, legal and technical check, a so-called ‘due diligence’, on the contractors’ idea, to independently identify the risk profile of the project in order to determine whether the project is attractive for them to invest in (Van Geest, 2012).

The private funding is used for the large investment at the start of the project: the design and construction phase. Afterwards the private consortium is repaid by the public client in both milestone payments and payments during the maintenance phase. This is shown in the cash flow of infrastructure DBFM projects graph in Figure 4.3.
As stated in the previous section, the public client defines functional output specifications for the project. This is also captured in the financial settlement: Not the tasks but the services are awarded because payments are based on the project output, in road projects this is not the volume of the users, but the availability of the road. Lacking availability of lanes (based on clear measurements from the traffic control centre (Bos & De Vreese, 2012) results in a lower availability payment, as shown in Figure 4.4 (PPS bij het Rijk, 2012).

The addition of private funding in projects is considered to be a positive development because of two reasons: On the one hand it is used for ‘off-balance’ financing, which enables governments with an insufficient budget to do realise projects with an initiate private funding. On the other hand it is used to create added value: The involvement of banks is advantageous as it is seen as a so-called ‘watchdog’ of the contractors, because of their strict requirements and risk-controlling behaviour. This results in a better identification and control of the risks, leading to a larger ‘value for money’ and thereby a more satisfying end result of the project for the public client. Most countries use DBFM for the off-balance funding, but in the Netherlands DBFM was always applied to generate added value in projects. The last years however, a reversal towards the financial motivation can be found here as the economic crisis leads to decreased public budgets for infrastructure projects.

The economic crisis has been of large influence on the F-component in DBFM, not only in the lower available public budget. Its consequences on the private funding aspect are also notable: Due to the decreasing amount of activities and trust in the economy there is less money available to invest in projects for both banks and contractors, so reservaing money for more projects is tough and the opportunity costs of money and the validity of offers became thereby more weighty (Leendertse, 2012). In addition to this, regulations concerning bank investments, like the Basel III agreement (Basel Committee on Banking Supervision, 2010), became more severe, so the banks are opposed to long-term investments now because long maturity and uncertainty are hard to combine (Van Abswoude, 2012). These negative developments have an enormous influence on DBFM contracts, so it is desirable to investigate other options for the funding of the maintenance period. This is recognised by Rijkswaterstaat, which performs investigations to alternative sources of funding, for instance by constitutional (Maarsen, 2012), to ensure a future for DBFM contracts (Bollen, 2012).

4.3.3 DBFM compared to traditional RAW Contracts and D&C contracts

In the traditional way of RAW contracting the public client exactly specifies the product requirements and the detailed design in a strict hierarchical relationship. In the Netherlands there is many experience with these kind of projects with an executing contractor. Since DBFM contracts differ significantly from these traditional contracts, an overview is provided here with differences and similarities between these two forms. Afterwards also a comparison will be made between DBFM and D&C contracts.
Differences
Compared to traditional RAW approach of project development and implementation, differences can be found in the following aspects:

- The most important aspect of DBFM contracts is the fact that it represents an integration of more disciplines in one single contract, resulting in obligations of only one private contracting entity towards the public client;
- With a DBFM contract the public client does not buy an object or a product, but a service delivery. This is the availability-based aspect, because it entails the delivery of an available road by the private contractor;
- The service has to meet functional requirements instead of project requirements;
- DBFM combines both public funding and private financing instead of fully public funding;
- The risk in DBFM is transferred to the private contractor instead of a situation in which the public client bears all the risks;
- In DBFM there is a new role in partnerships because the private project financier significantly changes the collaboration between public and private partners;
- The maturity in DBFM contracts is much longer than the traditional contracts because of the maintenance component. The length of these contracts often depends on availability and private funding aspects (Eversdijk & Korsten, 2009).

Similarities
Also similarities can be found when DBFM contracts and the traditional approach are compared, they are summarised below:

- There is still a hierarchical relationship between public and private parties: No equal partnership is found here because there is still a public client and a private contractor in DBFM projects;
- The distribution of roles in terms of focus remains unchanged: The contractor is focused on the execution phase while the public client is still playing a controlling role;
- Selection of the private contracting party happens in both forms in a competitive way, for these kind of projects tendering is regulated by EU regulations (Eversdijk & Korsten, 2009).

The last decades a tendency towards D&C and DBFM contracts is found. For new national projects with a project budget of more than 60 million euro the government performs a test, the so-called Public Private Comparator (PPC), to find out whether D&C or DBFM fits best with the specific project characteristics. This implies that the public client is convinced of the added value of these two integrated forms compared to the traditional RAW method. Therefore, also a comparison on D&C and DBFM is made here.

Differences
The most striking difference between DBFM and D&C is the presence of the F and M components. Differences between these two forms are related to these components. DBFM and D&C differ on the following aspects:

- DBFM has a considerable longer contract maturity due to the integration of maintenance activities in the contract;
- The involvement of banks, resulting from the private financing of the private party.

Similarities
The most striking similarities are found in the following facts:

- Both contracts are based on the integration of activities which leads to decreased interface risks and thereby a more optimal process;
• In DBFM and D&C projects the public client provides functional requirements to the contractor, which implies more freedom in the execution of the project.

4.3.4 Uncertainties and DBFM

The Role of Uncertainties
The theory of uncertainties, more specific: opportunities to add value and risks threatening the project, is used as a scientific framework to structure the research. The assumed success factors and challenges of DBFM are discussed here, because they can be considered as value-adding opportunities and result-threatening risks. The following findings about these issues expose the close relationship between DBFM and uncertainties. It demonstrates the importance of exploiting opportunities and precluding threats to realise added value in projects.

Opportunities
The most important opportunity in DBFM is the focus on life-cycle costs following from the integration of different disciplines in the contract. The private contractor makes an optimal planning and design in terms of investment, realisation and maintenance, which increases the quality. In addition to this, the integration also implies smaller interface risks as the activities are coordinated by one consortium. Although an integration is found in D&C as well, DBFM positively distinguishes itself here in the long maturity of the contract, which implies a long-term result.

The finance component also ensures added value, since it involves banks in the SPV. Their involvement has a positive influence on the budget control (Flyvbjerg, Bruzelius, & Rothengatter, 2003). Risk allocation happens in a more optimal way since the party who is best able to control the risk, is responsible to do so. Compared to D&C contracting this result is more striking as private parties will feel the financial consequences. Also less time overruns are found because of this financial motivation for the private party to complete the project in time (Eversdijk & Korsten, 2009). These opportunities for added value ensure an increasing ‘value for money’ and thereby a better project result.

Risks
As stated above, using an innovative contract leads to substantial public benefits. There are however some challenges that can harm a successful application of DBFM in complex projects (Bloomfield, 2006). These issues can be considered as risks threatening the project result. Therefore, also the difficulties of DBFM are discussed here.

An important challenge is found in the private funding: The finance-component and thereby the involvement of banks can be seen as a threat, since it causes risk-avoiding behaviour of parties. This can be explained by the fact that there is a sharp risk division in DBFM projects between the public client and the private contractor. Risks are divided in such a way, that the party that is best able to manage the risk is responsible for the risk in case it occurs. Due to the fact that risk events have financial consequences that are undesirable because they can harm the financial models, parties try to avoid them to secure their financials.

Another difficulty is found in the fact that the agreement is very inflexible because of the long-term maturity due to the maintenance activities. Following from the financial consequences of alterations and risk events, the contracts are fenced-off as much as possible, because this is considered to deliver long-term certainty. However, it is impossible to predict and cover all the future risks events, so uncertainty plays an important role in the contract.
The procurement and tendering phase is considered to add difficulties as well, as it takes much longer than the traditional duration because more activities and thereby more products are demanded here. The transaction costs of the preparation phase are therefore considerably higher. This is a result of the competitive dialogue, which is applied in complex projects to consult the market to find solutions for a given problem. The freedom that private parties receive implies many preparations because many documents are demanded by the client, which increases the transactions costs and time.

In addition to this, an important difficulty is found in the hierarchical relationship between the public client and the private contractor, resulting in a typical ‘principle-agent’ problem, where the contractor has more knowledge about the project then the client does. This can result in a difficult relationship during the long maturity of the project.

To conclude with a final comparative risk: The DBFM contract seems to rely on collaboration, but this is displayed too optimistic, since the finance component and the inflexibility of the contract imply a strong focus on risks. This is clearly summarised in the following quote: “The contract form of PPP is not actually a PPP at all, but a revamped form of tendering in which there is still a sharp risk division” (Eversdijk & Korsten, 2009). An explanation is found in the fact that the interests of public and private parties are diverging in financially valuable projects. The government mainly focuses itself on the fulfilment of the project scope, commercial parties however particularly tend to strive for a positive financial result. The success of projects is important to them, since it can harm their balance sheets for years and companies can even collapse when projects fail (Flyvbjerg, Bruzelius, & Rothengatter, 2003).

These findings from literature about DBFM will be compared to practical findings at the end of this chapter. The next paragraph provides an overview of the findings about DBFM in practice as input for the comparing part.

4.4 DBFM in Practice

In the last years DBFM became a contract form that has to be considered as value-adding option in public construction projects. The Public Private Comparator (PPC) is a mandatory comparison tool from the government for projects with an assumed value of more than 60 million euro to identify whether projects should be executed with either a D&C or a DBFM contract by looking at the assumed value that can be created (Rijkswaterstaat, 2012). This development leads to a sense of urgency for involved parties to gain knowledge about DBFM.

During the interviews the use of DBFM in construction projects is discussed. Due to the fact that the selected interviewees have different backgrounds, their opinions about the applicability of this contract form differ from each other. Therefore, an overview of their ‘perceptions’ is made in Table 4.1. A distinction is made between the theoretical and practical groups within the public client: RWS DBFM, RWS ECI and RWS Project managers, the involved private parties: The contractors and financial parties, and legal advisors as independent observer. An explanation is given per category in the next section of this chapter. Experiences in DBFM projects, from the three large line infrastructure projects that are currently in execution with a DBFM contract: The 2nd Coentunnel project, A15 MaVa and A12 LuVe, will be used here as well in order to illustrate the collected perceptions.
### Table 4.1 - Perceptions about DBFM

<table>
<thead>
<tr>
<th>Party Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Role of Uncertainties</th>
<th>Added Value?</th>
</tr>
</thead>
</table>
| RWS DBFM   | - Lifecycle focus  
- Integral Approach  
- Clarity in costs  
- Value for Money | - Inflexibility  | - Better insight and control of risks | Yes, is shown in projects |
| RWS ECI    | - Lifecycle focus  
- Integral approach | - Increased costs  
- Inflexibility | - Pricing  
- Better insight and control of risks | Questionable, better than D&C? |
| RWS PM's   | - Value for Money  
- Lifecycle focus  
- Clarity in costs  
- Attitude contractor | - Alterations are difficult  
- Status banks  
- Network of many DBFM projects | - Other attitude contractor than in D&C  
- Impossible to identify each uncertainty | Questionable, better than D&C? |
| Contractors | - Integral approach  
- Continuity works  
- Competition | - High transaction costs | - Risk allocation contract  
- Opportunity for Pricing | Yes, but can be higher |
| Financial Parties | - Yields  
- Client relations  
- Safe market  
- Turn key contract  
- Value for money | - Contract maturity  
- BAFO validity | - Risk profile  
- Bankgroup  
- 10-90% equity ratio  
- Regular checks  
- BAFO validity  
- Long-term | Yes, but for long-term institutional? |
| Legal Advisors | - Lifecycle focus  
- Integral Approach  
- Clarity in costs  
- Value for Money | - SPV is empty shell  
- Alterations are difficult | - Beneficial for client  
- Exit options  
- Alterations options | Yes, is shown in projects so standard in the future |

#### 4.4.1 Interests of the Different Parties in DBFM

Before discussing the perceptions of the different parties about DBFM, it is important to identify the parties' interests in this topic. Therefore, the specific interests per party are shown in Table 4.2. In addition to the described interests below, all interviewees shown interest in these topics as they want to be informed about the developments in their field of knowledge.

<table>
<thead>
<tr>
<th>Party Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWS DBFM</td>
<td>The DBFM departments' employees within Rijkswaterstaat are on a daily basis interested in the application of DBFM projects and therefore they are having the main interest in this issue.</td>
</tr>
<tr>
<td>RWS ECI</td>
<td>The employees from the ECI department within Rijkswaterstaat are employed for ECI projects. They are having no significant interest in DBFM projects.</td>
</tr>
<tr>
<td>RWS PM's</td>
<td>The projectmanagers from Rijkswaterstaat have an interest in DBFM in case it is applied in their project as they have to deal with the result then on a daily basis.</td>
</tr>
<tr>
<td>Contractors</td>
<td>The contractors are as a private party mainly interested in the commercial perspective, application of this DBFM implies a more important role for the contractor so they are having a large interest in this as it implies activities.</td>
</tr>
<tr>
<td>Financial Parties</td>
<td>The financial parties are involved in the funding of DBFM projects as their main activity, therefore they are having an important stake in this subject.</td>
</tr>
<tr>
<td>Legal Advisors</td>
<td>Legal advisors are used in DBFM for providing advice about procurement law, legal issues and guiding parties in conflicts, so they have an interest in DBFM from a commercial point of view.</td>
</tr>
</tbody>
</table>

Table 4.2 - Interests of the Different Parties in DBFM
4.4.2 Perceptions about the Advantages of DBFM

The assumed advantages of DBFM are broadly recognised in the interviews: The involved parties from both public and private sectors mention the integral approach of design, build and maintenance as a method to decrease interface risks because of the linkage of activities, which optimises the projects’ end result. This issue, combined with the private F component that involves the contractor financially as well, is leading to a higher commitment and closer involvement of the contractor, resulting in clarity about the total (long-term) costs of the project, a lifecycle focus and ‘value for money’, because it ensures more quality for a given budget. The banks with their continuous checks are an important factor in this, they have a controlling role in the consortium. From the contractor’s perspective additional commercial advantages are found: The long contract maturity ensures this party of continuity of their activities and DBFM is desirable from a competitive point of view because it favours the larger contractors since they are able to meet the requirements of DBFM while smaller companies cannot do so.

The role and perceptions of the financial parties are substantially different from the others: The banks enable private funding so they are necessary in the consortium to provide equity for the contractors. The risk profile of the project is essential for them and specific construction activities are therefore less relevant. They are mainly involved to serve their clients and to achieve proper yields on their investments. Infrastructure projects are currently considered as a rather safe investment since it is likely to be used for decades. The Dutch PPP market is interesting for investors because of the relatively stable economy (compared to for instance southern EU countries), the standard DBFM contract with clear regulations and risk allocation and the priority the Dutch government gives to high-level infrastructure.

4.4.3 Perceptions about the Disadvantages of DBFM

Also about the disadvantages of DBFM parties are having quite similar opinions. The fact that the DBFM contract covers a period of decades due to the maintenance period, implies fixed provisions for the total duration. Most parties call the contract therefore inflexible. Public project managers however refine this vision by stating that in practice flexibility can be regulated in the contract, but that alterations are often difficult because then negotiations between the parties have to take place. They blame the banks for the stiff discussions with the consortium since the financiers are steering on their financial models and alterations might change the risk profile and harm their models. In addition to the struggle with the long-term fixed contract, contractors experience the amount of risks they need to take resulting from the DBFM standard contract as a disadvantage.

Other disadvantages of DBFM are related to the involvement of financial parties:

- Obtaining private funding is more expensive than governmental funding, because the interest rates on these loans are considerably higher so the price of projects increases. DBFM proponents believe that the ‘value for money’ is higher than these additional costs, but the higher interest rates on private loans remain undisputed;
- Due to the financial crisis new regulations are set-up in the Basel III agreement to strengthen the resilience of the banking sector (Basel Committee on Banking Supervision, 2010), which hamper the long-term funding possibilities for financial parties because they are now forced to have more equity available. Their current preference for short-term financing and the long maturity of a DBFM contract are not compatible: Only funding the construction period and afterwards handing over the project to institutional investors might be an appealing option for them;
- The period between the Best And Final Offer (BAFO) and Financial Close (FC) is also difficult for banks because of the opportunity costs as budget has to be reserved for a project (that might not even
proceed in case the contract is awarded to another consortium). The validity of the BAFO is related to this, especially in an unstable economic climate circumstances can change so the duration of the offer is at its longest 4 months.

Also a legal issue is mentioned during the interviews, namely the existence of a Special Purpose Vehicle (SPV) that is responsible for the works. This legal entity can be considered as an 'empty shell' because of the back-to-back contracting, which might be disadvantageous in case of trouble because of the little responsibility for involved parties since the SPV is responsible. Proponents of DBFM however state that this is covered in the DBFM contract and that the back-to-back contracted parties do have responsibility and will execute the activities properly.

Finally, the project managers mentioned another difficulty in case many DBFM projects are realised. It can have a negative impact on the infrastructure network as a whole while the previous long-term DBFM contracts in the area determine the preconditions for new projects. The public client already had to keep this issue in mind in current DBFM projects since this might otherwise become a problem in the future.

4.4.4 Perceptions about the Role of Uncertainties in DBFM

Uncertainties play an important role in DBFM contracts: As uncertainties and more specific as risks and opportunities. First the uncertainties are discussed, then an explanation about risks will be given, to conclude with the opportunities to add value with DBFM.

Due to the long maturity of DBFM contracts, uncertainty is an unavoidable factor to take into account, since it is impossible to eliminate all uncertain aspects for the coming 20-30 years at the project start-up. Although the DBFM contract is fenced-off and the public client has to think about possible events and changes in advance, regulations about alterations and exit options are included in it. Also the financial parties take uncertainties over time into account. They execute regular checks to ensure that the financial model is not harmed and to identify undesirable developments in time. But overall, it can be stated that banks do not favour long-term funding because uncertainties might cause changes in the future that might imply a changing risk profile of projects, which might result in a decreased return on their investment. Uncertainties in the near future are undesirable for this reason as well, which explains why funding offers from banks are only valid for a few months.

Because the contractor is involved financially, distributing the responsibility in case risk events occur is essential. The idea in this allocation is that the party that is best able to control the risks is responsible for it. Within Rijkswaterstaat the overall perception is that private parties are better in managing risks than the government does.
In the Standard 3.0 DBFM contract already an extensive risk distribution can be found (Rijkswaterstaat, 2012), for other risks, the so-called ‘list-risks’, the distribution is regulated specifically for the project as they entail public risks that can be taken by the private party to be distinctive. Pricing of these risks is therefore an important part of the tender procedure. The main perception of the contractors about risks in DBFM is that the private parties have an off-ratio large amount of risks to manage in projects, but that list risks provide an opportunity to be distinctive in the tendering procedure. The opportunity to add value is furthermore recognised in the possibilities of integration and optimisation that result from the different disciplines in one contract and the relative freedom of the contractor.

The financial parties have another interest in the identification of risks:

- For them the construction project is an investment opportunity, so the risk profile of the project is used as main input to decide whether financing will generate yields. To identify this, the bank performs a ‘due diligence’, a study on the technical, legal and financial risks in the project which forms the basis of the funding requirements;
- Funding is always arranged by a group of banks, who all have several projects in their portfolio to spread risks;
- It is mandatory for the contractor to finance about 10% of the project with own equity, for the rest they can obtain a loan from the bank, but risky activities have to be financed with their own equity.

To conclude, the interviews show that DBFM contracts are particularly beneficial for the public client in terms of risk distribution, because they have to manage less risks and the contractor has to face the financial consequences in case risks are not handled properly.

4.4.5 Perceptions about the Added Value of DBFM

In many countries DBFM is used for the off-balance financing, so without public budget, governments are still able to develop public assets because of the use of private funding then. In the Netherlands on the contrary, DBFM is applied in order to realise ‘value for money’, so higher quality for a certain budget as a result of the applied contract form since the Dutch government itself has enough budget for construction projects. The government even steers on more DBFM projects, so it is important that this added value is actually achieved in projects.

DBFM is definitely considered as an interesting contract form by the interviewees because of the integration of activities, the use of functional requirements and the lifecycle focus, but the added value compared to D&C is for the projectmanagers and the ECI proponents questionable as the advantages can also be achieved with D&C. The DBFM proponents however state that the proof is found in the projects, others believe that the same results can be achieved when Rijkswaterstaat specifies the output criteria properly.
In that case, the valuable private financing is not necessary, which might lead to cheaper projects. Which shows that value can be created with DBFM, but that there might be other options to realise a good project result as well.

**An example from the A12 Lunetten-Veenendaal (A12 LuVe) project**

This project is executed by means of a DBFM contract and finished more than 2 years earlier than initially planned (Rijkswaterstaat, 2012), an excellent example of a successful DBFM project according to many actors. On the same highway however, the project A12 Gouda-Woerden, that was executed with a D&C contract, did finish 2 years before the initial date as well. Is the contract really the key to success then?

Characteristics of the A12 LuVe project can be found in the Project Overview in Appendix A.

much for account of the contractor. When risks are divided in a more collaborative way, more additional value can be created with a DBFM contract. The legal advisors and financial parties already see the added value. They expect that it will be the standard for the future, with banks to provide funding only in the construction phase and institutional investors for finance on the long-term.

### 4.5 Comparing Theory and Practice

This paragraph compares the findings in literature and from interviews by describing the differences and similarities in order to identify knowledge gaps and to enable crosslinking of useful information in the future. In succession the findings about the advantages, disadvantages, role of uncertainties and added value of DBFM are discussed, to conclude with an overall statement about the comparison of theory and practice.

**Advantages**

The advantages of DBFM contracts are broadly discussed and recognised in literature. In the practical findings the same characteristics are mentioned, so practice and theory confirm each other when globally compared. In practice however, although the advantages are mentioned, they are questioned as well. Especially the projectmanagers state that it is doubtful whether these advantages are a product of the DBFM application, because comparable results are also found in projects that were executed with a D&C contract.

**Disadvantages**

The findings about disadvantageous of DBFM in practice and theory slightly differ from each other in risk distribution and flexibility of the agreement, which seems to be a result of a changing attitude towards the contractor. Theory is often written from a clients’ point of view and elaborates mainly on the added value that the project delivers to society, while the interviewees proved to be able to emphasize with the contractor, leading to practical findings where the private interests are taken into account as well.

**Role of Uncertainties**

In theory a role of uncertainties is mainly found in the risk category, since it is considered to be a negative issue in DBFM projects so all risks need to be banned. On the long-term this implies a harmed flexibility of the agreement. In practice however a more pragmatic view is applied to uncertainties. This is a consequence of the perception that managing uncertainties is an unavoidable aspect in complex projects that has to be dealt with, resulting in the addition of regulations about flexibility in case of alterations to the contract.
In addition to this, the financial crisis is having considerable consequences on the application of DBFM in projects, which has not been recognised in literature yet, but practical findings all show increasing difficulties in long-term private funding and available budgets. Even a changing public motivation for applying DBFM is mentioned by many interviewees, as shifting towards the off-balance funding instead of the official ‘value for money’ justification of this contract form.

**Added Value**

Findings about the assumed added value of DBFM in literature and practice show similarities. Added value can be achieved with DBFM contracts in terms of ‘value for money’, which implies higher quality of the project result for a certain budget or a better price and thereby a less expensive project with a certain quality. Summarising, it can be stated that DBFM projects entail a positive price/quality ratio. Value is mainly realised in the lifecycle optimisation and more specifically in high availability of the road. In addition to this, the private funding aspect results in an increased project control, which leads to realisation of the project within planning and budget. In literature, these features are often extensively described, but in practice no single DBFM project in the Netherlands has been fully executed, so hard conclusions about the actual added value of DBFM on the total contract maturity cannot be drawn yet.

**Conclusion**

The findings from literature and practice are to the utmost extent comparable to each other, the assumed advantages, disadvantages and role of uncertainties and added value is confirmed. However, especially the project managers have a more pragmatic attitude towards DBFM. They are using the beneficial characteristics to realise added value and simply fend-off the disadvantages, as can be seen in the example of the assumed inflexibility of the contract. In projects this is covered in the contract with agreements about alteration and exit options and a constructive behaviour in case of new provisions. They accepted the fact that it is simply impossible to ban all uncertainties in advance. In practice changes can be handled, if necessary with separate payments, during the project. This shows that some refinements are made on theoretical views or practical experiences and ideas. These small differences can be explained by the fact that interviewees always have coloured ideas resulting from their experiences and personalities on the one hand, and the theoretical approach from scientists in literature which might underexpose the practical impacts on the other hand.
Early Contractor Involvement (ECI)

Introduction

The last years the development of infrastructure projects has not only been a public case anymore. More and more the governments are involving all kind of stakeholders to ensure a better end result with a higher public support. Not only the citizens became more important, also the private contractors are playing a larger role than ever before. This development started in the United Kingdom as Early Contractor Involvement (ECI) and is implemented in the Netherlands to improve projects and processes as a result of both practical need and policy. This chapter discusses ECI and its related topics, therefore it starts by exploiting the idea of ECI. Then procurement and tendering and the principle of interweaving are discussed, to continue with the applicability of the specific models, subsequently practical input from ECI experiences in the Netherlands is discussed to end with a comparison between theory and practice.

Early Contractor Involvement

The last years a trend of increasing cooperation between the public client and the market can be noticed, for instance in the execution of projects in a Public-Private Partnership (Lenferink & Arts, Government Strategies for Market Involvement in Road Infrastructure Planning: An International Overview, 2009). In the traditional start-up of projects the public party plays lead, with tendering procedures only starting after completion of the planning phase. Contractors are having extensive knowledge about executing infrastructure works, but due to the fact that they are involved here after the public decision-making procedure, they are restricted to execute the project as imposed by the client, which limits their ability to optimise the project with innovative solutions. Therefore, the Ministry of Infrastructure and Environment currently changed its attitude towards the private parties. It desires to use their knowledge already in an earlier phase so it aims to actively involve them in an earlier stage of the planning process (Van Valkenburg, Lenferink, Nijsten, & Arts, 2008). Their intention with the early involvement of private parties is to increase the ‘value for money’ of projects, resulting from more innovative solutions (Tillema & Arts, 2009). Another important reason to involve the market in the plan development implies changing behaviour towards environmental and social effects. Since currently those aspects are not always taken into account during the design phase, projects are often not fully supported by their users. The involvement of market parties and other stakeholders in an early stage of the project, to enable them to influence the design in a positive way, can smoothen the planning process and leads to better project results (Flyvbjerg, Bruzelius, & Rothengatter, 2003).

Procurement and Tendering

The combination of ABC and ECI in complex infrastructure projects is strongly related to procurement and tendering procedures, because both ideas are applied in these phases and regulations might cause difficulties in the combination of the two approaches. Procurement entails the way how goods and services are obtained, public organisations organise this by the method of tendering. Tendering is the invitation of two or more parties to lodge a price for the execution of a contract to deliver goods or to provide services including works. Institutions and projects required to tendering are all the public contracts above a certain financial value, in 2012 a budget of five million euro, for organisations, departments and other partial public parts of the Dutch government (Bregman, 2009). Since the scope of this thesis entails infrastructure projects with a project value above 60 million euro that are executed for the Dutch government, in all projects the procurement should follow a tendering procedure.
5.3.1 Legal Background

Current policy about tendering in the Netherlands is based on European Law, which follows the idea of a common internal market, liberation of regulated markets and the implementation of free market principles in the European Union. A special Tendering Law is now made that might be declared valid as from 2013, but until then two directives are devised, Directive 2004/17/EU for special sectors and Directive 2004/18/EU for works, supplies and services. EU directives have been converted into two binding Dutch National regulations, the ‘Decision Rules for Public Procurement’, in Dutch ‘Bao’, and the ‘Decision Procurement Special Sectors’, in Dutch ‘Bass’. The ‘Procurement Working Rules 2005’, in Dutch ARW 2005, offers the practical implementation rules of the Bao, following this rules is obligatory for the national government (Pianoo, 2012). Bao applies to the road infrastructure projects and Bass is applied to rail infrastructure projects. This is subsequently implemented from the Directive 2004/18/EU for road projects, and Directive 2004/17/EU for rail projects. Because of the delineation of this thesis into road projects, Bao and Directive 2004/18/EU are applicable for research purposes. In addition to this, general regulations for good governance like the equality principle, diligence principle, justification principle, fiduciary principle and the proportionality principle are always applicable.

The specific procurement and tendering regulations are based on three principles:

- **The Transparency Principle**, which stipulates that preferences are eliminated;
- **The Objectivity Principle**, which states that the tenders’ awarding norms should be predetermined and controllable;
- **The Competition Principle**, stating that tender procedures should be regulated in such a way, that enough competition between parties is ensured (Bregman, 2009).

The idea with these professional regulations concerning tendering and procurement is that projects will be realised with lower failure costs and that more market involvement and good competition deliver innovative developments and a higher value for the taxpayers’ money (Pianoo, 2012).

There are three different EU procedures for the tendering of large infrastructure projects:

- **The Open Procedure**, a standard procedure which is open to all parties after publication of the tender. The candidates and their products are assessed in one single round;
- **The Closed Procedure**, a standard procedure consisting of two rounds, which is open to all parties after publication of the tender. In the first round a group of candidates is selected. In the second round their products are assessed;
- **The Competitive Dialogue**, a special procedure that is suitable for complex projects where input from the market and stakeholders is needed, because it aims to find innovative design solutions with an open, transparent and objective approach. The competitive dialogue is the only procedure that is open for the whole market (Pianoo, 2012).

For commercial parties the most important moment is the awarding of the tender since it determines who will execute the project. The awarding takes place based on the lowest price or on so-called Most Economically Advantageous Tender (MEAT, or Dutch EMVI) criteria. Selection on MEAT criteria implies that not the lowest price, but the contribution with the best value for money will be awarded. In the Netherlands this works with a method of price correction, where the price is corrected with the value of quality, so discounts are made to the original price when the contribution contains a design that will create a higher value (Rijkswaterstaat, 2011 ).

For complex projects in the Netherlands the government applies the competitive dialogue as procedure with selection based on MEAT criteria, because they expect these approaches as most suitable here.
5.3.2 The Planning Procedure

In the development of infrastructure projects a standard phasing and decision-making model is followed, the so-called ‘Route Determination’ procedure that can be found in Figure 5.1. The specific steps in this public planning procedure are discussed to explain the image: Project implementation following the Route Determination procedure consists of three main phases: The exploration, plan development and realisation. The goal of the exploration phase is to develop a solution for a problem that is supported on a social, political and environmental level. It starts with an official ‘Start-up Decision’, which is the agreement of the involved public entities, both regional and national, that supports the problem and their need for the project. Then a step-by-step approach is followed to develop a suitable solution for the assumed problem, with two ‘sieve’ moments to narrow the possible solutions. From all the possibilities first a selection of two to four solutions is made, after investigating these ideas finally one single preferred solution is developed. This results in a ‘Structure Vision/Preferred Decision’ that also entails the continuation approach and the financing and funding of the project.

Subsequently the plan development phase starts, which can be passed smoothly when the previous phase was elaborated in a thoughtful way. It needs to be noticed that the responsible public entity changes in this phase: The Ministry of Infrastructure and Environment, more specific the Directorate General Mobility (DGMo), executed the exploration, from now on the project is Rijkswaterstaats’ responsibility (Rijkswaterstaat, 2011). The plan development phase is the most tangible phase in project development as in this stage major project decisions are taken. The plan development entails a more detailed plan over time, by improving the Draft Route Decision that finally becomes the ‘Definite Route Decision’ or the ‘Implementation Decision’. Following from the possibilities to lodge appeal in the planning procedure after the Draft Route Decision and the Route Decision, a public say in projects is guaranteed for public and private actors, which leads to socially supported projects as adjustments need to be made to the design to fit these changes. After the 'Implementation Decision' the actual realisation can be commenced, which completes the public procedure after the construction of the project.

Figure 5.1- Phases and Decisions in Infrastructural Project Development
As shown in Figure 5.1, the exploration phase has an average duration of two years, the plan development takes about two years and in most projects the realisation is executed in approximately three years. The total average implementation time of a construction project is therefore about seven years. This is based on the new decision making approach as recommended by the Elverding Committee (Commissie Versnelling Besluitvorming Infrastructurele Projecten, 2008). This faster decision-making process as based on the ‘New Market Approach’ is a strategy from the Dutch government to make the processes and results of construction projects faster and better. As can be seen in Figure 5.1, this approach is cutting the time of the former duration of 14 years by half (Commissie Versnelling Besluitvorming Infrastructurele Projecten, 2008).

5.3.3 The Tendering Procedure

As stated in paragraph 5.3 about the legal background of procurement and tendering, there are three ways of tendering for public projects: The open procedure, the closed procedure and the competitive dialogue. The competitive dialogue is currently the standard for complex infrastructure projects in the Netherlands, which implies the use of this procedure in all projects that are subject to the graduation research. The competitive dialogue is an exception in the procurement regulations, since it allows the public client to consult with several different private parties. It is applied in order to solve remaining ambiguities that are attributable to the complexity of the project for the public client by obtaining relevant information from private parties. Due to this special nature, the competitive dialogue is bound by restrictions and regulated in a clear standard protocol. The different steps are shown in Figure 5.2 and explained in a chronological matter in the next section.

The first activities, concerning the initial design of the project, are considered to be the steps prior to the official announcement and are executed by an integral project team from Rijkswaterstaat to ensure the usefulness of the project. This project team composed following the role division of the ‘Integral Project Management’ (IPM) model, with technical, context, contract, control and overall managers in it. An investigation on the projects’ context is performed, entailing a determination of the scope, identification of the projects’ Critical Success Factors (CSFs), and an analysis on the context and the assumed risks. Finally, a decision to proceed is provided, supplemented with a certain planning, budget and contract form determination (Rijksoverheid, 2009).

Then the projects’ preparations are started, depending on the complexity of the project, which take, depending on the complexity of the project, approximately 7 to 12 months. A clear and univocal tender strategy is devised in this stage too and functional requirements, preferences, and selection and awarding criteria are compiled here as well. Organising a market consultation prior to the tendering phase might be eligible for this issue to ensure a feasible proposition. The public client however has to make sure that this action meets the several legal principles. In this phase already a pre-announcement is done to inform the market that near upon a contract will be introduced to the market. Also a briefing meeting is organised to provide information to all interested contractors to make them decide whether they wish to apply for a consortium in the project. When the preparations of the tender documents are finished, the official announcement for the project can be published and applications can be done by an unlimited number of candidates.

There is a procedure for the submission of the candidates’ applications: Candidates are assessed on the completeness and validity of their application and on their own characteristics, they are immediately excluded in case minimum requirements are not met or when grounds for exclusion are demonstrably present. All other candidates are ranked in a systematic assessment on the basis of the selection criteria and the five parties with the highest scores are invited to participate in the first dialogue round. Again, exclusion, rejection and selection has to meet the legal principles of transparency, so decisions have to be motivated in a clear and objective way (Rijksoverheid, 2009).
The dialogue phase can be divided into two parts: It is used as an optimisation process where first five parties are asked for a plan of approach or project vision in order to select the three best parties, to continue with these three parties in a dialogue in order to develop an optimal design and a suitable contract content. Each dialogue round entails a number of dialogue meetings which are used for asking questions, submitting proposals and raising new issues by the candidates. Because the public client is restricted to guarantee a transparent process, all parties have to receive similar written information to ensure the level playing field with equal competition. After completion of the dialogue rounds the three remaining candidates are requested to submit their final tender for the project. The tenders are objectively assessed on clear awarding criteria and the economically most advantageous tender (MEAT) is selected for the realisation of the project (Rijksoverheid, 2009).

### 5.4 Interweaving of Procedures

Involving the market in an early stage can be done in four different ways (WB Consulting, 2009):

- By organising a **Design Competition** to gain innovative design ideas from market parties;
- By accepting ideas from an **Unsolicited Proposal** from market parties;
- By the **Parallel Running** of plan and tendering procedures, without coupling them;
- By the **Interweaving** of plan and tendering procedures by crosslinking information.

The most innovative and complex way of involving private parties in the project start-up is by using the method of interweaving, its implications are shown in Figure 5.3.
The interweaving of procedures considerably shortens the implementation time of construction projects compared to the traditional approach (Carpenter, Fekpe, & Gopalakrishna, 2003). Besides this, interweaving is also applied in order to enlarge the contractors' commitment and thus to realise the project for a smaller budget with a higher quality (WB Consulting, 2009). The application of interweaving with the actual contracting of a private party is an interpretation of Early Contractor Involvement (ECI) that can happen on in both exploration and plan development phase.

5.4.1 Interweaving Models 1 & 2

Early input from contractors in the design leads to improved drawing quality, material supply, information flow and consequently improved construction schedule performance. Especially when contractors are officially involved in the project by means of a contract, they will show much commitment and their motives to realise a successful project will be strong (Song, Mohamed, & AbouRizk, 2009). There are several possible moments on which the market can be involved in an early phase. They have been drawn in an 'Interweaving Models' image, Figure 5.4, where Model 1 and Model 2 match the set ECI standard of my research and Model 4 represents the traditional approach.

<table>
<thead>
<tr>
<th>Legal Routing</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft SV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SV/PD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft RD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD/PD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.4 - Interweaving Models

The major characteristics of the four Interweaving Models are summarised in Table 5.1.

| Model 1 | Start tender of Draft Structure Vision and program of requirements, winning bid becomes Structure Vision. |
| Model 2 | Start tender of Structure Vision, program of requirements and Draft EIA, winning bid becomes Draft Route Decision. |
| Model 3 | Start tender of Draft Route Decision, program of requirements and EIA Decision, winning bid becomes Route Decision. |
| Model 4 | Start tender of Route Decision, program of requirements and EIA Decision. |

Table 5.1 - Interweaving Models and Characteristics
Currently, not all the Interweaving Models are applied in projects yet, because Rijkswaterstaat struggles with their implementation in combination with certain circumstances. Models 3 and 4 have been successfully applied yet, but Rijkswaterstaat is reticent about the execution of projects with Model 1 and 2 combined with some contract forms, because they are not certain whether implementation can be realised in a successful manner since there are many uncertainties that have to be faced in those phases. Therefore, ECI in the Interweaving Models 1 and 2, so with tendering and awarding before the Draft Route Decision, will be deeper investigated in this research. These models are defined with a yellow block in Figure 5.4 and Table 5.1 and the tendering phase is highlighted with the green arrows in Figure 5.5.

Interweaving Model 1 concerns the most profound form of ECI, since it involves the market already in the exploration phase. Tendering takes place already when budgets and planning are not determined yet, which implies a challenge for the public client to ensure that legal principles are met. In the public planning procedure plans are abstractly designed in this phase, which implies a large role for the contractor as much room is given for their creative input. The interweaving of the public and private procedures in Model 1 is shown in Figure 5.6.
The tendering procedure in Model 2 starts when the Structure Vision is determined. Private parties are involved in the Draft Route Decision preparations by means of the competitive dialogue and awarding of the contract takes place based on the Draft Route Decision. Compared to Model 1, plans and budgets are improved in level of detail, which eases the role of the public client in the tendering procedure, but narrows the solution space for innovative private ideas. Interweaving according to the Model 2 approach is shown in Figure 5.7.

5.4.2 Interweaving Models 1 & 2 Compared to Traditional Procurement and Tendering

In the traditional method of procurement and tendering in the Netherlands the public planning procedure is completed before the private tendering procedure is commenced. This method not only entails a long period from start-up decision to actual realisation, it rules out the possibility to apply Early Contractor Involvement (ECI) as well. Also on a more detailed level differences between interweaving Models 1 & 2 and the traditional procurement and tendering approach are identified, they will be described in the following paragraph. It will also elaborate on the similarities, because the two methods entail resemblances as well.

Differences
Compared to traditional approach of procurement and tendering, differences in Interweaving Models 1 & 2 can be identified in the following aspects:

- Following from the interweaving approach, the public and private procedure are applied simultaneously which results in a considerable acceleration of procedures since the passing of procedures is halved by the new approach;
- The earlier involvement of the market provides room for creativity of the market because the broader solution space accommodates possible innovative private input;
- The public clients’ role in the interweaving process changes as it becomes a facilitator in the plan development process;
- The costs for private parties in the plan development, the transaction costs, are considerably higher as much more is expected from them than in traditional procurement.

Similarities
Also similarities are found when the two approaches are compared. They show analogies in the following features:

- The process of interweaving is still bound to tendering principles of competition, transparency and objectivity, which have to be guaranteed by the public client;
- Following from the public procedure there is still a possibility for society to lodge appeal against plans. The outcome of these appeals needs to be taken into account in the plan development.
5.4.3 Uncertainties and Interweaving Models 1 & 2

The Role of Uncertainties
Uncertainty plays a large role in interweaving. This is a consequence of the amount of available information that is strongly related to the timing of the contractors’ involvement. Late private involvement implies a large amount of available information and thereby less investment risks. In case of ECI the amount of uncertainties is considerably higher because of the limited availability of information. This is shown in Figure 5.6 with the red arrows. It can both be seen as a risk that threatens the project and an opportunity to increase the added value (Lenferink & Arts, Government Strategies for Market Involvement in Road Infrastructure Planning: An International Overview, 2009). Therefore, an elaboration on these issues is found in the following paragraph.

Opportunities
The rather new form of ECI is reviewed positively because its implementation can lead to additional value. The success factors are described here as an explanation of this development:

- The first characteristic is the acceleration of the exploration and plan development phase compared to traditional project development because of the interweaving of the public planning procedure and the private tendering procedure;
- Early in the project less specific requirements are known, which implies a broader solution space. The use of the contractors’ experience and knowledge in this phase can result in more innovative and creative solutions;
- Actual involvement of the contractor by means of a contract results in a higher contractor commitment towards the project. Due to the fact that private parties are then able to influence project decisions, they will feel more responsible which results in project optimisation and thereby better ‘value for money’;
- Since both public and private parties have an opportunity to influence the project design, they have to collaborate, which results in a stronger relationship and thereby a better process and reputation than in traditional projects (Song, Mohamed, & AbouRizk, 2009);
- To conclude, this development is conform the policy of Rijkswaterstaat to decrease the role of the government in projects into a facilitating public client.

Risks
In the involvement of private parties in an early phase of the development of construction projects one major risk can be found that is a direct result of the timing of tendering. Due to the fact that much is still unknown in the exploration phase, many uncertainties have to be faced here. Through time more information is gained, which transforms the ‘dynamic uncertainty’ into ‘certainty’ (Winch, 2011). When tendering is executed before the Draft Route Decision, which is the case in Interweaving Models 1 and 2 as subjects of my thesis, dynamic uncertainty plays an evident role. The most striking risks are explained here:

- Institutional disagreements, for instance between different cities along the new road project, form a risk of delays as they can decelerate procedures after lodging appeals;
• Legal regulations might cause difficulties. Due to the fact that the agreement with the private party is arranged in private law and the tendering procedure is arranged in public law, a diverging development of both procedures can make interweaving impossible;

• Scope, cost and time are not fixed yet in an early phase, which makes the development of suitable output requirements as awarding criteria for tendering highly difficult, because considerable changes in a later stage might cause problems with the private competitors for the public client.

Uncertainty needs to be managed in such a way that risks are mitigated properly to decrease threats on the project result on the one hand. On the other hand opportunities need to be realised in order to create additional value.

5.5 Interweaving Models 1 & 2 in Practice

ECI is assumed to create additional value in the planning phase, because it accelerates procedures and uses input from the private market to achieve better project results. It is a rather new and interesting development so in the interviews the use of ECI in construction projects is discussed. Due to the fact that the selected interviewees are having different backgrounds, their opinions about the applicability of this approach differ from each other. Again, a distinction is made between the theoretical and practical groups within the public and the private parties. Because ECI does not necessary entails private funding, financing parties were not analysed because the applicability of ECI is only discussed with them in a combination with ABC. In the next section of this chapter an explanation is given per category respondents. Experiences from an ECI project, the A2 Maastricht project, are used here to illustrate perceptions. An overview of ECI perceptions is made in Table 5.1.

<table>
<thead>
<tr>
<th>Role of Uncertainties</th>
<th>Added Value?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many uncertainties due to public procedure</td>
<td>Questionable</td>
</tr>
<tr>
<td>Pricing</td>
<td></td>
</tr>
<tr>
<td>Clarity in costs and planning</td>
<td></td>
</tr>
<tr>
<td>Transparency</td>
<td></td>
</tr>
<tr>
<td>Alterations (15-20% amendments)</td>
<td>Yes, is shown in projects</td>
</tr>
<tr>
<td>Less competition (&gt;25% higher costs)</td>
<td></td>
</tr>
<tr>
<td>Opportunities</td>
<td></td>
</tr>
<tr>
<td>Clarity</td>
<td></td>
</tr>
<tr>
<td>Institutional complexity</td>
<td></td>
</tr>
<tr>
<td>Institutional complexity</td>
<td>Questionable</td>
</tr>
<tr>
<td>Exit options</td>
<td>Yes</td>
</tr>
<tr>
<td>Alterations options</td>
<td></td>
</tr>
<tr>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Institutional complexity</td>
<td>Questionable</td>
</tr>
</tbody>
</table>

Table 5.1 - Perceptions about Interweaving Models 1 & 2
5.5.1 Interests of the Different Parties in Interweaving Models 1 & 2

Again it is useful to identify each parties' interests in this topic, as it will influence their perceptions about ECI. Therefore, the specific interests per party are shown in Table 5.2.

<table>
<thead>
<tr>
<th>Party</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWS DBFM</td>
<td>The employees from the DBFM department within Rijkswaterstaat are employed for DBFM projects. They are having no significant interest in interweaving projects.</td>
</tr>
<tr>
<td>RWS ECI</td>
<td>The ECI departments' employees within Rijkswaterstaat are on a daily basis interested in the application of interweaving projects and therefore they have the main interest in this issue.</td>
</tr>
<tr>
<td>RWS PM</td>
<td>The projectmanagers from Rijkswaterstaat have an interest in interweaving in case it is applied in their project as they have to deal with the result then on a daily basis.</td>
</tr>
<tr>
<td>Contractors</td>
<td>The contractors are as a private party mainly interested in the commercial perspective, application of this interweaving implies a more important role for the contractor so they are having a large interest in this as it implies activities.</td>
</tr>
<tr>
<td>Financial Parties</td>
<td>The financial parties are not involved in interweaving projects because this does not imply funding, as shown in Figure 5.2 with the N.A. (Not Applicable) comments.</td>
</tr>
<tr>
<td>Legal Advisors</td>
<td>Legal advisors are used in interweaving for providing advice about procurement law, legal issues and guiding parties in conflicts, so they are having an interest in interweaving from a commercial point of view.</td>
</tr>
</tbody>
</table>

Table 5.2 - Interests of the Different Parties in Interweaving Models 1 & 2

5.5.2 Perceptions about the Advantages of Interweaving Models 1 & 2

The different parties are having rather different opinions about the advantages of ECI. Even within Rijkswaterstaat diverging views can be found between the different departments. The ECI interviewees mention the advantages as found in literature: Clarity about costs and planning in an early stage, creative innovations resulting from the broader solution space and acceleration of procedures from the interweaving of procedures. The DBFM representatives also recognise these advantages, but narrow the innovation advantage into creativity in the spatial plan. Project managers are critical about ECI: From their experience in several large projects they state that ECI only leads to a better logistic plan and a smarter planning, the other advantages are not confirmed by them.

An example from the A2 Maastricht project:

In the A2 Maastricht project ECI was applied in order to find a creative solution for the spatial plan. This worked out properly in a creative idea from the contractor: A stacked tunnel of two layers was a design that would not have been made by the government, while this was the best possibility to meet all the requirements.

Characteristics of the A2 Maastricht project can be found in the Project Overview in Appendix A.

Box 5.1 – Innovation in the A2 Maastricht project

The contractors are positive about this new development but are currently hardly focussing on ECI projects. ECI appeals to them because of the increasing influence that they will have in this kind of projects. Also from a commercial point of view it is interesting because it implies a longer period of involvement in projects, which ensures continuity of the work. Finally, legal advisors were interviewed, who mainly mention the innovation that can be achieved as an advantage of ECI.
5.5.3 Perceptions about the Disadvantages of Interweaving Models 1 & 2

The disadvantages of ECI are extensively discussed during the interviews because people have strong feelings about this issue. The representatives of ECI mention objectively found disadvantages from literature. The alterations following from the public procedure that might lead to a considerable amount of amendments, and the lacking competition after awarding, which implies one-to-one negotiations between client and contractor, both probably resulting in higher prices.

The DBFM people also recognise these disadvantages of competition and pricing, but add two striking issues to the list: Since the contractor is not experienced in planning procedures because it is not their core activity, the capability of the contractor as the right party for an innovative design is questioned. Also taking the principle of transparency into account, for instance in the awarding criteria, is a hard task to accomplish for the government. Therefore, this can be seen as a disadvantage as well. Of course these difficulties can be overcome, but especially in case of rather new developments this lacking experience has to be kept in mind. The public project managers are somewhat more negative, they claim from their own experiences in projects that the mentioned advantages of ECI are unlikely to be achieved in terms of innovation. The acceleration of procedures is not guaranteed according to them as well.

The private parties clearly have another interest, which results in other perceptions about ECI. Their disadvantages are motivated from a commercial point of view. The contractors consider ECI as a new and desirable development, but because there is only little knowledge and experience about it, it takes more time and is therefore more costly. In addition to this, contractors experience the high transaction costs in the competitive dialogue as a disadvantage. Preparation of a design is costly so especially the consortia that do not win the tender need to be compensated.

The legal advisors immediately link ECI to the procurement regulations: The principles of transparency and competition need to be taken into account, which is according to them task for the government. In conclusion the principle of interweaving as an approach is questioned, since the planning procedure is covered by public law while the procurement procedure and negotiations with contractors are found in private law, procedures might diverge as a result of appeals in the public procedure, which leads to the opposite of interweaving.

5.5.4 Perceptions about the Role of Uncertainties in Interweaving Models 1 & 2

Uncertainties play an important role in ECI because of the early stage and thereby the amount of uncertainties. Both the positive and the negative interpretation of uncertainties are used: The amount of risks threatening the project is higher in an early phase since no mitigation strategies are developed then yet, which results in the pricing of these risks. This implies fast clarity about time and budget, so uncertainties are banned in an earlier phase.

An example from the A2 Maastricht project:
In the A2 Maastricht project the possibility to gain information from the market during the competitive dialogue was intensively used: For a period of 3 years contractors joined the competitive dialogue, which expensed about 10 million euro per party. Parties only received a compensation of 1 million euro for this at the end, so private parties were not satisfied about the way the public client organised this. Characteristics of the A2 Maastricht project can be found in the Project Overview in Appendix A.

Box 5.2 - The dialogue in the A2 Maastricht project

The legal advisors immediately link ECI to the procurement regulations: The principles of transparency and competition need to be taken into account, which is according to them task for the government. In conclusion the principle of interweaving as an approach is questioned, since the planning procedure is covered by public law while the procurement procedure and negotiations with contractors are found in private law, procedures might diverge as a result of appeals in the public procedure, which leads to the opposite of interweaving.
These uncertainties can however be interpreted as opportunities to create added value as well, because creative ideas can only be thought up when there is enough solution space available. Especially the contractor, the main candidate for this role, recognises this opportunity. From a legal point of view decisions must not be made too strictly due to the amount of uncertainties, because in case of alterations or public failure, there have to be options for exit strategies and alterations to the design.

As a final statement about uncertainty, institutional complexity plays a large role in this issue, while it can cause delay in case public parties do not recognise the need for the project. Involving the contractor in this phase might become difficult because the government is not able to fulfil a facilitating role as no uniformity is achieved then.

5.5.5 Perceptions about the Added Value of Interweaving Models 1 & 2

As can be seen in Table 5.1, opinions about the added value of ECI are diverging, there are proponents in the RWS ECI department and in the private sector. The first group is convinced about the added value because it is shown in projects according to them, the contractors mainly consider ECI as an interesting options due to its related commercial benefits. Other parties however show strong resistance against this development, they are convinced of the fact that it is more expensive and does not lead to more innovation than for instance could be achieved by hiring an engineering company.

5.6 Comparing Theory and Practice

In this part the findings about ECI in literature and practice are compared by describing the differences and similarities in order to identify knowledge gaps and to enable crosslinking of useful information in the future. Subsequently the comparison is made for findings about the advantages, disadvantages, role of uncertainties and added value of ECI, to conclude with an overall statement about the comparison of theory and practice.

Advantages

Literature presents that the main advantages of ECI application are found in innovation and acceleration of procedures. Practical findings however narrow this to creative solutions in spatial plans and procedures are in practice not always passed more quickly. As a result of interweaving, another significant feature is found in the relationship between practice and theory. In literature, the improved relationship between client and contractor is often mentioned as one of the main advantages of ECI because that is considered to be the reason that innovative solutions are found and projects are delivered within planning and budgets. In practice however this view is clarified into a less strict cause-effect, as interviewees mention that the relationship depends on the involved people and the progress in the project. Due to the commercial interests of private parties the contract and financial consequences are considered to be leading. The longer relationship that follows from ECI definitely forces the parties to collaborate, but wrong fulfilment might result in an ‘unfortunate marriage’ that is unlikely to result in optimisations.

Disadvantages

Perceptions and literature about the disadvantages of ECI proved to be quite similar. The one-to-one negotiations between client and contractor after contract close are mentioned as a major disadvantage because it probably leads to a higher price as the competition is eliminated. Also the role of the government is often discussed, since it has the challenging obligation to ensure a level playing field, transparency and objectivity in ECI projects. In practice interviewees seemed to be more negative about the development than literature suggests, because they question the other parties’ capability in an early stage. Both Rijkswaterstaat and the contractors think that the other party first has to gain extra knowledge in this field.
To conclude with the disadvantage of transaction costs. Literature recommends to compensate these costs, the contractors in practice are more explicit and demanding, by stating that they will not participate in projects unless the high transaction costs are compensated by the public client.

**Role of Uncertainties**

Especially in practice the role of uncertainty is seen as a dynamic flow of increasing information, because many uncertainty is found early in the process. This amount of uncertainties is often pointed up as it is strongly related to the commercial perspective of the involved contractor as well. On the one hand as an opportunity to add value from the larger role in the design which provides a certain workflow, on the other hand because arrangements with the client need to be set-up to ensure that their risks are mitigated by for instance suitable exit and alteration options which is directly related to the idea that it is impossible to predict every development, because a certain amount of uncertainty will remain in projects. This is an issue that is less mentioned in literature, which fits the idea that much literature is written from a public point of view.

**Added Value**

Considerable differences can be found about the assumed added value of ECI. In literature ECI is positively reviewed in many documents, while in practice most actors proved to be quite critical about this development. Often they question the actual additional value that is created when it is deposited to the extra costs of ECI that follow from the one-to-one negotiations and the high transaction costs, they feel that consultants are able to execute the design activities as well. But the added value of the obligation to execute the own design is recognised as well, which ratifies the awarding of one single contract for plan development and realisation in an early phase.

**Conclusion**

In literature ECI is applied in order to realise an acceleration in procedures and to stimulate innovative solutions, which is coupled to the improved relationship between the public client and the contractor resulting from an earlier collaboration. Practical findings however show that the assumed advantages are not always achieved following from the commercial perspective of the contractor and the nature of the assignment. In road projects solution space is offered to the contractor to use the creativity of the market in spatial issues. The added value of ECI is not broadly recognised in both literature and practice because of the disadvantageous one-to-one negotiations, the high transaction costs and the doubts about the capability of both public and private parties that the other parties show about this new development. Therefore, it can be stated that the collected literature and practical findings are somewhat diverging which might be caused by the fact that ECI is not often applied yet in Dutch construction projects.
Combining Early Contractor Involvement and Availability-Based Contracting

6.1 Introduction

After analysing the main topics of my investigation, this chapter will discuss the intended purpose of the research: An investigation on the applicability and possibilities in the combination of ECI and ABC. It will elaborate on the experiences from the field and the theoretical findings from the previous chapters, complemented with literature and opinions from experts about the combination of Interweaving Models 1 & 2 with DBFM contracts. First the two approaches will be compared on conflicting and complementing aspects, then the role of uncertainties in the combination is described to identify which added value can be achieved and what difficulties have to be faced, to finally distil preconditions and find directions to enable the combination to conclude with findings about whether added value can be achieved by combining ECI and ABC.

6.2 Comparing ECI and ABC

In order to determine whether and how ECI and ABC can be combined, it is useful to investigate on which aspects the two approaches are conflicting and complementing. Added value can be realised from the complementing characteristics and the conflicting aspects need to be solved.

6.2.1 Complementing Aspects

Many complementing aspects can be found when the two approaches are combined. To start with the involvement of the contractor: In both ECI and ABC the contractor is actively involved to create higher ‘value for money’ from their assumed knowledge. This interpretation is twofold: It implies a lower price for a certain project or a qualitatively better project for a certain budget.

Controllability

To commence with the controlling ability of the contractor that results in a better management on time and budget. The public client is increasingly convinced of the fact that the contractor is able to manage the project in a more pragmatic and efficient way than governmental parties do, because they keep the time and budget stricter in mind from a commercial point of view. Therefore it is likely that time and cost overruns are decreasing when private parties are involved. In the ECI approach this is mainly found in the acceleration of the planning phase, in the ABC approach improvements are seen in the execution of the projects. These approaches positively complement each other on acceleration resulting from the added value from both a smoother planning process and a stricter time control during execution.

Optimisation

Not only does the involvement of the contractor imply a better timing, also the use of private knowledge can result in better solutions and integration of activities. In both ECI and ABC the contractor can optimise the design and implementation of the project following from the freedom they receive from the public client to execute the works to their own interpretation, as long as the availability of the road is guaranteed. This enables the contractor to come up with innovations and optimisations in the integration of activities and the specific execution, resulting in better project for a certain budget. The ECI approach steers on creative design solutions, while in the ABC approach mostly the integration of activities is optimised. The two approaches are complementing on the optimising ability of the contractor from both the creativity in the designing phase and the integration of activities in execution.
**Long-term Relationship**

In both ECI and ABC the public client and the consortium of private parties are involved in a long-term relationship with each other, in which they are sentenced to one another. In ECI the relationship is focused on the development of the project in the planning phase, the long relationship in ABC follows from the integration of more activities into one single contract, where especially the maintenance phase leads to a connection of parties for several decades. The long-term relationship between public and private parties often implies proper consultations and high commitment, but it has to be kept in mind that it also entails lacking competition and one-on-one negotiations, which might result in a higher price. As a conclusion, it can be stated that in case the two approaches are combined, the relationship between the public client and the private parties will enlarge in time, because of the accumulation of the involvement in an early stage from ECI and the long maturity of the contract from ABC.

**6.2.2 Conflicting Aspects**

Also conflicting features of the two approaches are identified. These are mainly found in the presence of uncertainties. In ECI the amount of uncertainties is considerable and definitely desirable because it is considered to provide opportunities for innovation and optimal solutions. It can even be stated that applying ECI without certain ambiguities is futile, while the market’s knowledge is then of no use for the project and no solution space is needed. In ABC projects however, risks are mitigated as much as possible because parties are involved financially as well, so uncertainty is undesirable as it can harm their financial models.

**Fencing-off the Contract vs. Broad Solution Space**

A striking conflicting aspect that is found when ECI and ABC are combined is the amount of room to manoeuvre for parties. In DBFM contracts the contract is completely fenced-off to ensure a proper risk division, while ECI implies a broad solution space to stimulate innovative ideas. These two principles are hard to combine. In case the two approaches must be combined, the solution space and risk division have to be guaranteed, without fencing-off the contract or preserving a too high amount of uncertainties.

**Committed Funding at Final Bid vs. Involvement before Draft Route Decision**

Also a large conflict is found in the private funding of the combination, resulting from the co-financing aspect of DBFM. The DBFM contract 3.0 version, the currently prevailing standard for this kind of projects in the Netherlands, requires committed funding for the whole lifecycle of the project at the Final Offer of the consortium in the tendering procedure, while financing parties require a clear and complete risk analysis as basis for their funding decision, which cannot be made before the Definite Route Decision or might result in considerable higher discount rates to cover these risks. The combination of ECI and ABC implies procurement before Draft Route Decision, which is more than a year before the Definite Route Decision, seems therefore hard to combine or will become extremely expensive as a result of the pricing of uncertainty. In case the two approaches have to be combined, a solution has to be found that does not harm the principles and is not extremely expensive.
6.3 Uncertainties and the Combination

6.3.1 The Role of Uncertainties
The uncertainties theory fits the combination of ABC and ECI well as uncertainty is playing a major role in this issue. In both ECI and ABC one must deal with uncertainties, on the one hand by handling risks appropriately as DBFM is focused on risk allocation, on the other hand by exploiting opportunities because ECI is applied to develop creative solutions. The challenge in the combination is to avoid accumulation of complexities and thereby high costs, but to ensure the creation of added value instead. Therefore, the role of risks and opportunities in the combination is discussed in the following paragraphs.

6.3.2 Opportunities in the Combination
It is important to identify the opportunities in the combination because these are considered to be the characteristics that can realise added value compared to the more traditional methods of a solely public planning process and the use of RAW or D&C contracts. They are following from the identified advantages and complementing aspects from the separate approaches as identified in the previous chapters and are discussed below.

Innovation
The presence of ECI in the combination provides an opportunity for innovative solutions. The early involvement enables the contractor to utilise the broader solution space as no Route Decision with extensive provisions is fixed yet. The contractors’ knowledge from the execution phase is used as valuable input in the design phase. Following from the nature of road projects, to which this research is delineated, innovation will mainly be found in creative spatial solutions or logistic optimisations.

Acceleration of Procedures
Resulting from the interweaving of the planning and tendering procedures as implication of ECI, the plan development phase will be passed more quickly than before. This results in an earlier start of the construction works and thereby an earlier availability of the road for its users.

Lifecycle Optimisation
Following from the addition of the maintenance component from DBFM, parties are having responsibility in the project for decades, which results in a plan that is based on the projects’ lifecycle. Activities are organised in such a way that an optimal availability is guaranteed for the long maturity of the project and interface risks between the activities are banned.

High Availability
The payment mechanism in DBFM projects is based on private investments during the start of the project and public repayments based on availability of the road during the exploitation of the project. Following from the relation between the degree of available lanes and the amount of availability payments, private parties ensure a high quality of the road to ensure availability as otherwise their financial models are harmed. This financial motivation consequently leads to a satisfied customer, since the road is highly available and qualitatively better on the long-term. Which can thus be considered as an expression of the increased optimisation in ‘value for money’.
Realisation within Time and Budget
Following from the financial involvement of DBFM private parties are forced to properly manage the project and the early involvement of these parties implies a clarity in costs and planning in an earlier stage as well. This increased clarity and controllability results in a realisation of the project within time and budget, which is considered to be an expression of the increased controllability in 'value for money'.

6.3.3 Risks in the Combination
Also the risks in the combination need to be identified because these are considered to be the characteristics that can threaten the projects' success. They are following from the disadvantages and conflicting aspects from the separate approaches as identified earlier are discussed below. A separation in three main risks can be found, the threats are therefore divided into institutional, legal and financial difficulties in this paragraph.

Institutional Difficulties
A risk that mainly follows from the early involvement of the market as a result of ECI is found in the public support for the project in the exploration and plan development phase. A clear distinction can be made here between Interweaving Models 1 & 2. Model 1 implies involvement of the market already before the Structure Vision/Preferred Decision, when the project is in the exploration phase and public support still has to be gained here in a political sense. This phase therefore entails many uncertainties about the continuation of the project and the risk for the political decision-making cannot be transferred to the private parties. Although private parties have enough room for innovative solutions in this early phase, actually contracting them for the realisation might be a bridge too far as they are possibly not the right consortium to execute the works.

In addition to this, the exploration phase is executed under authority of the Ministry of Infrastructure and Environment by name of the Directorate General Mobility (DGMo). After the Structure Vision/Preferred Decision the responsibility is transferred to the executive arm of the Ministry: Rijkswaterstaat. When parties are involved before this moment, which is the case in Model 1, they will also have to deal with two different clients and the interface risks following from this, which might cause difficulties as well. Due to the high level of uncertainties about the projects' continuation and characteristics, financial parties are not willing to participate in a project already, which makes the combination with DBFM hard to realise.

While the Model 1 with DBFM combination can be considered as an almost impossible political challenge, the combination with Model 2 seems to be more feasible. Model 2 starts with tendering after the Structure Vision/Preferred Decision when the likelihood of the projects' continuation is considerably enlarged because of the achieved political support. Now the involved local public entities like provinces and different cities need to agree on the project plan in the Route Decision, so back-up for the project from these parties is needed in this phase. Again, the public procedures cannot be influenced by the private consortium, so institutional support for the project is considered to be a precondition for the combination. Otherwise the private parties' involvement can lead to innovative solutions for which no permission will be achieved. Resulting from the fact that the project planning is evolved in detail in Model 2 compared to Model 1, fulfilment of Model 2's precondition of institutional support is more realistic than achieving the political support in Model 1. This enlarges the willingness of financial parties to participate in the funding of the project, which might enable a successful application of Model 2 with a DBFM contract.

Legal Difficulties
Also legal regulations cause risks in the combination, following from both ECI and ABC. This is strongly related to the fact that the projects to which this research is delineated are all obliged to tendering and thereby bounded to the national and European procurement and tendering regulations. This implies that tendering
principles like competition, transparency and objectivity need to be guaranteed during the whole maturity of the ECI and ABC execution. Because scope, budget and planning are often not fixed yet in case of early involvement, it is hard for the public client to think up transparent and objective output requirements and awarding criteria that are broad enough to remain flexible, and to warrant competition on the long-term as well.

In addition to this, also a diverging view from the legal fixation in ABC and ECI is found. DBFM contracts are strongly fenced-off as a result from the sharp risk allocation following from the financial consequences for private parties in case risk events occur, while in ECI a broad solution space is offered to provide room for creative solutions and thereby innovation. A balance between the necessary solution space and a controllable amount of uncertainties therefore needs to be developed in combination projects.

Financial Difficulties
The legal and institutional difficulties as discussed before are particularly the responsibility of the public client, but there are also challenges to be faced in the combination that are mainly a private problem. They are found in the funding of the project and are considered to be the hardest risk in the combination of ECI and ABC as these separate approaches have contrasting implications. The current DBFM standard contract, the 3.0 version that is currently applicable for these kind of projects, requires committed funding for the total duration of the contract already in the final bid, while financiers require a clear and complete risk analysis as basis for their funding decision, which cannot be made before the Definite Route Decision or might result in considerable higher discount rates to cover the risks. Because of the involvement of the contractor before the Draft Route Decision, which is more than a year before the Route Decision becomes definite, this implies a problem as this maturity is too long for a valid bid, so this is an impossibility or the combination will become extremely expensive combination due to pricing of uncertainties.
6.4 Perceptions about the Combination

Because of the fact that there is hardly literature to be found about the combination of ABC and DBFM, which shows the need for my investigation, perceptions of involved actors are of major importance as input for the determination of the possibilities and desirabilities in the combination. An overview of these perceptions is shown in Table 6.1. A distinction is made here between the different public, private and advisory parties and their ideas about several aspects of the combination. It needs to be kept in mind that these perceptions are gained in discussions about hypothetical situations, which considerably differs from the findings about the separate approaches of ECI and ABC because these statements where based on experiences.

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Difficulties</th>
<th>Solutions</th>
<th>Preconditions</th>
<th>Added Value?</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWS DBFM</td>
<td>- Solution space</td>
<td>- Procurings on partnership</td>
<td>- Mainly in an early stage</td>
<td></td>
<td>Probably, ECI with D&amp;C is better</td>
</tr>
<tr>
<td></td>
<td>- Lifecycle focus</td>
<td>- Alliances</td>
<td>- Questionable, more idealistic than realistic, more expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Efficiency</td>
<td>- DBM+F</td>
<td>- Yes, 1+1=3 in certain projects, otherwise costs &gt; added value</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Clarity in costs</td>
<td>- Best Value Procurement</td>
<td>- Yes, start a pilot project</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Value for Money</td>
<td>- Financiers are involved in the dialogue phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RWS ECI</td>
<td>- Solution space</td>
<td>- DBM+F</td>
<td>- Questionable, opportunities but more expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Lifecycle focus</td>
<td>- Best Value Procurement</td>
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<td></td>
<td>- Efficiency</td>
<td>- Financiers are involved in the dialogue phase</td>
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<tr>
<td></td>
<td>- Clarity in costs</td>
<td>- DBM+F</td>
<td>- Yes, start a pilot project</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- Value for Money</td>
<td>- Best Value Procurement</td>
<td>- Yes, start a pilot project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RWS PM</td>
<td>- Innovation</td>
<td>- DBM+F</td>
<td>- Questionable, opportunities but more expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Lifecycle approach</td>
<td>- Adjusting procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Efficiency</td>
<td>- 2 steps: Partnership + Pricing in competition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Clarity in costs</td>
<td>- Alliances</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Value for Money</td>
<td>- DBM+F</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Clear risk distribution</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Contractors</td>
<td>- Freedom and responsibility</td>
<td>- DBM+F</td>
<td>- Questionable</td>
<td></td>
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<tr>
<td></td>
<td>- Continuity of the works</td>
<td>- Alliances</td>
<td>- added value</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Contractors’ role</td>
<td>- DBM+F</td>
<td>- added value</td>
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<td></td>
<td></td>
<td>- Clear risk profile</td>
<td>- Maybe, added value can be achieved in other ways</td>
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<td>Per project decision</td>
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<td></td>
<td></td>
<td></td>
<td>Questionable due to financing aspect</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Maybe, many difficulties and more expensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Parties</td>
<td>- Committed Funding &amp; ECI</td>
<td>- DBM+F</td>
<td>- Clear risk profile</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- High transaction costs</td>
<td>- Alliances</td>
<td>Questionable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- DBM+F</td>
<td>- Maybe, many difficulties and more expensive</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Roll-over commitments</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Compensation costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Clear requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal Advisors</td>
<td>- Innovation</td>
<td>- DBM+F</td>
<td>- Exit options</td>
<td>Only in an early stage</td>
<td>Probably</td>
</tr>
<tr>
<td></td>
<td>- Demand for legal advice</td>
<td>- Adjusting procedures</td>
<td>- Clear requirements</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- 2 steps: Partnership + Pricing in competition</td>
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<tr>
<td></td>
<td></td>
<td>- Competition</td>
<td></td>
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<td></td>
<td></td>
<td>- Transparency</td>
<td></td>
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</tbody>
</table>

Table 6.1 - Perceptions about the Combination
6.4.1 Interests of the Different Parties in the Combination

Also for the combination the interests of the different parties are collected, since they are influential on the perceptions about the combination of ECI and DBFM. The interests per party are shown in Table 6.2.

| RWS DBFM | The employees from the DBFM department within Rijkswaterstaat are convinced of the added value of DBFM. They are having a considerable stake in the combination because DBFM is one of the two pillars. The application of this combination might result in an increasing amount of DBFM projects, which is beneficial for them as department since their activities will grow. |
| RWS ECI | The ECI departments’ employees within Rijkswaterstaat are convinced of the added value of ECI. They also have a considerable stake in the combination because ECI is the other pillar in the combination. The application of this combination might result in an increasing amount of ECI projects, which is beneficial for them as department since their activities will grow. In addition to this, they are very curious about the combination so they are pleading for a pilot project. |
| RWS PM | The projectmanagers from Rijkswaterstaat have an interest in the combination in case it will be applied in the future as they have to deal with the result then on a daily basis. |
| Contractors | The contractors are as a private party mainly interested in the commercial perspective, application of this combination implies a more important role for the contractor with increasing responsibilities and integral activities. Therefore, the contractors’ goal in the combination is to combine the approaches in the most beneficial way for them. It should be mentioned here that the combination is mainly attractive for large contractor companies, since they are the only ones with the required capabilities. |
| Financial Parties | The financial parties are solely involved from a commercial point of view. They provide funding for DBFM projects based on a risk analysis. In case of ECI the amount of uncertainties is probably to high and will hamper a complete project analysis then. The financial parties' goal in the combination is therefore to postpone the moment of funding until enough certainty is achieved to base their investment decision on. |
| Legal Advisors | Legal advisors are used in two ways: As an advisor for the graduation research, here they are mainly interested in the difficulties and preconditions. In their role as legal advisor for the combination they are interested commercially. Due to the complexity of the combination many legal advice is needed so the combination implies an increasing amount of activities for them. |

Table 6.2 - Interests of the Different Parties in the Combination

6.4.2 Perceptions about Opportunities in the Combination

A clear distinction can be noticed between the different roles of the parties in the perceived opportunities in the combination. The perceptions of the public interviewees are quite similar. Opportunities are recognised in the sum of the advantages of the two approaches, namely the ‘value for money’ which can be found in the increased quality and controllability, the broader solution space and thereby room for innovation, and an earlier clarity about planning and costs. The interpretation of the possible innovations in projects however seem to differ. Some interviewees claim that there is hardly any room for innovation in road projects and that the contractor will only optimise the logistical process, others think that the contractor can also add value in the creative solutions for spatial integration and in the technical execution.

The private parties are having significantly different ideas about the opportunities combination, which clearly is an expression of their own commercial interests. Contractors mainly see advantages in the freedom and responsibility that they will receive, as it enables them to actually influence the design and process now. This more important role gives them an opportunity to be distinctive in the market. Also this combination implies a longer time span of works following from the different disciplines into one single contract, this certain continuity of the works is attractive for them.
The financial parties do not see significant advantages in the combination since they want to invest in projects based on risk profiles and the combination entails too much uncertainties to their sense. The legal advisors assume that the combination will result in increasing innovation in the design of projects, but their main opportunity is found in the growth of legal demand resulting from the complexity of the combination.

6.4.3 Perceptions about Difficulties in the Combination

In the perceptions about the difficulties in the combination the parties are having quite similar ideas, therefore this topic is discussed here in a more general way. All the interviewees mention the fact that the private funding will be difficult as the requirement for committed funding from the DBFM standard contract and the tendering before Draft Rout Decision are hard to combine. There is a conflict here because banks will only provide committed funding at the earliest when the comments on the Route Decision are known, so the maturity between these moments is too long for a valid bid at the Draft Route Decision.

In addition to this, challenges are seen in guaranteeing competition, because early awarding of the contract implies one-to-one negotiations from an early phase. This might result in a higher price from the contractor which makes the project more expensive. Proponents however see this one-to-one situation as an advantage because only then contractors will be able to show their creative solutions, as otherwise the risk of cherry-picking or copying by competitors is too high for them.

Other disadvantages in the combination are mentioned by less interviewees, but still have to be kept in mind in future projects. The contractors think that Rijkswaterstaat has to change significantly as organisation to ensure a successful combination. At this moment this public client is not able to play the facilitating role as they want to stay involved in the details while they must become a controller in projects, with a main concern of guaranteeing the transparency and competition. Finally, the considerable transaction costs must be decreased or compensated as much as possible, since experiences have shown their undesirability for private parties and thereby for the public client.

6.4.4 Perceptions about Solutions for the Combination

During the interviews also possible solutions to successfully combine ECI and ABC are discussed with the different parties. A striking fact in analysing the perceived solutions, is that the ideas show many similarities. However, the assumed usefulness of specific ideas is often questioned and parties want to ensure that their interest is kept in mind. This is valuable information as well because it results in a more complete insight in advantages and disadvantages, and thereby the applicability, of the specific solutions. Globally, a distinction can be made between four directions: Namely maximization of the given planning framework for solutions, postponement of funding obligations, provision of settlements to overcome the risks and procurement based on partnership selection. The perceived solutions per direction are shortly discussed here, an extensive explanation of their characteristics and implications is given in Chapter 7.

To start with the direction of broadening solution space in the planning procedure. This idea is considered to be a promising solution by interviewees that struggle with the combination of ECI and ABC on a daily basis, for instance in the ViA15 and Hoevelaken project. It entails the set up of such a broad framework for the Draft Route Decision, that on the one hand enough room for innovative solution is provided, and on the other hand plausible institutional and social support can be expected. In this case procedures can be completed so quickly that the validity of the bids is not harmed.
Another direction that prevents difficulties in the combination is found in postponing of funding obligations of the DBFM contract. This implies the use of financial sources on the required moment following from the specific obligations. A solution can be the execution of a so-called 'Dept Funding Competition', the DBM+F form, in which the project is developed by the DBM consortium in advance and the funding is regulated at a later stage when financial parties are willing to participate in the project, also in this case the validity of the financial offers is not affected. The phasing can also be interpreted in another way that meets the financial parties' interests, namely by splitting the D&B phase with short-term funding and the M phase with long-term funding. In this case less uncertainties about the long-term harm the financial models of banks so funding will be provided for the construction period. The long maintenance period is then regulated on a later moment when institutional investors are interested in funding of a safer long-term loan.

Another possible direction is the provision of settlements for the changing risks in the early stages of projects. When parties agree on suitable arrangements in case of changing circumstances, funding can already be provided in this phase. This can happen on two different ways: By using roll-over commitments that enable the financial party to revise their bids on a regular basis and by procurement on margins or flexible assumptions about costs and planning, that can be adjusted over time.

A final direction is found in another method of tendering, which is based on the idea that selection of a good partner is evident and full pricing is not possible yet in case of early involvement. It implies a selection in 2 steps: First the partnership for the plan development is selected to stimulate innovative solutions, later pricing takes place in competition to ensure a suitable price. This method of incremental commitment reasons from the idea that the developing party will execute the construction and maintenance phase as well in case a reasonable price is given.

To conclude, many interviewees are positive about the applicability of alliances in the development of projects as this approach implies better collaboration between the public client and the private parties since it entails a better risk sharing mechanism. Because of the fact that alliances are not by definition related to a specific contract form or moment in the planning procedure, this recommendation is considered to be an advice that does not fit the delineation of the research. Therefore it will only be mentioned in the considerations for further research in this report.

6.4.5 Perceptions about Preconditions for the Combination

The perceived preconditions for a successful combination of ECI and ABC are related to the difficulties resulting from the financial, constitutional and legal difficulties that have to be faced. From a legal perspective, resulting from EU procurement and tendering regulations, the public client has to guarantee a level playing field by securing a transparent and competitive process. This issue is not only mentioned by the legal advisors, also Rijkswaterstaat recognises this as responsible party to ensure these preconditions. The private parties state that the governments’ capability in this field is evolving, but still their ability to provide clear requirements to private parties needs improvement as this is considered to be an important precondition for the combination.

The ECI department of Rijkswaterstaat emphasizes on the importance of involvement of at least one financial party in the dialogue phase of the project, because of the assumed added value of their controlling activities and the security that funding will be provided in a later stage. This precondition is not broadly recognised as other parties believe that this is impossible or not necessary for a design that fits the budget. The financial parties even show a contrasting view here as they see a clear risk profile as a precondition for funding provision in combination projects.
In addition to this, the public and private project managers and legal advisors mention the use of exit options and options for alterations in a later stage as an important precondition in contracts when this combination is applied. This implies on the one hand a suitable compensation for the executed works in case the activities do not pursue, without compensation for future financial losses, and on the other hand a workable contract in case of changing conditions. This precondition can be extended to the requirement that incentives must be provided to all parties that execute activities for the project, so all consortia that participate in the tendering procedure must receive a proper compensation for the transaction costs that went along with this.

6.4.6 Perceptions about the Added Value of the Combination

This research is not only executed to identify whether and how ECI and ABC can be combined in projects, an essential aspect is whether added value can be achieved with this combination compared to a situation where only one of the separate approaches is applied. The different parties have diverging ideas about the applicability of the combination, so a description about the perceived added value is given per party here.

Already within the public authority differences can be found about this. The ECI employees are positive about it, although they assume that it will not be suitable for every project. In certain projects a considerable added value can be created with ECI and ABC, as it will be a cumulation of the advantages of the separate approaches. Not only will this combination result in more innovative spatial solutions, projects will also be executed with a higher value for money according to them.

The DBFM department within Rijkswaterstaat reveals a more critical view about the combination by stating that the added value is questionable, as it is a more idealistic than realistic idea that only the advantages of the combination will be revealed in the combination. It is probably a more expensive option than traditional procurement due to the one-to-one negotiations, so they think that only in case considerable innovative solutions are found, the combination can deliver added value. Otherwise a DBFM contract with later involvement or early involvement with a D&C contract might be more suitable according to them. The public project managers agree with this perception, as they recognise the opportunities from both advantages in practice, but they question the idea that the added value will exceed the additional costs in this combination.

In contrast to this view, contractors do think that added value can be realised with this combination as in their perception the disadvantages of DBFM are compensated with the advantages of ECI. They appreciate the increased responsibilities and amount of activities. It is a desirable development from a commercial point of view for them.

The financial parties and the legal advisors are less outspoken about the added value of the combination. Financiers perceive that it is questionable to be achieved due to the many difficulties that have to be faced and the fact that it will be more expensive, legal advisors think that the combination can only be successful when it is applied in an early stage since then considerable added value can be created as a result from the broader solution space.

As a conclusion it can therefore be stated that this research shows that the added value of combining ABC and ECI is not broadly recognised, at least it has to be applied in an early phase to utilize the given freedom in the design and it has to be prevented that the disadvantages and difficulties exceed the assumed advantages and opportunities.
6.4.7 Perceptions about the Future of the Combination

Ideas about the likelihood that ABC and ECI will be combined in the future are discussed concisely as this clearly relates to the perceptions that parties have about the added value of the combination. The ECI employees, who have the most positive perception about the combination, are most convinced about its application in the future. According to them, enough information is gained, now it is time to apply it in a pilot project to test its implications. All other parties show doubts about the future, mainly due to the financial difficulties and the fact that value might also be achieved with another combination.

6.5 Comparing Theory and Practice

This part aims to compare findings from theory and practice about the combination of Interweaving Models 1 & 2 and DBFM contracts in order to identify differences and similarities to enable crosslinking of the information. Following from the fact that hardly any genuine literature is found about this specific combination, a study is performed on policy documents and literature about adjacent fields and the analysing and crosslinking of information is applied based on own insights.

**Opportunities**

In theory a clear idea about the opportunities is exposed as the cumulation of advantages is considered to provide opportunities for the combination. In practice however, these advantages are less broadly recognised because parties question the actual results from the separate approaches.

**Difficulties**

No complete overview of the difficulties in the combination of ECI and ABC was found in theory. Therefore, these findings are composed of different documents related to the specific fields of expertise. In the interviews parties proved to be able to empathize with other parties, which resulted in a broader image about the difficulties in the combination from practice than in theory.

**Solutions**

Due to the fact that the combination of ECI and ABC is hardly discussed in theoretical documents, information about possible solutions is scarce as well. Therefore, the ideas for possible solutions have a clear basis in the interviews. The necessary information for the actual application of specific solutions however did come from theory as solutions have been adopted from other fields.

**Preconditions**

The preconditions are distilled from the interviews as well. They can be explained by the preconditions for the separate approaches and are therefore justified by theoretical findings.

**Added Value & Future**

Because again no information could be collected about the these issues in literature, the subjects of added value and future of the combination are discussed here together because their justification is strongly related to each other. It is based on hypothetical assumptions from experts in the field that cannot be supported by practical experiences. Therefore, the subjectivity has to be kept in mind in assessing these parts.

**Conclusion**

Following from the subjectivity of the findings in this chapter as a result of lacking literature and hypothetical perceptions, a complete comparison between theory and practice could not be made. Therefore, the interviews are used as main source for this chapter and literature is used to back-up certain issues with explanations.
7 Model Design

7.1 Introduction
The goal in this graduation thesis is to investigate whether and how added value can be created for the public client by combining Early Contractor Involvement (ECI) and Availability-Based Contracting (ABC). In the previous chapters literature was studied and information from practice was collected as input for a new model to realise a successful combination. This chapter entails the actual model design.

7.2 Model Structure
Due to the fact that each project is unique and different characteristics need to be kept in mind in every specific project, it is unlikely to come up with one single solution for combining ECI and ABC. Therefore it is more desirable to develop an overall framework with different solutions and a framework that ensures that risks threatening the project are kept in mind properly and that opportunities to add value are recognised and used.

In this thesis the combination of ECI and ABC is translated into two models, which are both designed as a core element with four different components. The first model contains preconditions and is set-up as a controlling framework, because it entails requirements that have to be met when the two approaches are combined. Only when all preconditions are sufficient, there is an opportunity to successfully combine ECI and ABC, a so-called window of opportunity. This model is inwardly directed as the preconditions lead to the solution, which is finding the window of opportunity. In case not all requirements are met there is no window of opportunity.

The second model contains possible solutions for the combination. In this model the window of opportunity is the starting point and the goal is to find a suitable method to combine ECI and ABC. In this case the components are directed outwards from the core, because the opportunity is considered as the base and there are multiple ways to realise the combination. In contrast to the preconditions model, this framework is open for new solutions, assuming that each project has its own specific characteristics and that the future will bring new insights and thereby solutions. The following paragraphs present the preconditions and solutions models and will extensively elaborate on their implications.

7.3 Preconditions
Following from the specific features of both ABC and ECI, DBFM and Interweaving Models 1 & 2 are not suitable for every project. These approaches are developed with a clear motivation and will only create additional value when they are applied as intended. Therefore, it is important to identify which preconditions have to be met in order to select projects for a successful combination. These preconditions are collected from both theoretical and practical input from literature, policy documents and interviews and have a strong relationship with the preconditions for the separate approaches op both ABC and ECI. Following from the starting point in the design process to develop an abstract model as this fits the abstract level of the research, the preconditions are set-up in a comparable way as it endeavours to capture the whole range of specific identified preconditions from both the contractors, the independent advisors and the public client. It assumes that each precondition can be grouped under the overall terms that serve as an umbrella, so the overall terms are developed on a comparable level of generalism. When all of these preconditions are met a window of opportunity is found for combining ECI and ABC, therefore the conditions are described and explained in the following part.
7.3.1 Institutional Consensus

A first precondition is the existence of institutional consensus. This includes that all the involved public entities admit the problem and recognise the necessity for the project. Commitment of public parties, entailing for instance the different provinces and cities that are representing their inhabitants, is considered to be a requirement for the combination because it predicts the smoothness of the planning procedure. It implies political conformation as well (Bundgaard, Klazinga, & Visser, 2011), which is formally regulated in the Preferred Decision and needs to be warranted by both the Ministry of Infrastructure and Environment and Rijkswaterstaat as changing responsible entities. Therefore, it can be stated that when the project becomes an institutional issue, the likelihood of execution considerably decreases, so this preferably has to be achieved before market involvement in combined projects (Lenferink, Tillema, & Arts, 2009).

7.3.2 Complex Project

A certain degree of complexity in the project is also required because ECI is part of the combination for the broader solution space. Added value can be created in case optimisations are expected from the market in this phase. In case the public client has in-house expertise or when the project is considered to be straightforward, input from the market is needless in the plan development which makes the addition of ECI in the combination difficult and unnecessary. Following from the intention of Rijkswaterstaat to become a more facilitating public client, this might also imply a certain complexity or task that does not fit this policy. Concluding, a certain complexity is considered to be one of the preconditions for the combination of ECI and DBFM as it implies a need for market involvement to perform activities that the government is not able or willing to execute.

7.3.3 Capable Client

Following from the procurement and tendering principles and regulations from both ABC and ECI, the public client is forced to ensure proper circumstances for private parties. Amongst other this implies the guarantee of a level playing field with competition and an objective and transparent process during the whole maturity of the contract. In addition to this, these principles need to be secured in the selection procedure as well, with clear and objective output specifications and criteria and a transparent choice for the preferred bidder in the project (Bundgaard, Klazinga, & Visser, 2011). Only when the government is able to show professional behaviour and thereby being a capable client, which can be controlled by a critical audit process, the approaches of ECI and ABC can successfully be combined.

7.3.4 Capable Market

Another precondition for the combination is derived from the closer involvement of the market as a result of DBFM and ECI. The market in this definition entails all commercial parties, so the bank consortium and the contractors both match this description. They need to have the capability to execute the activities in combined ECI and ABC projects. Private parties should have the requested knowledge for projects, otherwise their involvement will not result in added value from the advantages of ECI and ABC. This expertise entails knowledge about the public planning procedure and its supervenient activities and implications on the one hand, because parties are involved in the cross-linking of information as a result of the interweaving of the planning and tendering procedure. On the other hand parties need to have significant relevant knowledge about for instance technical features, logistics, funding and other project-related competences since these issues are considered to deliver additional value as input for creative solutions. It needs to be kept in mind that this precondition is strongly related to the capability of the public client, because this party determines which quality is required for projects and it is their task to arrange the process in such a way that this quality will be achieved.
7.4 The C4 Model with Compulsory Conditions for the Combination

The C4 model, as shown in Figure 7.2 is composed of four quadrants that have to be fulfilled in order to find a window of opportunity for combining ABC and ECI. It exists of two axes that have a relationship in it. There is a horizontal category with a complex market and thereby a need for knowledge from the market on the right and on the left a capable market that is willing to participate in combination projects, so an expression of supply and demand. The vertical axis is based on the role of the public parties, with on the one hand the capability to fulfil their responsibility to actively arrange the project and process in a transparent, competitive and objective way, and on the other hand the existence of institutional consensus.

As stated before, the goal of the preconditions check is to identify whether a window of opportunity can be found for combined ECI and ABC projects. Resulting from the fact that the window of opportunity is only revealed when all preconditions are present, the preconditions are pointing inwards to the core of the model. This model does not imply that all projects that meet these criteria are instantly suitable for the combination of ECI and ABC, an expert team has to assess the project specific features as well in order to identify whether value can be created.
7.5 From Preconditions to Solutions

This part contains an explanation of the process that took place in order to develop a framework with solutions from the gained information during the practical and empirical research. It elaborates on the process of analysing by explaining the sequent steps and discussing the encountered considerations. The consecutive activities in the determination of suitable solutions have a converging character, entailing the next sequence of steps: First an exploratory investigation is executed in order to identify a broad spectrum of possible solutions, then these ideas are explored on a more detailed level by mapping their features, in order to finally select suitable solutions and reject unservable options for the delineated research.

The actual accomplishment of these activities proved to be less straightforward than described above. Possible solutions were mentioned during the interviews and suggested in several policy and literature documents, but due to the new nature of the combination of ABC and ECI all ideas entail expectations and their applicability is partly subjectively judged as it has not been tested in projects yet. This is a considerable contrast compared to the gained information about the separate approaches of ABC and ECI because this information is supported and thereby validated by genuine experiences. The subjectivity in solutions for the combination results in a chaos of divergent ideas is therefore kept in mind in the analysing phase, which points up the necessity to investigate the corresponding features of the solutions in the following phase.

The range of possible solutions for a combination of ABC and ECI as gained in the exploratory phase is far-reaching and dissimilar, so further research is evident and executed in both sequel interviews and related documents in order to develop a complete image of their applicability. Therefore, the mentioned solutions and their motivations are shortly described below:

- **Procurement on Partnership**: Another method of tendering than traditional procurement that is based on the idea that selection of a good partner is evident and full pricing not possible yet in case of early involvement.
- **Best Value Procurement**: A procurement method in which selection of a suitable partner is based on both personal and quantitative elements in order to select that party that is best able to create value for society with the project.
- **Adjusting procedures**: The set up of such a broad framework for the Draft Route Decision, that on the one hand enough room for innovative solution is provided, and on the other hand plausible institutional and social support can be expected. In this case procedures can be completed so quickly that the validity of the bids is not harmed.
- **DBM+F**: Project development by the DBM consortium in advance and the funding is regulated at a later stage when financial parties are willing to participate in the project so the validity of the financial offer is not affected.
- **DBF+MF**: Splitting of D&B phase with short-term funding and the M phase with long-term funding.
- **Alliances**: A collaborative partnership between client and contractor in which risks and benefits are shared in an equivalent division in order to achieve better value for money as a result of good cooperation between actors.
- **2-Step-model**: Partnership + Pricing in competition: Method of incremental commitment in which first the partnership for the plan development is selected to stimulate innovative solutions, and later pricing is regulated in competition to ensure a suitable price.
- **Roll-over commitments**: Regulations that enable the financial party to revise their bids on a regular basis to overcome changing circumstances in order to achieve bank involvement in an early phase.
- **Awarding on assumptions/margins**: Awarding on margins or assumptions with regulations for flexibility in case changes occur as a method to tender a DBFM contract in an early stage.
When these solutions are compared to the delineation of the graduation research, the option of alliances is excluded from the suitable solutions list. This can be explained by the fact that alliances are not related to a specific contract form or timing of procurement, which shows its generality and therefore lacking specificness for the combination of ECI and ABC.

A stronger relationship between ECI, ABC, or the combination of these approaches can be found in the other options. Procurement on partnership, Best Value Procurement and the 2-step-model of partnering and pricing in competition are seen as options that enable a broad solution space for the market, which is an important element of ECI. DBM+F an DBF+MF are obvious interpretations of ABC since the use of a DBFM contract is evident in these solutions. Finally, the options of adjusting procedures, roll-over commitments and awarding on assumptions or margins reason from the idea that exceeding the validity of the bid needs to be prevented in an interweaving procedure. These solutions are based on the use of both private funding and interweaving of planning and tendering procedure, which are clear consequences of ECI and ABC.

Following from the fact that except for the alliances option each solution entails a relationship with at least one of the components of the combination of ECI and ABC, all remaining options are considered to be suitable for the combination to some extent. The process can be caught in the an abstract image as shown in Figure 7.3.

Figure 7.3 – The Development of Solutions

Hereafter, this range of solutions is compared to each other on distinctive aspects and subsequently translated into a workable amount of equivalent options. Following from the analogous characteristics and principles in the several ideas a classification is developed with directions that are able to serve as a guiding umbrella terms. The following solutions are grouped in an umbrella direction based on a distinctive aspect:

- The adjustment of procedures is based on the idea of a subordinate tendering procedure and a leading planning procedure as public procedures have to be passed easily so enough room for private creativity is provided here.
- DBM+F and DBF+MF are both interpretations of DBFM in such a way that the funding obligations become feasible for the financiers as they are postponed or splitted to a desirable moment when enough certainty is achieved.
- The options of roll-over commitments and awarding on margins or assumptions are similar in the fact that procurement and financial close are taking place within a desired period, as agreements are obtained in case circumstances and thereby risk profiles are shifting.
- The 2-Step-model with partnership and pricing in competition, procurement on partnership and Best Value Procurement show resemblance on the idea that the selection of a good team is leading in an early stage.
These four directions endeavour a complete picture of the current specific directions for solutions that enable a simultaneous application of both ECI and ABC. Therefore, they are extensively described in the following paragraph. First an elaboration is provided on characteristics together with a clear image of the specific interweaving interpretation. Afterwards the role of uncertainties is discussed because it is expected to be considerable as it is earlier selected as scientific framework. To continue with the final part of the analysis that takes place in the rating of the defined solutions on assumed complementing and conflicting aspects in order to check the applicability and subsequently develop a conformable model. This is extended with an elaboration on the implications of the specific directions for involved actors to determine the desirability in specific cases, to finish with a conclusion about the direction in general.

7.6 Directions for Possible Solutions

After the occurrence of a window of opportunity for the combination of ABC and ECI, the actual combining still has to be realised. Following from the difficulties that are expected to be faced in the implementation, it is unlikely that DBFM and ECI can simply be applied simultaneously. Therefore directions to prevent these issues and thereby to realise a combined application are identified and grouped here. Resulting from an analysis on practical experiences and insights from literature as described in the previous section four main directions with different implications are found as possible solutions. Resulting from the fact that it is almost impossible to meet all preconditions in the Model 1 approach, Model 2 is used as a starting point in the developed solutions. These four solutions present the current available knowledge about this topic and each potential possibility is processed in it. This rating is based on the assumed adding value components and difficulties in the combination as identified in Chapter 6 and judged by ascribing a matching icon to provide a clear overview. Three icons can be used for this purpose: The green checkmark as a sign that the demanded condition can be achieved, the orange query as symbol for a questionable success, and a red cross that shows the impossibility of the option. Afterwards, a nuancing explanation with f.i. issues to keep in mind in case of application is described as well in order to complete the image with refined statements. Therefore, the following paragraphs elaborate extensively on the identified solutions. Their characteristics, advantages and issues to keep in mind are described and subsequently composed in a final model.

7.6.1 Maximizing Planning Solution Space

Characteristics

In this direction the solution space is broadened in such a way that every thinkable solution will suit the Route Decision in order to pass procedures in an optimal way to ensure that the validity of the final bid is not harmed. In this option no adjustments have to be made to the current procedures as the financial, institutional and legal challenges are not an issue. Because of the demand for a committed bid and a requirement from financiers to execute the financial close (FC) after the Route Decision (RD), the validity of this bid is only achieved in case of a late Model 2 scenario with a public client being responsible for the development of the Draft Route Decision. The Draft RD in this case has a quite basic design in order to fit a broad range of solutions in the future. This provides maximal solution space to private parties. This scenario is considered to be a reasonable option for the ViA15 Project (Projectbureau ViA15, 2012) and is shown in interweaved procedures in Figure 7.4.
Uncertainties

This option entails an important role of uncertainties, both as opportunities to add value and as risks threatening the project. The opportunities to add value in this direction are discussed here. To start with the fact that this approach enables parties to smoothly pass the public procedure which results in an unharmed validity of the final bid. In addition to this, solution space is given to private parties to develop a creative solution so there is room for innovation. To conclude with the likelihood that a fundable plan is developed following from this approach is high as a framework is provided by the public client.

There are points of interest to keep in mind as well in case of application since they can threat the project result. There is an important role for the public client. Minimum plans from the private parties that fit the framework as provided by the government might win the tender, so the public client must ensure that the requirements and awarding criteria are set-up in such a way that the worst propositions will still meet the desired quality. There is always a risk that the procedures are not passed as smooth as proposed because it is impossible to predict all appeals. In case appeals are lodges the maturity of the procedures might be prolonged then, which might result in an exceeded validity time.

Score on Added Value and Difficulties

This approach is evaluated from the clients' perspective on the assumed advantages and difficulties in the combination in order to determine whether this is a suitable solution. The findings are summarised in Table 7.1 and explained in this paragraph as well. The identified opportunities in the combination are innovation, acceleration of procedures, lifecycle optimisation, high availability and realisation within time and budget.

As shown in the table, the last three advantages that are following from the DBFM contract can be achieved with this combination. This is explained by the fact that a complete consortium is involved from the start. The presence of a financial party in the development and the general financial responsibilities and consequences for private parties ensure a focus on lifecycle, availability and a strict control on planning and costs. The acceleration of procedures that follows from the interweaving approach and the steering on a suitable Draft Route Decision can also be achieved. The other positive feature of ECI, the use of the markets' creativity for innovation, is questionable in this specific combination.

Table 7.1 – Maximizing Solution Space
This can be explained by the fact that the public client determines the framework for creativity, which might delimit the room for innovative solutions as it has to fit the public idea. The score on the difficulties is comparable to this, a positive score on all the three defined difficulties can be achieved. The legal difficulties can be ward off by professional commissioning from the government, no extra activities need to be executed compared to the separate forms in terms of procurement principles. Also no additional institutional difficulties have to be expected as this form attempts to ban all institutional difficulties before the interweaving starts. There is however a financial difficulty that might occur in this approach: It is developed to pass procedures smoothly so no financial tricks are needed. But in case appeals are lodged in the public planning procedure, the validity of the final bid might be exceeded, which immediately harms the limit of this specific combination. No consensus about funding can be reached within this model in case of delay, which is a considerable threat of this approach.

Implications for Involved Actors
The maximizing the solution space direction has implications for the involved actors as they actively participate in the process. The public client has a major role in this solution, since it has to determine which requirements and criteria have to be met to realise a certain quality. The public client develops a broad Draft Route Decision and has to guarantee competition, transparency and an objective view in the procedures. In addition to this, they have to mitigate the risk of appeals during the planning procedure as much as possible in advance in order to pass the procedures smoothly. The private consortiums’ role is comparable with their role in the separate approaches as they are involved in the tender procedure as a complete consortium with a funding party. Following from their considered roles in this solution it seems desirable for the public client and the contractor as no adjustments to the existing approaches have to be made.

Conclusion
As a conclusion about this direction of broadening the solution space it can be stated that this solution seems to be a good option as the separate approaches do not have to be adjusted to each other. When this option is properly executed no institutional, legal or financial difficulties have to be faced and professional behaviour of the public client can result in a positive score on the several advantages of the combination. However, some characteristics of this solution are questionable and might impede a successful combination. On the one hand, this solution is only applicable for a late Model 2 approach where the client is still responsible for the development of the Draft Route Decision, leading to decreased possibilities for innovation. On the other hand the solution requires a smooth passing of the planning procedure to maintain the validity of the final bid, which is harmed in case of appeals that cause delays. Then the combination cannot be executed in accordance with this approach.

7.6.2 Postponed Funding
The second direction for a successful combination of ECI and DFM is found in the splitting of funding obligations. This is regulated then in such a way that the funding party that is best in it, is involved at the desired moment to execute the activity. This implies a potential variety of funding partners in the consortium with a public client that accommodates this opportunity for the private partners. The most striking interpretation of this direction is found in the so-called ‘Dept Funding Competition’, a solution where the F component is detached from the DBM activities, therefore it is explained in the following part.
Characteristics
In the dept funding competition the DBM activities are developed with a consortium without committed funding since the actual private funding is postponed to a moment that financial parties are willing to invest in the project. Therefore, this can be considered as the DBM+F form. Theoretically, financial parties are willing to participate when a clear and extensive risk analysis shows the feasibility of the project, this analysis is executed in the technical, legal and financial ‘due diligence’ that can be performed when each uncertainty is banned, so when the Route Decision has become definite. In practice however, according to these investors enough knowledge can be gained already when the appeals on the Route Decision are acquainted. Therefore, after the Route Decision the dept funding competition for the developed design of the DBM consortium is initiated, to obtain a competitive price for the project. The interweaving approach following from this DBM+F form is shown in Figure 7.5.

Uncertainties
Uncertainty is playing a major role in this solution, because this solution is developed as an answer to the perception of financial parties that the amount of uncertainties in an early phase is too high. Although the presence of uncertainties implies an opportunity for contracting parties to realise creative optimisations, financial parties only consider their existence as a threat for their financial models since no complete risk analyses can be executed. This approach however implies other uncertainties in both opportunities and risks.

Opportunities are found in the possibility to contract a good consortium for design, realisation and maintenance in an early stage. In addition to this, financial parties see an opportunity in the later involvement following from the opportunity cost of money: In this approach they are not obliged to reserve money for a consortium in the tendering procedure, what might turn out to be superfluous in case of a lost tender. The dept funding competition implies the funding of the winning design, resulting in the assurance that the project will be executed.

Risks that threaten the project are however a consequence of the later involvement of a financial party as well. The ‘watchdog’ role of the financial parties is not present in the design phase in this approach, which might harm project results in the future following from an insufficient design. Therefore, these risks need to be captured by the involvement of at least one financial party that supports the project already from the start. A committed bid will not be provided in such an early phase, but regular control on feasibility is incorporated then (PPS Kennispool Rijkswaterstaat, 2009).
Score on Added Value and Difficulties

This solution is evaluated on the advantages and difficulties of the combination to identify whether organising a dept funding competition can result in added value for the public client. The findings are summarised in Table 7.2 and explained extensively in the following paragraph.

A positive score on the adding value characteristics on all the advantages of DBFM can be achieved when a dept funding competition is applied. Following from the requirement of a financial advisor in the consortium it is likely that lifecycle optimisation, high availability and a project realisation within time and budget are associated results. This can be explained by the fact that the consortium exists of capable parties for the design, build and maintenance activities and that the private funding aspect leads to a stricter steering on costs and planning. Also innovation can be realised since there is enough room provided for creative input from the market. However, there is still an adding value component from which the realisation is questionable. The acceleration of procedures as a consequence of interweaving can be doubted in this approach as two competitions are executed, the funding competition in a later stage might cause delays on the progress in case adjustments have to be made to the design.

In terms of mitigating difficulties with this solution positive results can be achieved. No additional activities have to be explored in case the public client acts professionally. In case institutional consensus is achieved and the competition, transparency and objectivity is guaranteed in the process, no problems will be faced in these fields. The financial difficulties are prevented in this option, because this is the basis of the solution with the separate involvement of contractors and financiers.

Implications for Involved Actors

For involved actors this solution is having consequences as specific roles are changing. It is based on the requirement of financial parties to provide committed funding at the earliest after the Definite Route Decision and the ability of the DBM consortium to develop a suitable design on the long-term. Therefore, this solution meets the wishes of private parties, which is a desirable feature for them. Resulting from the fact that the public client wants to ensure a feasible and fundable design, a financial advisor is added to the consortium from the start to ban this kind of uncertainties. The contractors do not experience this as an obstructive requirement because steering on fundability is beneficial for them as well.

Conclusion

This direction is considered to be a suitable approach for combining ECI and ABC, as it solves the legal, financial and institutional difficulties properly and is able to achieve added value in innovation, lifecycle optimisation, availability and realisation within time and budget. The acceleration of procedures is questionable as a result of the postponed dept funding competition that might cause delays, but this is often not the main goal of combining and therefore less important. Although the solution of a DBM+F form is developed to meet the financiers' wishes, this option is also attractive for the public client, because it can eventually result in added value for the project since the advantages of both ECI and ABC can be combined.

<table>
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<tr>
<th>Postponed Funding</th>
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<td>Innovation</td>
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<tr>
<td>Acceleration of Procedures</td>
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<td>Lifecycle Optimisation</td>
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<td>High Availability</td>
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<td>Realisation within Time &amp; Budget</td>
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<td>Mitigates Institutional Difficulties</td>
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<td>Mitigates Financial Difficulties</td>
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Table 7.2 – Postponed Funding Option
7.6.3 Provisions for Risk Settlement

The third direction for a successful combination is found in the ‘provisions for risk settlement’ option. In this approach a contract close is realised with regulations in the contract about settlements in case of alterations.

Characteristics

This direction enables the realisation of both ECI and ABC and thereby the opportunity to achieve added value from both approaches and parries the assumed difficulties with agreed settlements. Two interpretations fit this approach: Roll-over commitments and awarding on assumptions or margins. These specific solutions are therefore subsequently described and collectively reviewed as direction on features and implications in the following paragraphs.

Roll-over Commitments

The solution of roll-over commitments enables a contract close in an early stage because financial parties are willing to participate as the validity of their bids is not harmed. After the awarding of the assignment to a consortium, new bids can be composed each time the validity of the previous bid expires until the Route Decision is definite. Due to the fact that this period can take about two years and the validity of committed bids is approximately 3-4 months, the committed bid can be rolled-over several times, as shown in this specific interweaving approach in Figure 7.6.

![Figure 7.6 – Roll-over Commitments](image)

Awarding on Margins or Flexible Assumptions

Another interpretation of provisions for risk settlement is found in solutions of the awarding on margins or assumptions. In this approach financial parties are willing to participate in projects in an early stage as the validity of their bid is not harmed. In case of awarding on margins the price is fixed without the setting up of an interest rate swap, so within margins everything is known and regulated except for the discount rate risk. The other interpretation of awarding on flexible assumptions entails a financial close with enclosure of alteration options in the contract (Peters, 2012). The actual interweaving of public and private procedures in case awarding takes place on margins or assumptions is shown in Figure 7.7.

![Figure 7.7 – Procurement on Assumptions/Margins](image)
Uncertainties

The uncertainty theory again fits this specific interpretation of a suitable combination of ABC and ECI because this approach is based on the current uncertain economical climate. Many risks that threaten the project result are involved, but this approach offers opportunities to add value as well. An elaboration on risks and opportunities in this solution is therefore provided in the coming part.

Due to the instability of the financial market financial parties are not able to predict developments on the long-term, so the validity of their bids is decreased to a period of maximal 3-4 months. This implies the negative interpretation of uncertainties as this idea is based on the risk of an outdated bid that can harm financial models for the long maturity of the contract. This approach is developed to meet the financial parties' requirements but has its consequences in the institutional environment because of the uncertain price, this is considered to be a risk for the public client.

However, this approach delivers added value as well, because it provides an opportunity to execute ECI and DBFM contracts with the involvement of a complete consortium. The presence of a financial party from the start ensures proper control on the feasibility and fundability of design, construction and process, which makes the realisation of 'value for money' plausible as the focus is put on the projects' lifecycle and the availability of the road. In addition to this, the consortium receives enough room for creative solutions which increases the likelihood of an innovative design. Therefore it can be concluded that added value from the separate approaches can be realised with this direction for a successful combination of ABC and ECI.

Score on Added Value and Difficulties

This direction and the corresponding interpretations are evaluated on the advantages and difficulties of the combination to identify whether this approach can result in additional value for the public client. The findings are summarised in the umbrella term of provisions for risk settlements, which is evaluated in Table 7.3 and clarified in the following explanation.

The score on the assumed components that deliver added value in the combination is positive as this approach enables the complete consortium including a funding party to participate early in the process. This early involvement offers room for creative input of the market to develop innovate solutions and the awarding of the contract within the desired period enables acceleration of procedures, so this approach achieves a positive score on the ECI aspects. In addition to this, the advantages following from the DBFM contract are met as well. The 'watchdog' function of the bank is guaranteed with ensures a stricter steering on costs, planning and financial models, resulting in lifecycle optimisation, high availability and realisation of the project within time and budget.

The score of this direction on dissolving the arising difficulties of the combination is however less convincing. The financial difficulties are perfectly solved in this option because the validity of the private bids is not harmed and private funding is guaranteed from the start, but whether the legal and institutional difficulties are solved with this option is questionable.
This is a result of the uncertain price for the public client as a consequence of the provided flexibility, when the costs are not extensively known discussions might arise between involved public actors. Also the legal difficulty might occur in this direction when the awarding on assumptions option is applied. In case considerable alterations are made to the design, the legal principle of a ‘substantial change’ might become applicable. This entails the alteration of the assignment in such a way, that parties would have offered another bid in the tendering procedure if those features were known back then. When this occurs, consortia that lost the tender can rely on this principle and lodge appeal, which might even force the government to start a new tender. This is a risk that has to be prevented so the public client must ensure a transparent and suitable set of awarding criteria that fit future alterations.

Implications for Involved Actors
As can be concluded from the previous section, the government has a major role in this approach, since the public client has to facilitate the possibility to close the contract within the validity of the bid by ensuring such agreements, circumstances and criteria that institutional and legal difficulties are banned as well. The private parties’ wishes are met in this approach, which eases their participation in the planning procedure, so their main goal is to realise the added value from the combination of ECI and ABC.

Conclusion
The direction of provisions for risk settlements is developed to face the financial difficulty in the combination of ECI and ABC by meeting the financial parties’ requirements for participation. Following from the facts that they will only provide competitive funding when the project risks are clear and when their bids are valid for 4 months at most, the public client facilitates options in which these issues are processed. For private parties this option offers the desired circumstances to realise the added value for the combination. The impact for the public client is however less attractive as uncertainty might cause difficulties in the institutional or legal field, so they need to take additional precautions in order to make this combination succeed. The balance of this option is therefore considered to be privately focussed.

7.6.4 Stepwise Procurement: Partnership >> Price
The final direction for a successful combination of ECI and DBFM is found in the procurement on partnership, a substantially different approach than selection on plan. It is developed as a suitable solution since the early stage with abstract plans does not require a detailed design and price (National Audit Office, 2007). The execution and the implications of this direction are described in the following part to identify whether this approach can be applied in order to successfully combine ABC and ECI.

Characteristics
In this approach a partnership is selected to execute the design and realisation activities in a process in which the level of detail increases when it is required in the followed procedures. This option is based on the ‘building team’ idea from the field of area development, where public and private parties develop a plan together for own expenses with the intention to remain partners in the realisation phase as well. This approach increases the commitment and creativity of the market party because of the one-to-one relation with the public client and their desired selection for realisation. Because these features need to be achieved with ECI as well, this approach seems suitable for the combination. However, following from the high budget road projects are required to tendering, so in contrast to the field of area development the selection of parties needs to be regulated in a tendering procedure with a formal assignment for the developing activities (Pianoo, 2012). Selection takes place on MEAT criteria by followin ‘Best Value Procurement’, a transparent procurement method that meets the legal regulations and ensures the selection of a capable partnership and competitive pricing (Andersson Elffers Felix, 2010).
The direction of stepwise procurement in planning and tendering procedures is shown in the Interweaving Model in Figure 7.8.

**Uncertainties**
In this approach uncertainty is playing a role in both opportunities and risks, following from the fact that procurement is regulated differently than in the traditional approaches as selection does not take place on an extensive design with planning and prices. The implications are described in both positive and negative sense in the following part.

This approach offers an opportunity to add value because it enables the public client to select a capable partner to start the developing phase with. The abstractness of the planning procedure during the tendering phase and this options’ level of detail are aligned to each other (Arts & Lenferink, 2009), which allows the collaboration of public and private partners in the elaboration of the design (Peeters, 2012). This one-to-one situation contributes to a higher creativity of the consortium as the risk of cherry-picking, where creative ideas of different consortia are combined in order to realise an optimal solution, is banned and the intellectual property of the contractor remains unaffected. Following from the fact that pricing is regulated in competition afterwards, the market conditions will ensure a reasonable price (Department of Main Roads, 2009).

The risks in this approach are a consequence of the modified procurement method as well. The selection of a capable partner needs to be executed in accordance with EU tendering principles, there is a risk for the public client that the criteria or the process show lacking features in transparency or objectivity because the awarding decision needs to be justified. Also the public client needs to ensure that competition is incorporated in the process by setting-up suitable exit options and an appropriate maximum price, because otherwise the risk of a too high price threatens the project result. For the contractor the risk of not being selected for realisation is the major threat in this approach, therefore exit options with suitable compensation for the executed activities need to be adopted in the contract.

**Score on Added Value and Difficulties**
In order to determine the applicability of the stepwise procurement solution an evaluation is done on the assumed value adding and complicating features in the combination. An overview is provided in Table 7.4 and the score on the assumed features is explained in the following section. The advantages of the DBFM approach are likely to be achieved with this approach because of the involvement of a complete consortium in an early stage. Following from the financial party in the consortium and the financial consequences of decisions for private parties, a steering on budget, time, feasibility and fundability is ensured, which probably results in a highly available road for a long maturity that is realised within time and budget.
The innovative advantage of ECI that is found in the creative input from the market will also be achieved, because this selection procedure affirms the election of a capable private partner for this purpose. The advantage of the acceleration of procedures is questioned in this approach, because the GO/NO GO moment of the pricing in competition might result in a new tender for the execution of the design.

This stepwise procurement option with a detailing process from partnership to specified plan with a competitive price is rated on its ability to mitigate the assumed difficulties in the institutional, legal and financial field. This solution does not harm the validity of the bid for financial parties as the pricing is postponed to a later stage, so financial difficulties are out of the question. Institutional difficulties are not expected as a professional attitude of the client will result in a proper realisation of the assumed added value components. The public client however needs to keep the legal principles in mind, because difficulties in this field are easily faced in case the tendering or pricing is not executed in accordance with these regulations. Because of the application of the relatively new method of Best Value Procurement a flawless implementation might be an overestimated expectation, therefore the ability to solve legal difficulties is questioned here.

### Implications for the Involved Actors

Due to the fact that this solution implies a relatively new procurement method for the government in which selection of a consortium is not directly related to a specific plan, the public client needs to pay extra attention in the facilitating role, because tendering principles like competition and objectivity can easily be harmed with this approach. This solution implies a changing role for the private parties as well, because the selection criteria are different. In addition to this, a design with competitive pricing needs to be ensured, as otherwise the potential of project realisation by another contractor seems a reasonable threat. Therefore the contractor needs to enforce suitable exit options with compensatory agreements in the contract.

### Conclusion

This option of stepwise procurement is considered to be a suitable solution for the combination of ECI and ABC, because it can realise the assumed added value and mitigate all difficulties when properly applied. Risks in this direction are a consequence of the relative newness of the idea of procuring on partnership, which might result in inferior behaviour of involved actors. That is why attention has to be paid to the compliance of the tendering regulations in coming projects, as it might become a frequent method in the future.

### 7.6.5 Rating of Solutions

In future projects a choice for a suitable direction has to be made in case a window of opportunity for the combination occurs. This part determines whether a consecution can be identified in the applicability of the developed directions. An overall table with a short elaboration on the added value and difficulties is therefore composed in Table 7.5. Several colours are used in this table to clarify the appropriateness of the comments in order to mark whether it entails an explanation, which will be highlighted green in case of a positive explanation and red when negative results are expected. A recommendation to improve the suitability of the solution is marked orange to show its questionability.
<table>
<thead>
<tr>
<th>Maximizing Planning Solution Space</th>
<th>Postponed Funding</th>
<th>Provisions for Risk Settlement</th>
<th>Stepwise Procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation</td>
<td>The client has to devise such a framework that there is still room for private innovation.</td>
<td>Following from the early involvement of the market and the smaller role of the financier in this phase, innovation is likely to be achieved.</td>
<td>Following from the early involvement of the market room is provided for private innovation.</td>
</tr>
<tr>
<td>Acceleration of Procedures</td>
<td>Following from the subordination of the tendering procedure acceleration is plausible. The client must prevent a long delay in starting the tender.</td>
<td>It needs to be prevented that the splitting of obligation results in delays of the procedures, therefore partners have to be involved in advance to decrease this risk.</td>
<td>Following from the application of interweaving this advantage is plausible.</td>
</tr>
<tr>
<td>Lifecycle Optimisation</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
<td>Likely to be achieved as DBM activities are executed with support of a financier from the start.</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
</tr>
<tr>
<td>High Availability</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
<td>Likely to be achieved as DBM activities are executed with support of a financier from the start.</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
</tr>
<tr>
<td>Realisation within Time &amp; Budget</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
<td>Likely to be achieved as DBM activities are executed with support of a financier from the start.</td>
<td>Likely to be achieved as DBFM activities are executed by a complete consortium from the start.</td>
</tr>
<tr>
<td>Mitigates Institutional Difficulties</td>
<td>In all probability as a result of the leading public procedure.</td>
<td>Likely to be achieved as this is considered to be a precondition and no extra difficulties are expected afterwards.</td>
<td>Public entities might dislike the uncertainty about the actual price, so strict agreements need to be developed about the amount of flexibility.</td>
</tr>
<tr>
<td>Mitigates Legal Difficulties</td>
<td>In all probability as a result of the rather late involvement of the market.</td>
<td>In all probability as this option does not entail extra alertness of the client.</td>
<td>The client has to pay extra attention in composing contracts and criteria because the legal principles are easily harmed.</td>
</tr>
<tr>
<td>Mitigates Financial Difficulties</td>
<td>Only in case procedures are indeed passed quickly, otherwise this issue will be harmed.</td>
<td>In all probability as a result of the involvement of banks on the moment that they are willing to provide funding.</td>
<td>In all probability as a result of the created certainty for financiers as provisions are settled for changing risk profiles.</td>
</tr>
</tbody>
</table>

Table 7.5 - Explanation and Recommendations on Directions Score Card
Also a rating with signs of the scores is revealed in Table 7.6 to provide an overview, to conclude with a short elaboration about these components. As shown in the figure above, each solution received a particularly positive rating on the value-adding and difficulties-solving ability and no impossibilities or clear disadvantages were identified, so it can be concluded that each solution direction is feasible and useful when certain issues are kept in mind. The opportunities of DBFM can be realised with every solution and it is likely that added value will be achieved on the ECI advantages as well. Also the difficulties can be prevented or mitigated when the proposed solutions are properly applied.

Following from the comparable scores on these aspects, it can be stated that it is difficult to show a rating on applicability of the solutions here as the consequences of the different options are to a greater or lesser extent suitable for the different actors as it variably favours the private or the public parties most. The solutions of postponed funding and provisions for risk settlement are advantageous for the private parties, while public parties appreciate the other options of stepwise procurement and maximized planning phase mostly. It has to be kept in mind that desirable options for private parties might be advantageous for the public party as well if the project is completed properly. Following from this rather equal scores on suitability, a team of experts needs to decide on basis of project specific characteristics which solution can best be applied in case a window of opportunity occurs.
7.7 Final Model: The P4 Model for Project Planning

Finally, a model is composed from these directions to serve as a framework for combined ECI & ABC projects: The P4 model for Project Planning. This model exists of four main directions where solutions can be found in case a window of opportunity for the combination of ECI and ABC occurs. The model has two axes that have comparable contents in them. There is a horizontal category with a phasing element in it, on the left the phasing is based on postponed funding with possible varying partners, the direction in the right is phased in the level of detail with stepwise procurement on fixed partnership and pricing.

The vertical axis is based on the amount of freedom that is regulated in the contract to handle changing conditions. On the one hand a direction is given that provides that much solution space, that it enables the application of almost every thinkable innovation which ensures a smooth passing of the planning procedures, on the other hand a stricter contract is set-up with provisions for flexibility in case circumstances and thereby risk profiles change. The ‘P4 Model for Project Planning’ is shown in Figure 7.10.

As stated before, the goal of the model is to provide directions and related specific solutions in case projects are considered to be suitable for the combination of ECI and ABC. This model does not claim to provide every possible solution for a successful combination, because this field is still developing it is likely that in the near future more suitable ideas will be found. Therefore, this model is exposed in an open, outwarding structure: New solutions can be grouped in an existing direction or a new arm can be attached to the window of opportunity core as a new direction.
7.8 Validation Model

An interactive workshop with several experts from the field of procurement, contracting and project management is organised in order to validate the applicability of the developed model. Ten experts with both public and private backgrounds who are involved in this field on a daily basis actively participated in discussions about the preconditions and possible solutions for the combination of Interweaving Models 1 & 2 and DBFM contracts. Within the group of experts a distinction is found between experts that already participated in the interviews and new experts in the field. The selection of interviewees for the external validation is a consequence of the specificity of the subject that minimizes the amount of specialists on the one hand and the ability of the selected interviewees to show objectivity and interest concerning this subject on the other hand. Following from the accurate selection of participants for the workshop, the scientific methodological requirement of external validation is still achieved with it.

The goal of the workshop was to find out whether the research proved to be executed in a plenary and justified way and how experts consider the value of the findings of it. After a presentation about the research set-up and the findings, the preconditions, possible solutions and composed model for a successful application were evaluated. An elaboration about these topics is found in the following parts in line with the sequence of the workshop.

No annotations are made on the research design in the workshop, which can be explained by the fact that this scientific justification is applied to follow a scientific approach in the graduation research. This aspect is less relevant for the workshop participants since they show a higher interest in the practical implications as they recognise the relevance of this research already in their daily activities and actual results are most interesting for them. Also in the findings from both literature and interviews no outcomes are questioned as they cannot be doubted when a clear explanation about the source or the point of view is provided. Some participants did raise the necessity to clarify issues and append some nuances, which proved to be a point of attention in discussing other issues as well, so this is taken into account in the refinement of the report.

The model with preconditions for the combination is the first product that is composed after an analysing phase and thereby a relevant subject for conversation with the experts. It is discussed on the completeness and applicability by reviewing its different components and the composition in general. The experts broadly confirm the need for institutional consensus and the task of the government to guarantee the compliance of tendering principles in the criteria and circumstances, as these issues are considered to obstruct the process with certainty. The condition of a capable market has to be defined and participants mention the role of the government as an inherent issue, since the government has to predefine and control the demanded level of capability in the selection of the market. Finally, a sizable comment is made on the applicability of the complex project precondition. This condition is selected following from the requirement from procurement regulations that the competitive dialogue is only permitted in case the market is needed to develop a solution, which is recognised by the participants, but the policy within Rijkswaterstaat as a facilitating client that is unwilling to execute some activities as the market is better able to do so remained unexposed in the presentation. Experts emphasize that this policy needs to be mentioned, and that the precondition of a complex project has to be nuanced into projects entailing such a content, that the client is not able or willing to execute it. In this case the market is still involved to solve a certain complexity so the overall term of a complex project can be retained.

Also the structure of the model is discussed: The experts approved the abstractly composed model with the inwards directed compulsory conditions that all have to be met in order to identify a window of opportunity for the combination, because they agree with the subparts and no major elements are missing according to them.
Afterwards the different solutions to enable combined application of ECI and ABC were extensively discussed. Following from the diverging interests of the participants, ideas about the actual execution of these solutions proved to be different.

The maximizing planning solution space option was extensively discussed on the room for actual creative solutions as the client determines the framework in which innovation can be found, some experts claim that this delineation limits the necessary room, while others emphasize on the need for delineation in a planning procedure, since otherwise no clarity can be obtained within this public procedure and in addition the public client is responsible to set-up the framework in such a way that the desired creativity can be realised with it.

The option of postponed funding was then still known as the solution of selecting the best partner per phase, which lead to confusion about its content within the group of experts, so this umbrella term is changed into a more comprehensive term. The interpretations however were recognised by the experts as suitable options, with a clear confirmation for the involvement of a supporting funding party already from the start of the project. Within the group of experts diverging ideas were shown about the ‘watchdog’ function of banks, mainly the projectmanagers doubt the added value and mention that the dept funding competition is only applied abroad in case no public funds are available. Following however from the fact that Rijkswaterstaat desires bank involvement and contractors do not reject it, it is considered to be a precondition.

Provisions for risk settlements are considered to be useful as well, parties admit the applicability of the interpretations of roll-over commitments and awarding on assumptions, but point out that the role of the government and the abstractness of the agreements needs to be kept in mind because it has to be in line with procurement regulations but following from the nature of ECI some amount of adjustments can be expected in these kind of project which decreases the risk. In addition to this, the uncertainty for the client is discussed and according to the financial experts in the workshop this uncertainty is low as the major part of the contract remains fixed and bids are not considerably altered in practice.

The final solution of stepwise procurement is also discussed. A strong preference for this option is found within the public client, but the private parties are positive about this option as well. This can be explained by the fact that the best team can be selected for a reasonable price by using Best Value Procurement. The pricing in competition element might be difficult resulting from the intention to continue with the same party but experts recognise the applicability of Best Value Procurement as a suitable method for proper selection. The GO/NO GO moment in the pricing is considered to be undesirable by the contractor and advantageous for the client, therefore it is recommended by the experts to execute this solution in a professional way.

Finally, the P4 Model for Project Planning is presented. The set-up of an open and abstractly composed model with directions and the devised interpretation were broadly recognised by the experts. They did not mention inaccuracies in the model and no adjustments had to be made according to them. This strengthens the reliance that a certain amount of completeness is achieved in this investigation and in the composed models, which implies that the investigation can be considered as a contribution to this field. The of participants and the presentation of the workshop are found in Appendix D.
8 Conclusions & Recommendations

This report contains an investigation about the combination of Early Contractor Involvement (ECI) and Availability-Based Contracting (ABC) in complex infrastructure projects. It is executed in order to detect whether and how additional value can be created for the public client by combining these issues, to provide direction in the current struggle within the public client about the applicability of the combination. The research delineation therefore took place based on this demand, which resulted in an investigation towards procurement before Draft Route Decision as delineation of ECI and DBFM contracts as interpretation of ABC in road projects for Rijkswaterstaat.

This chapter presents the identified conclusions and recommendations. Conclusions are drawn by answering the research questions in the first paragraph, to subsequently finish with topic-related recommendations.

8.1 Conclusions

The main research question entails the full extent of the research: How can ECI and ABC be combined in complex infrastructure projects in order to create added value for the public client?

Several sub questions were formulated in order to answer this main question. Answering these questions took place in accordance with various research methods, entailing a literature study, collection of practical experiences from both cases and interviews, and a validation workshop for approving the findings with experts in the field. The consecutive answers on the sub questions collectively provide an outcome for the research question. Therefore, this paragraph extensively elaborates on the sub questions to conclude with a framework for the combination of ECI and ABC as a final answer on the main research question.

The first sub question entails an analysis on the separate approaches of ECI and ABC: On which aspects are ECI and ABC complementing or conflicting?

The two approaches proved to be complementing on several aspects. The first aspects are identified as results of the motivation to involve the contractor in order to create a higher ‘value for money’ from their assumed knowledge. Controllability is ensured because of the ability to manage projects from a commercial point of view, which leads to in acceleration of procedures (ECI) and execution of the project within time and budget (ABC). Optimisation is realised as a result as well, because private parties are able to develop creative ideas (ECI) and integrate activities (ABC). In addition to this, a complementing feature is found in the long-term relationship between the public client and the private contractor as a result of the involvement of the market in an early stage (ECI) and the awarding of one single contract for design, build and maintenance activities (ABC).

Conflicting aspects were found in the comparison as well, which can be clarified by the management of uncertainties and the private funding component. The first contrast is found in the amount of room to manoeuvre for parties, which is minimized in ABC projects to ensure a proper risk management and enlarged in ECI projects to stimulate creative solutions: Fencing-off the contract vs. broad solution space. The other conflict in the combination is found in the requirement of committed funding at final bid (ABC) vs. involvement before Draft Route Decision (ECI) when no financial party is willing to provide funding due to the high amount of uncertainties in an early stage.
Following from the fact that the theory of uncertainties is selected as an appropriate scientific framework to structure the research, an explanation about the role in the combination is an essential part of the research:

**What is the role of uncertainties in combined ECI and ABC projects and what is the best way to deal with them?**

Uncertainties are having a considerable role in this combination as both approaches require uncertainty management: On the one hand by handling risks that are threatening the project properly as a result of the private funding component in DBFM, on the other hand by exploiting opportunities to create added value by using the broad solution space in an early phase. Because of the coupling that is made in the research between opportunities and possibilities and risks and difficulties, the specific interpretation of these issues is provided in the next sub question, this answer is narrowed to the role of uncertainty and its resultant management. The best way to handle uncertainties in this kind of projects requires identification in an early stage. Conflicting aspects need to be solved and complementing aspects have to be used in order to mitigate risks that threaten the project result and to realise added value from the opportunities to add value.

The third sub question collects information about the applicability of combined ECI and ABC projects:

**What are the possibilities, difficulties and preconditions in combining ECI and ABC?**

In deciding whether the combination of ECI and ABC can create added value in projects, the possibilities and difficulties need to be clear in advance as they determine the results that can be achieved with it. Preconditions need to be identified as well because they have to be met in projects that are suitable for the combination.

The opportunities in the combination of ECI and ABC in projects are found in the following aspects:

- **Innovation**
  As a result of the creativity of the market that is used as input early in the process (ECI).

- **Acceleration of procedures**
  Following from the interweaving of the public planning and private tendering procedure (ECI).

- **Lifecycle optimisation**
  The addition of maintenance in the contract ensures a focus on long-term ‘value for money’, which implies better project result for a certain budget (ABC).

- **High availability**
  As result of the payment mechanism that is based on the availability of the road (ABC).

- **Realisation within time and budget**
  Following from commercial interests projects are strictly managed (ABC).

The identified risks in the combination are grouped in the next issues:

- **Institutional difficulties**
  Projects need support from involved public parties to ensure execution.

- **Legal difficulties**
  Tendering principles need to be guaranteed by the government in processes and contracts.

- **Financial difficulties**
  Committed private funding requires clear risk analyses so a limited amount of uncertainty.

Strategic preconditions that have to be met in order to find a window of opportunity for the combination are:

- **Institutional consensus**
  Public entities admit the problem and recognise the necessity for the project.

- **Complex project**
  The market is needed to solve a certain complexity as the public client is not able or willing to do so.

- **Capable client**
  The government is able to guarantee tendering principles circumstances and criteria.
• **Capable market**
  Private parties have the required knowledge and experience to deliver input.

There is an opportunity for combining ECI and ABC when these four preconditions are met. The model consists of two axes as shown in Figure 8.1: The horizontal axis represents conditions based on supply and demand, the vertical axis shows the options with a certain role for the client. The preconditions for a window of opportunity are shown in an abstract model: The C4 Model with Compulsory Conditions for the Combination as shown in Figure 8.2.

The following sub question entails the perceptions of involved actors about the combination: **What is the perception of public and private parties about combining ECI and ABC?**

Perceptions of the involved parties are identified during the interviews for two purposes: On the one hand information from experts in the field is used as input for the research, on the other hand it predicts the desirability of a combined application of ECI and ABC. A distinction within the public and private parties is made: In employees of both the DBFM and ECI departments from Rijkswaterstaat and the public projectmanagers, and contractors, legal advisors and financial parties as private actors, in order to refine the findings.
Perceptions about the separate approaches of ECI and ABC and about the combination were identified to identify visions on i.a. the role of uncertainties, the added value of application and the difficulties that have to be faced. The findings prove to be strongly related to the professional role parties are having in projects and the ideas about the combination are corresponding to their perceptions about the specific approaches. Within Rijkswaterstaat the added value of the combination is not broadly recognised, only the ECI employees expect the combination to succeed, others have doubts about ECI. Within the private parties other views can be identified, mainly resulting from the commercial perspective of actors. Contractors have a positive perception about the combination, as it increases the amount of activities and the importance of their role. Legal advisors and financial parties however perceive the combinations' value less obvious.

A striking finding here is the fact that experts see many difficulties in their own field of expertise and possible solutions for this in other fields, that are subsequently invalidated by others. This is for instance found in ideas about procurement of financial parties that harm the legal principles that are protected by the legal advisors. This can be considered as a signal that the combination is not facile, as tricks need to be applied to realise a successful combination. The added value of the combination is therefore perceived to be questionable as there might be other possibilities to achieve the assumed advantages. On a more abstract level, it can therefore be stated that synergy in terms of 1+1=3 will not be achieved, but 1+1 > 1 is already more than 1, which results in increased value in the project.

A final sub question entails the actual added value that is created with the combination:

**Which added value can be created by combining ECI and ABC?**

The cumulation of advantages of the separate approaches is considered to result in the actual added value of the combination, namely innovation, acceleration of procedures, lifecycle optimisation, high availability and realisation of the project within time and budget. Following from the institutional, legal and financial difficulties that have to be faced in the application, it can not unconditionally be stated that combining of ECI and ABC will deliver added value. It has to be considered per specific project since only in case all preconditions of complexity, capability of both client and market, and consensus are met a window of opportunity is found for the combination, but then still the likelihood of 1+1 is 2 or 3 remains small and 1+1 > 1 is already more than 1, which can be considered as an increased value projects.

Following from these aspects, the combination of DBFM and Interweaving Model 1 seems to be a bridge too far. Interweaving Model 2 might realise added value that is slightly higher than a separate application, but still solutions only have to be explored in case a considerable added value in contrast to the actual costs can be created, because it must be prevented that only complexities and disadvantageous of the approaches are cumulated, while no innovation or optimisation is realised.

After identification of these answers on the sub questions the main research question is answered:

**How can ECI and ABC be combined in complex infrastructure projects in order to create added value for the public client?**

Although the realisation of added value with the combination of ABC and ECI is not broadly recognised as a result of the many difficulties that have to be faced and the advantages of the separate approaches that are questioned, a model is designed to provide solution directions that enable a combination of the two approaches.

Four directions for solutions are identified:

- **Maximizing Planning Solution Space**
  
  Broadening solution space in such a way that creative ideas from consortia will fit the Draft Route Decision in order to pass procedures quickly and to ensure financial close within the validity of the bid.
• **Postponed Funding**
  Postponing of funding activities with potentially varying partners to a moment that parties are willing to participate in projects, as the party that is best able to execute the funding is responsible for it. This can f.i. be realised with a dept funding competition or the splitting of short- and long-term funding.

• **Stepwise Procurement: Partnership >> Price**
  Selection on partnership and pricing in competition as this fits the abstractness of the early phases better and detailing happens in a one-to-one situation.

• **Provisions for Risk Settlements**
  Contract close is executed with regulations to compensate parties in case of alterations. This option parries the assumed difficulties, f.i. by roll-over commitments or margins/assumptions.

These directions are composed in an abstract model as a plan of approach for projects that are considered suitable for the combination: The ‘P4 Model for Project Planning’. As shown in Figure 8.3, this model consists of two axes: The horizontal axis represents solutions with a phasing element in it, the vertical axis shows the amount of freedom in the contract. The model does not claim to be complete, because this field is still developing, so it is consciously exposed in an open, outwarding structure as shown Figure 8.4 and it can be extended when new findings are gained in the future.

The designed model is validated by a group of experts in the field, who recognised the completeness and usefulness of the composed model and the performed research. Therefore, it is concluded that the findings and the model are validated and that the investigation can be considered as a contribution to the current knowledge in the field.
8.2 Recommendations

Following from the executed research four topic-related recommendations for the future have been developed in order to realise added value. They concern the application of the combination, the selection of a direction for the combination, the role of the government and the perceptions of involved actors. An elaboration on these recommendations is provided in the next paragraph.

Application of the combination

The combination of ECI and ABC is doubted to realise significant added value, as it delivers less value than expected in the field. However, still more value can be achieved with the combination of ECI and ABC than by application of one of the separate approaches. Therefore, it is recommended to explore the combination when the composed preconditions are met in an Interweaving Model 2 situation. When the assumed added value of the combination considerably transcends the extra costs from disadvantageous aspects of these approaches a window of opportunity is found, for which the ‘P4 model for Project Planning’ can provide direction for combined application of ABC and ECI.

Selection of a direction for the combination

By following the ‘P4 model for Project Planning’ after occurrence of the window of opportunity, directions are identified for the implementation. On an abstract level these four developed directions seem to be equally applicable, so in projects the decision for an interpretation is recommended to be made by a group of experts that takes project specific elements in consideration.

Role of the government

Another recommendation is found in the role of the government. It follows from the fact many difficulties need to be faced that in the specific combination of Interweaving Model 2 and DBFM contracts. Therefore, the government has to execute its role as a facilitator in a professional way by guaranteeing the tendering principles of transparency, objectivity and competition already from the start. Although the government developed itself positively in the last years, this combination requires that the government should do its best as the combination entails much complexity.

Perceptions of involved actors

The last recommendation entails the interests of involved parties: When parties listen carefully to each others’ perceptions about the developments in this field, the probability of proper identification of risks and opportunities and thereby the realisation of added value enlarges. Again, the public client is already on the right track with their focus on the involvement of market parties, but still progress can be realised when the trust between parties is increased. This implies another attitude for the private parties as well, because it entails a stronger focus on the project result than on the financial consequences of decisions then currently happens.

When these recommendations are kept in mind in the future the likelihood of a successful application of the combination of ABC and ECI increases, which might result in the realisation of added value in new projects.
9 Reflection

9.1 Scientific Value of the Findings

This graduation research can be considered as a valuable addition to the existing knowledge in this field. This is motivated by the fact that the findings are based on relevant literature, a study on cases and a large amount of interviews with all involved actors. The execution of a validation step by evaluating the findings in an interactive workshop with new experts, ensures the justification of the ideas in this field of research.

Drawing up broader conclusions on an abstract level however turned out to be difficult in the investigation, as the findings about combining ECI and ABC result from a limited amount of literature, projects and personal opinions. Although findings have been validated by a group of experts, this field of knowledge clearly is still evolving, so the lessons of this study are therefore context-specific and time-specific.

In addition to this, no judgement is passed on the isolated approaches of ECI and ABC, since this can be considered to be a full study itself. In case ideas about (one of) the components in the applicability of the combination considerably change, there will be a consequence on the applicability of the combination of ABC and ECI as well.

9.2 CME Relevance

This research is performed in order to finish the Construction Management & Engineering (CME) master at the TU Delft, so relevance of the topic in the CME field is expected. The topic of combining a moment of procurement and a contract form in complex road projects fits the CME program properly. This can be explained by the core elements and existence of the CME study, which is developed to fit into the changing field of construction.

This research contains both two rather new developments in this field and it entails the integration of policy, financial aspects and legal regulations for public and private actors in one single subject. Therefore, this graduation thesis can be considered as a highly relevant and integrative CME research, which is likely to deliver a contribution in this field of research.

9.3 Shortcomings / Further Research

Several shortcomings or recommendations for further research were identified during the interviews, mainly as a result of the strict delineation of the research as a consequence of the complexity and broadness of the investigation. Therefore, this paragraph presents implications that need to be kept in mind in further research.

This research only contains an investigation for road projects from Rijkswaterstaat, but in other kind of infrastructure projects, for instance in rail projects from ProRail and in decentralised governmental projects, parties are curious about the applicability of ECI and DBFM as well. Therefore, this research can be used as a starting point for further research in this field.

Besides this, the research has presented several interpretations of the developed directions for a successful combination of ECI and ABC. In case solutions are actually applied in projects, further investigation needs to be done on the characteristics and consequences as this research only provides a global rendition.
In addition to this, this research showed the importance of the creation of added value in projects, and the importance that this value is higher than the additional costs from the application. No suitable method for predicting the added value of the combination of ECI and ABC is developed yet, so currently projects are only discussed by experts in ECI projects and tested in the Public Private Comparator (PPC) to determine the assumed value of DBFM. A comparable tool needs to be developed for future projects.

To conclude, setting up alliances seems to be an appealing form of collaboration nowadays as it is mentioned by the majority of the interviewees. They believe that this approach implies better cooperation of public and the private parties because it entails a better risk sharing mechanism. Since alliances are not by definition related to a specific contract form or moment in the planning procedure, this was considered to be an advice out of the research scope, but resulting from the enthusiasm about it by all actors, its possibilities related to the combination of ECI and ABC are definitely interesting for further research.
References


  http://www.rijkswaterstaat.nl/kenniscentrum/aanbestedingsbeleid/pps_bij_rijkswaterstaat/

  http://www.rijkswaterstaat.nl/wegen/plannen_en_projecten/a_wegen/a12/wegverbreding_a12_utrecht_veenendaal/


Appendix A – Project Characteristics

ABC Project A12 LuVe

Broadering of the Utrecht – Lunetten – Veenendaal A12 Highway in order to realise faster, quieter and safer road use. It entails two trajectories: Utrecht - Maarsbergen (from the Emergency Act) and Maarsbergen – Veenendaal.

Activities

- Between Utrecht and Bunnik the A12 will be enlarged from 2x3 tot 2x4 lanes;
- Between Bunnik and Driebergen the A12 will be enlarged from 2x2 to 2x3 lanes and a peak lane will be created in both directions;
- Between Driebergen and Veenendaal a peak lane will be created in both directions;
- Five entrances and exits (Bunnik, Driebergen-Rijsenburg, Maarn, Maarsbergen and Veenendaal) will be adjusted in order to improve the traffic flow towards and from the local road network;
- If needed overpassings will be renovated, by placing enough lightning and sight to increase the safety;
- Also roads crossing the A12 traject will be adjusted in order to increase the safety and the traffic flow.

Goal

- Better traffic flows
- Less traffic jams
- Less nuisance for the region as less traffic will use the local roads
- A quieter road as a result of using two-layer porous asphalt (Zoab)

Consortium

BAM-consortium ‘Poort van Bunnik’:

- BAM PPP
- BAM Wegen
- BAM Civiel
- BAM Infratechniek
- BAM Infraconsult

Contract Specifics

Contract Value: 260 mio
Contract Type: DBFM with 20 year maintenance
Maturity: November 2010 untill March 2013 (2 years earlier delivered than initially planned)
ABC Project A15 MaVa

Broadening the A15 highway on the trajectory Maaslakte - Vaanplein

Activities
- The A15 will be enlarged from Maasvlakte untill Thomassentunnel;
- The creation of peak lanes in the Rozenburg trajectory;
- The creation of a new Botlekbridge;
- The creation of both main- and parallellanes between Beneluxplein and Vaanplein;
- The A15 will be enlarged on the Vaanplein and A29 trajectories.

Goal
The A15 highway between Maasvlakte and Vaanplein will be improved in order to improve the safety and accessibility of its vicinity.

Consortium
Consortium ‘A-Lanes A15’:
- Strukton
- Ballast Nedam
- John Laing
- Strabag

Contract Specifics
Contract Value: 1,095 bn
Contract Type: DBFM with 20 year maintenance
Maturity: Autumn 2011 until end 2015
ABC Project 2nd Coentunnel

The creation of a second Coentunnel and a new highway, Westrandweg, on the A10/A5/A8 highway trajectory.

Activities
- The creation of a second Coentunnel next to the existing Coentunnel underneath the Noordzeekanaal in Amsterdam;
- The creation of a new highway, Westrandweg, between the Coentunnel and junction Raasdorp as an extension of the A5 highway;
- The tunnel will entail three fixed lanes directed to Zaanstad and two exchange lanes that will be used in the busiest direction.

Goal
Decreasing the daily traffic jams at the Coentunnel (on the A8 highway in the morning peak and at the A10-West highway in the evening peak) in order to considerably increase the accessibility of Amsterdam from the Northern direction.

Consortium
Consortium ‘Coentunnel Company BV’:
- Arcadis Nederland
- Besix Nederland
- CFE Nederland
- Dredging International
- Dura Vermeer Groep
- Haverkort Voormolen
- Vinci Concessions
- Vinci Grand Projects

Contract Specifics
Contract Value: 595 mio
Contract Type: DBFM with 30 year maintenance
Maturity: Medio 2008 until 2013
ECI Project A2 Maastricht

'The Green Carpet' combined area development and infrastructure project at the A2 highway in Maastricht.

Activities
- The creation of a stacked tunnel, which directs 80% of the current traffic underground and creates a residential environment on top of it;
- The creation of a recreative ‘green’ route for cyclists and pedestrians between the estate zone and junction Europaplein;
- The creation of two distinctive and recognizable city entrances.

Goal
- Improved accessibility of Maastricht;
- Improved traffic flow on the A2 highway between junction Geusselt and Europaplein;
- Improved safety and liveability in the vicinity.

Consortium
Consortium ‘Avenue2’:
- Strukton Civiel Projecten
- Stukton Bouw & Vastgoed
- Ballast Nedam Infra
- Ballast Nedam Ontwikkelingsmaatschappij

Contract Specifics
Contract Value: 515 mio
Contract Type: D&C
Maturity: Medio 2010 untill 2016
Combined ECI & ABC Project A11 Belgium with a Dept Funding Competition

The construction of a new highway, the A11, between Brugge (N49) and Westkapelle (N31) as part of the Trans-European Transport Network (TEN-T).

**Activities**
- The construction of the 13 km long 2x2 A11 between Brugge (N31) and Westkapelle (N49)
- The adjustment of the existing roads and structures in the trajectory
- The construction of a new bridge at the Boudewijnkanaal

**Goal:**
Creation of a smoother and safer connection between the harbour of Zeebrugge and its hinterland by splitting of the harbour and local traffic in an integral way by taking ecological, traffical, environmental and spatial aspects into account.

**Consortium**
At the end of this year a consortium will be selected for execution.

**Contract Specifics**
- Contract Value: 344 mio
- Contract Type: DBFM with 30 years maintenance
- Maturity: Medio 2013 (directly after Financial Close) until end 2016
Combined ECI & ABC Project M25 London Orbital Motorway UK with a Dept Funding Competition

Project to improve the traffic flow on this 188 km long motorway around London, which is one of the longest and busiest orbital roads in the world. The first widened section is opened before the 2012 London Olympic Games.

Activities
- The widening of junctions 16 to 23 and 27 to 30 (63 km)
- The upgrades of the electronic lane control signing
- The construction of a new motorway service area
- The maintenance and refurbishment of Bell Common and Hatfield tunnel

Goal
Improvement of the traffic flow and the safety on the M25 road.

Consortium
Consortium ‘Connect Plus’:
- Balfour Beatty
- Skanska
- Atkins
- Egis Road Operation UK

Contract Specifics
Contract Value: £ 6,2 bn
Contract Type: DBFMO with 30 years maintenance
Maturity: Medio 2009 until 2015
Appendix B – Interviews

Interview Protocol

1. Achtergrond
Dit interview protocol is bestemd voor de interviews in het kader van het afstudeeronderzoek van Anne Beekers, masterstudent Construction Management & Engineering aan de TU Delft. Het afstudeeronderzoek richt zich op het combineren van zeer vroege marktbenadering (aanbesteding vindt voor het OTB plaats) en DBFM contractering in complexe infrastructurele projecten. Dit protocol is geschikt om inzicht te krijgen in moeilijkheden en mogelijkheden die zich openbaren in de combinatie van DBFM en vroege marktbenadering zodat uiteindelijk aanbevelingen kunnen worden ontwikkeld hoe de vormen dusdanig worden gecombineerd dat er een meerwaarde voor de opdrachtgever ontstaat. Alle interviews worden afgenomen door de afstudeerder, Anne Beekers. Geïnterviewden worden geselecteerd op basis van enkele criteria: Onder meer ervaring, het veronderstelde kennisniveau, de huidige functie in het werkveld en de beschikbaarheid spelen hierbij een rol.

2. Doel van het interview
De primaire doelstelling van het interview is het verzamelen van empirische data die bijdraagt aan het volledig beantwoorden van de in het kader van het afstudeeronderzoek gestelde onderzoeksvragen. Deze onderzoeksvragen zijn erop gericht de moeilijkheden en mogelijkheden in de combinatie van DBFM en vroege marktbenadering te onderzoeken zodat er aanbevelingen kunnen worden ontwikkeld om meerwaarde te creëren uit de combinatie. Door beantwoording van de onderzoeksvragen kunnen de interviews op de lange termijn bijdragen aan het verhogen van het algemene kennisniveau over het succesvol combineren van contractvormen met marktbenaderingsmomenten in complexe projecten.

3. Resultaat van het interview
Het interview levert informatie op over de beleving die geïnterviewde als professional heeft van:
- Risico's van DBFM en vroege marktbenadering
- Meerwaarde van DBFM en vroege marktbenadering
- Mogelijkheden tot het succesvol combineren van deze twee vormen

De interviews worden verwerkt in het kader van het afstudeeronderzoek. De belangrijkste resultaten zullen in de hoofdtekst van het rapport zijn terug te vinden.

4. Werkwijze per interview
1. De te interviewen personen worden benaderd of zij bereid zijn mee te werken met het interview. Bij deze uitnodiging behoort ook een toelichting op de context van het interview. Als de benaderde persoon positief staat tegenover het interview, wordt er een afspraak gemaakt.
2. De omschrijving van de context voor het interview wordt tevoren toegestuurd. Bij de afspraak worden een aantal belangrijke kenmerken van het interview gemeld:
   - Het betreft een semigestructureerd interview.
   - Het gaat om een inventarisatie van persoonlijke visies en afwegingen en niet om formele standpunten van een organisatie.
   - Het gaat om het verkrijgen van informatie over afwegingen die managers in een specifieke context maken en er wordt niet gezocht naar informatie over één specifiek project.
Uitgangspunt is dat het interview maximaal 1,5 uur in beslag neemt. In de opbouw van het interview wordt uitgegaan van 60 minuten, om enige speeling in te bouwen.

Het interview zal, indien de geïnterviewde hier geen bezwaar tegen maakt, opgenomen worden ten behoeve van de rapportage in het kader van het afstudeeronderzoek. Opnames en aantekeningen zullen niet in een andere context gebruikt worden.

Een conceptuitwerking van het interview zal aan de geïnterviewde worden toegestuurd, waarop deze nog correcties kan aanbrengen.

De geïnterviewde zal na afronding van het onderzoek een management samenvatting met belangrijkste resultaten opgestuurd krijgen.

Het interview zelf bestaat uit vier onderdelen:
- Introductie (+/- 10 minuten)
- Deel 1 "Risico en meerwaarde in DBFM en vroege marktbenadering" (+/- 30 minuten)
- Deel 2 "Combinatie DBFM en vroege marktbenadering" (+/- 15 minuten)
- Afsluiting interview (+/- 5 minuten)

Alle interviews worden opgenomen op geluidsdraag. Deze opnames worden naderhand uitgewerkt tot een samenvatting van het interview. Een conceptversie hiervan wordt ter controle aan de geïnterviewde voorgelegd en deze krijgt een redelijke termijn om de tekst te corrigeren.

5. Het interview

Introductie
- Wederzijdse kennismaking
- Toelichting gang van zaken interview

Deel 1: DBFM en zeer vroege marktbenadering

Onderwerpenlijst DBFM Contracten:
- Voor- en nadelen voor publieke en private partijen
- Risicoperceptie, -openheid en -benadering van publieke en private partijen

Zeer vroege marktbenadering (met aanbesteding voor OTB):
- Voor- en nadelen voor publieke en private partijen
- Risicoperceptie, -openheid en -benadering van publieke en private partijen

Deel 2: De combinatie van zeer vroege marktbenadering met een DBFM contract
- Voor- en nadelen voor publieke en private partijen
- Barrières en mogelijkheden voor publieke en private partijen
- Meerwaarde? 1+1=2/1+1=3?

Afsluiting
- Heeft u nog tips voor de invulling van mijn onderzoek?
- Verdere vragen/opmerkingen?
- Verwerking van dit interview zal worden teruggekoppeld
- Bent u op een later tijdstip bereikbaar voor aanvullende vragen?
## Lijst met Geïnterviewden

### Oriënterende interviews

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<td>DBFM Aanjaagteam</td>
<td>RWS, A12 LuVe (PwC)</td>
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<td>Joost van der Haagen</td>
<td>Projectmanager</td>
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<td>Evert-Jan Schuurman</td>
<td>Jurist en PPS adviseur</td>
<td>RWS</td>
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<td>Wiebe Witteveen</td>
<td>Inkoopmanager</td>
<td>RWS, Best Value Procurement</td>
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<td>Marc Bollen</td>
<td>Hoofd afdeling</td>
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<td>Rob Peters</td>
<td>Financieel adviseur</td>
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<td>Carel van Belois</td>
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<td>Projectdirecteur en staf</td>
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<td>Marjolijn Lubbert</td>
<td>Projectmanager marktbenadering</td>
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### Onafhankelijk:

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<td>Alexander Schütte</td>
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<td>Finance AT Osborne</td>
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<td>Arent van Wassenaer</td>
<td>Partner Allen &amp; Overy, DBFM standaard</td>
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<td>Daniel Santurio González</td>
<td>Advocaat</td>
<td>Croon Advocaten, 2e Coen, A15 MaVa, ViA15, DHV</td>
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<td>Benno Stoiber</td>
<td>Projectmanager</td>
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<td>Pauline van Abswoude</td>
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<td>Wouter van den Berg</td>
<td>Jurist Financiering</td>
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<td>Frits Verhees</td>
<td>Bid director</td>
<td>Heijmans PPP, Strukton, ProRail, PhD RUG</td>
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<td>Robert Bos</td>
<td>Projectmanager</td>
<td>BAM, EPC Directeur A12 LuVe, A2 Maastricht</td>
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<td>Adelbert de Vreese</td>
<td>Projectmanager/tendermanager</td>
<td>BAM, A12 LuVe, 2e Coen</td>
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<td>Jan van de Meene</td>
<td>Projectdirecteur</td>
<td>A15 MaVa, John Laing, Boskalis, PhD UU</td>
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Uit privacyoverwegingen zijn de interviewverslagen niet opgenomen in de openbare versie van dit rapport.
Appendix C – Expert Meeting AT Osborne

Participants AT Osborne
Rudolf Rijkens   Sr. consultant, manager and trainer Infrastructure & Mobility
Albert de Vries  Management Consultant Infrastructure & Mobility
Pelle de Wit     Consultant and manager Infrastructure & Mobility
Paul Brinkman    Consultant and manager Infrastructure & Mobility
Daan Seesing     Consultant and manager Infrastructure & Mobility
Werner Plekkenpol Sr. consultant and manager Area Development and Infrastructure & Mobility
Harold Topper    Consultant and manager Area Development and Infrastructure & Mobility
Alexander Schütte Management Consultant Finance
Joost van Blokland Consultant and manager Finance
Frank Jacobsen   Consultant and manager Audits & Evaluations
Marjolijn Tausch Consultant Legal

The goal of this expert meeting is twofold: On the one hand it is used to validate the preliminary findings, on the other hand experts can provide new useful input from their own expertise and experience. The meeting is organised as follows: First a presentation about the graduation research is given, then several relevant issues are discussed in response to proposed questions, to conclude with an informal lunch where evaluation will take place. The workshop set-up is shown in the sheets on the next pages.

The experts agree that difficulties in the combination can be found in governance, procurement law and financial issues. They immediately state that interweaving model 1 is a bridge too far in combination with DBFM due to these issues since their inhibiting effect is stronger as interweaving starts earlier. In this report the statements and ideas about the combination of Early Contractor Involvement and DBFM therefore imply the use of interweaving model 2, with tendering just before the Concept Route Decision.

The most striking outcomes of the workshop are summarised below:

- The biggest challenge in combining the two forms is found in the financial aspect, more specific: In the tension between the lacking willingness of banks to provide funding in an early stage with uncertainties on the one hand and the requirement for committed funding in DBFM contracts on the other hand. The validity of the proposal is much shorter (max. 3-4 months) than the duration between Concept Route Decision and Definite Route Decision (about 1,5 year).
- Bridging the gap between BAFO (Best and Final Offer) and Financial Close by the use of a Dept Funding Competition (DBM+F) after Definite Route Decision is considered to be an interesting option. Since the experts are not convinced of the added value of banks in consortia in an early stage, they even state that this option will lead to more creativity. Therefore, no big disadvantages in the applicability of this solution can be found. Only the uncertainty about the budget might cause internal difficulties for RWS.
  - A few ambiguities need to be investigated, for instance by studying Belgium examples:
  - What are the awarding criteria in the tender procedure?
  - In case that payments are based on availability and the price must be given by the contractor in an earlier stage (in the tender procedure): When does this price transforms from price of the works into price of the service? Or is it possible for the contractor to make this availability-
based price already in an early stage? (While the banks, experts in funding, are not able to do so).

- Bridging the gap between BAFO (Best and Final Offer) and Financial Close by using Roll-Over commitments is less acceptable as solution, due to the high transaction costs and the uncertainty for the public client.

- Stretching the competitive dialogue in order to involve private parties in an early stage and expect the BAFO at the Route Decision is undesirable and not realistic:
  - Undesirable because private parties must be compensated by the client, which increases the costs for the public client and that much time is not needed for the design so there will be breaks in the procedure. The additional costs will be about 1% of the project budget, costs that are simply a waste of money.
  - Looking at the plan procedures this is an unrealistic option, because it is not realistic to expect similar concept route decision designs from three different parties that all fit the criteria, which will later result in three different route decision designs. If this is really the case, the market is not creative and distinctive, which makes the competitive dialogue futile. In addition to this, such a long competitive dialogue enlarges the risk of cherry picking.

- Financial close based on assumptions: The offer must be realistic, which is covered by several requirements about the BAFO, with recalculation options in case of delay. Therefore, the existence of market forces and thereby a properly financed project is guaranteed. This is also the case with an undefined discount rate due to the control from the standard DBFM contract.

- The overall idea about this combination is that the complexity of the ‘combining process might influence the added value in a negative way, so maybe this is not the best method to achieve added value. The striking advantage of the competitive dialogue, namely the conversations with different private parties, might decline in case one private party is selected early in the process.

- In case ECI & DBFM have to be combined, a dept funding competition might be the best option.
Sheets Presentation & Workshop Expert Meeting

Het Combineren van Vroege Markbenadering en DBFM

**Introductie**
- Aanleiding
  - Praktisch: Het is niet meer mogelijk om projecten te plannen met een lineaire benadering. Er is steeds meer behoefte aan aansluiting op de markt en flexibiliteit om te reageren op veranderingen.
  - Theoretisch: De klassieke benadering is te zwaar en te langzaam om effectief te reageren op marktveranderingen.
- Probleemstelling
  - praktisch: De trend is naar vroege marktbenadering, maar deze methode is nog niet gecombineerd met DBFM in Nederland.
  - theoretisch: Er is een ontbreekt een systematisch model voor het combineren van vroege marktbenadering en DBFM.
- Onderzoeksvraag
  - Hoe kunnen vroege marktbenadering en DBFM gecombineerd worden gecombineerd waardoor er meer waarde voor de publieke opdrachtgever wordt gecreëerd?

**Conceptueel Model**

- Afbakening
  - Vroege marktbenadering + Verslutingstrategie 1 & 2
  - Availability-based Contracting + DBFM

**Plan van Aanpak**

**Interviews en Cases**

- Respondenten
  - WHS Theorie & Praktijk
  - Aannemers
  - Public Works
  - Hereninen
- DBFM en Versluiting
  - Voor- en nadelen
  - Perceptie publiek en privaat
- Combinatie
  - Barriers en mogelijkheden
  - Perceptie publiek en privaat

**Eerste bevindingen over de combinatie**

- Mogelijkheden
  - Realistische targets & budget
  - Flexibele optimalisatie
  - Hoge beschikbaarheid
  - Creativiteit om normale inzets
  - Vereenvoudigde en kosteneffectieve procedures
- Barriers
  - Bestaande omstandigheden
  - Aanstekelijkheid

**Bestuurlijke barrières in de combinatie**

- Barrières
  - Haalbaarheid opdrachtgever: overdracht van DG naar MWS
  - Bestuurlijke overeenstemming is vereist
- Oplossing richting
  - Wijziging opdrachtgever: overdracht van DG naar MWS
  - Bestuurlijke overeenstemming is vereist

**Aanbestedingsrechtelijke barrières in de combinatie**

- Barrières
  - Concessiebeleving: Markspanning op contract slecht
  - Transparantiebeleving: Gisting over een aanbesteding
- Oplossing richting
  - De overheid moet zorgen voor een goede waarborg van het transparantie en concessiebeleving door helderere criteria op te stellen en begrip in het contract te nemen
  - De overheid kan de projectstrategie aanpassen (bijv. andere vormen van marktbeleving) voor een combineren van deze beginselen te waarborgen
Financieringsbarrière in de combinatie

- Barrière:
  - BiJ/DBFM is geconcentreerde financiering bij definitieve inschrijving vereist
  - Voorkeur basen is financiering na OTR (volledig of actief met VO op TB bekend zijn)
  - Bijdragen van scoped financiering en financieringscondities zijn aanwezig bij vroege marktwerking
  - Bijdragen zijn van invloed op het risicoprofiel
  - Gestandaardiseerd termijnbank maximum 3-4 maanden

Financiering door DBFM lijkt niet haalbaar met het huidige DBFM contract door het spanningseffect tussen de geconcentreerde financiering en de beperkte gestandaardiseerde termijn

Oplossingsrichtingen

- Schulen met mijlpalen
- Overbruggen periode tussen definitieve inschrijving en financiële close

Overbruggen periode tussen definitieve inschrijving en FC

- Roll-over commitments (Verlenging gestandaardiseerde termijn tot aan FC)
  - Input markt is gewaarborgd
  - Financier in consortium, dus toegeweegde waarde F-component is gewaarborgd
  - Steeds nieuwe voorwaarden, dus veel onzekerheid over de oplosningsquantum

Opleggen concurrentiegerichte dialoog

- Hiertoe hebben geen procedures te worden gewijzigd
- Gestandaardiseerd termijnbank niet in het geding
- Input markt is gewaarborgd
- Financier in consortium, dus toegeweegde waarde F-component is gewaarborgd
- Onbeperkt top hangt af
- Voetstuk daarlangs

Schooien met mijlpalen

- FC binnen gestandaardiseerde termijn met marges of met wijzigingsprocedure
  - Gestandaardiseerd termijn niet in het geding
  - Input markt is gewaarborgd
  - Financier in consortium, dus toegeweegde waarde F-component is gewaarborgd
  - Goede bijdrage en vrije marges (laag tevredenheid minder en vetst)

Publieke perceptie

- DBFM een vroegere marktwerking beveel (ontwikkelt meer waardoor
  - Combinatie is mogelijk, maar tegen welke prijs?
  - Krijf je vooral dat de concurrentie goed wordt gewaarborgd?
  - Per specifiek project moet worden bekeken of de betrokkenen geschikt zijn

Private perceptie

- DBFM beperkend vanwege de complexiteit en de integratie van het werk
  - Vroege marktwerking is wenselijk vanwege de grotere vertrouwenswaardigheid omdat de samenwerker ook wel 'close' draagt
  - Financiering in een vroege stadium wordt erg lastig
  - Private partijen zijn gericht op DBFM, de focus op vroege marktwerking ondubbelzinnig

Vraagstuk 1

- Bij het oprekken van de concurrentiegerichte dialoog worden private partijen al voor OTR betrokken, maar wordt de definitieve inschrijving pas bij TB gegeven, hiervan hiervan:
  - Dit werd de concurrentiegerichte dialoog jaren door kunnen
  - Dat de toekomstbanken ongesplitst

- Hoe kan de concurrentiegerichte dialoog duurzaam worden ingericht dat partijen de lange daar ervan niet vervelen vinden?
Vraagstuk 2

- Indien de financiële close binnen de gestandaardiseertermijn op aannames plaatsvindt, moet er een mogelijkheid worden ingebouwd voor wijzigingen.
  - Het risico hierbij is:
    - Dat er enkele bijzondere mogelijkgenspreken dat het risicoprofiel van het project verandert.

- Hoe kunnen de aannames duurzaam worden opgesteld, zodat er ruimte wordt geboden voor wijzigingen, maar dat het project ook interessant is voor financiers?

Vraagstuk 3

- De financiële close kan ook plaatsvinden binnen de gestandaardiseertermijn met enkel een ongedeeld financierer.
  - Wat de bijzondere mogelijkgenspreken dat het risicoprofiel van het project verandert.

- Hoe kan de opdrachtgever zorgen dat er een marktconforme prijs wordt afgegeven?

Vraagstuk 4

- Bij een financieringscompetitie (DBFM verf) wordt de financier pas later toegewezen aan het consortium. Risico’s hierbij zijn:
  - Dat de waardefunctie van basiskosten minder (negatief effect op marktwaarde)
  - Dat financiers enkel op waarde waarden zullen baten waardoor de planning vertraagd
  - Dat financiers geen interesses hebben in het project en de verkoop hindernis voor financiers

- Hoe kunnen private partijen gepikt worden om op voorhand een ‘bankabe’ plan te ontwikkelen?

Vraagstuk 5

- Met het gebruik van roll-over commitments wordt de gestandaardiseertermijn steeds verlengd tot aan de Financial Close. Risico’s hierbij zijn:
  - Veel onzekerheid over de aanbieders
  - Veel extra werk voor de partijen

- Hoe kan de opdrachtgever zorgen dat er sneller duidelijkheid wordt verkregen?

Vraagstuk 6

- De marktwaarde van DBFM & Vroege Marktenadering lijkt de liggen in:
  - Realisatie binnen tijd & budget
  - Lifecyclo-optimisatie
  - Hoog beschikbaarheid
  - Consistentie in steedsimplicatie overkoeping
  - Voordeel door gewoonlijk procedures

- Zijn er andere mogelijkheden om deze doelen te bereiken?
  - Gebiedsbereik Lifecyclo?
  - Buitenland?
  - Andere financierings projecten?
  - Aanbiedingsprocedure anders inrichten?
  - ...

Vraagstuk 7

- De combinatie van DBFM & Vroege Marktenadering zou duurder kunnen worden dan aanbesteding na TE, omdat:
  - Er worden meer financiële opties voor de aanbieders
  - Commitment van financiers in een vroege stadium wordt afgegeven

- Hoe kan worden gewaarborgd dat de kosten ervan de meerwaarde niet overstijgen?

Vraagstuk 8

- Bij wat voor projecten kan de combinatie van DBFM en Vroege Marktenadering succesvol worden toegepast?
  - Leren vergroten projecten zich voor innovatie?
  - Publiek/infraprovecten?
Appendix D – Validation Workshop

Participants
Rudolf Rijkens  AT Osborne ECI & DBFM, A2 Maastricht, A1/A28 Hoevelaken, RWS ECI & ABC
Harold Topper  AT Osborne ECI & DBFM, RWS MIRT & Markt
Pelle de Wit    AT Osborne PM, N/S Line, Alliances
Paul Brinkman  AT Osborne PM, A12 LuVe, N/S Line
Obbe Wassenaar RWS DBFM & ECI
Patrick van Dijk  DHV ECI & DBFM, ViA15, Project finance
Mario van der Zwan Director Heijmans, Movares, independent advisor for consortia (Belgium)
Rob Peters RWS Finance, 2e Coentunnel, A15 MaVa
Marjolijn Lubbert  RWS PM ViA15, A2 Maastricht, ECI & DBFM
Wouter van den Berg Ballast Nedam Legal, Clifford Chance, PPP abroad

Validation Workshop – August 27th 2012 – 3.00 AM
The goal of this validation workshop is to validate the findings and the designed models of the graduation research by experts in the field to gain a scientific justification for the investigation. In order to use the expertise of the participants in an optimal way, the meeting is organised as follows: First a short presentation about the graduation research is given, to immediately continue with a discussion about the findings, the specific solution directions and the composed models, to finish with drinks in an informal setting where evaluation will take place. The workshop set-up is shown in the sheets on the next pages a summary of this meeting can be found in the main text in Chapter 7.
Het Combineren van Vroege Markbenadering en DBFM

Inhoud
- Onderzoekspot
- Bevindingen
- Oplossingsrichtingen
- Model

Introductie

Aanleiding
- Practisch: PM5 vernoort met dit probleem: projectknoop strategie en A1 A23 Haeslaken
- Theoretisch: Beeld vanuit Ruding: 'Markt, Impul', 'en Dividing 'Theoretical View''

Probleemstelling
- Praktisch: OPfomen wordt Vroege Markbenadering niet gecombineerd met DBFM in Nederland. Als een combinatie mogelijk is, is het voor de politiek strategisch geen gemak en de mogelijke tegenvergelijke waarde van deze combinatie niet te nemen
- Theoretisch: RI is geen wetenschappelijk model over de uitvoering van vroege marktbenadering met DBFM, wat een gebrek is aan kennis in dit onderzoeksgebied

Onderzoeks vraag
- Hoe kunnen vroege marktbenadering en DBFM doelmatig worden gecombineerd zodat er een meerwaarde voor de publieke sector kan worden gerealiseerd?

Conceptueel Model

Afwikkeling
- Vroege Markbenadering: Vervangingsoverdracht 1 & 2
- Analyse in het Rapportie: Contact DBFM
- Wetenschappelijk Nader: Hoekeheren: Bosch & Karsen

Plan van Aanpak

Bevindingen DBFM

- Voordeelen
  - Lijst voor optimalisatie
  - Hoge beschikbaarheid
  - Realisatie binnen tijd en budget

- Nadeelen
  - Rechtst. bovendakbaar
  - Lengte hoogte

- Onzekerheden
  - Gedrag op Risico's

- Toegewezen Waarde
  - Wordt ervoer door partijen, maar zou nog groter kunnen zijn door betere risicovoorziening en vrijheid voor de aanbidders

Bevindingen Vroege Markbenadering

Mogelijkheden
- Ruimte voor innovatie: de markt
- Analyse van procedures
- Lijst voor optimalisatie
- Hoge beschikbaarheid
- Realisatie binnen tijd en budget

Waarschijnlijke Risico's
- Ruimte voor innovatie: de markt
- Analyse van procedures
- Lijst voor optimalisatie
- Hoge beschikbaarheid
- Realisatie binnen tijd en budget

Perspectieven
- Toekomst: sterk perspectieven zijn blijvend, volgens IR perceptie leent benadering en eigen rol
- Opvallend: Banken zijn bereid om te financieren, hebben meer problemen met langdurig

Bevindingen Combinatie Vroege Markbenadering & DBFM

Ontwerp en drukwerk
Conclusies

- Rol onzekerheden:
  - Zeer groot, biedt veel kansen en bedreigingen
  - Geen onafhankelijke beslissingen
  - Overbelasting van ruimte en vertraging

- Perceptrions:
  - Partijen zien vaak persisteren en hun eigen voordelen in de besluitvorming
  - Veranderingsfrees van betrokkenen verstoort

- Hoe kunnen vroegere marktbeoordeling en DBFM daadwerkelijk worden gecombineerd dat er een meerwaarde voor de publiciteit aangeboden wordt gerealiseerd?
  - Mogelijkheid tot coordonatie is gedemocratiseerd, meerwaarde voor betrokkenen wordt vertaald in betrokkenen door een goede communicatie
  - Combinatie met M1 is niet redelijk vormgeving, financiële mogelijkheden

Mogelijke oplossingen voor de Combinatie

- Opgelost in oplossing, aanvulling mogelijk

- Overzicht
  - Maximaal nemen van ruimte in de planprocedure
  - Bedrijfpartner per fase
  - Afhankelijk van veranderende risico
  - Stappenplan aanbevelen

- Discussie per oplossing richting
  - Voor- en nadelen
  - Aandachtspunten
  - Machtbaarheid

Maximaliseren van Ruimte in Planprocedure

- Motivatie:
  - Combinatie is mogelijk zonder aanpassingen
  - Er komt altijd financiële ruimte uit door de procedure

- Stappenplan:
  - Het huidige stappenplan werd geëvalueerd dat het slechts 1 fase heeft
  - Het tapijt loopt niet verder dan gewenst
  - Het is eenvoudiger om een plane te gaan dan de gesloten boekhoudingstekorten

Beste Partner per Fase

- DBFM / DFM + FM

- Modellie:
  - Coöperatie per fase
  - De markt kan een zeer vroeg stadium betrekken

- Stappenplan:
  - Ook zonder bevorderingsmiddelen zijn de plannen in vaste stappen gepland om de voorwaarden aan DBFM te nemen

Stapsgewijs Aanbesteden

- Aanbesteding in de fase van de aanbesteding:
  - Bij een aanbesteding met oplossing, kosten en contract stapsgewijs aanscherpen: Detectorisatie gestart bij fase
  - De markt kan in een zeer vroeg stadium betrokken worden

- Stappenplan:
  - Competitieve prijsbiedingen lastig naars plannenprocedure met 1 partij

Afspraken over Veranderend Risico

- Aanbesteden op Marge of Aansuutings per RIs over Commitment

- Motivatie:
  - Risico's zijn berekenbaar in een vroeg stadium te participeren
  - De markt kan in een zeer vroeg stadium betrokken worden

- Stappenplan:
  - Deze oplossing leidt tot ondubbelzinnigheid voor de opdrachtgever
  - Er moet gewerkzaam worden voor "zichtbare" en "zichtbaarheid"

P4 Model for Project Planning

- Aanbesteding in de fase van de aanbesteding:
  - Bij een aanbesteding met oplossing, kosten en contract stapsgewijs aanscherpen: Detectorisatie gestart bij fase
  - De markt kan in een zeer vroeg stadium betrokken worden

- Stappenplan:
  - Competitieve prijsbiedingen lastig naars plannenprocedure met 1 partij
Appendix E – Scientific Article

COMBINING EARLY CONTRACTOR INVOLVEMENT AND AVAILABILITY-BASED CONTRACTING IN COMPLEX INFRASTRUCTURE PROJECTS
Anne Beekers

ABSTRACT
Early Contractor Involvement (ECI) and Availability-Based Contracting (ABC) are considered to realise 'Value for Money' when applied in construction projects. Their applicability is found in governmental policy resulting from advices of both Ruding and Elverding committees and is shown in projects as well, but strangely enough no combination ECI and ABC has been found in Dutch projects yet. This research aims to identify whether and how these forms can be combined in order to create added value for the public client. It entails a comparison of the separate approaches and combines literature and practical findings in a new model with directions for a successful application.

Keywords: PPP, Early Contractor Involvement, ECI, Availability-Based Contracting, ABC, DBFM, interweaving, innovation, Ruding, Elverding, procurement, tendering, uncertainties, added value, risks, road infrastructure

INTRODUCTION
For many years construction projects were characterised by a poor image of time and budget overruns (Flyvbjerg, Bruzelius & Rozengatter, 2003). The construction industry is forced by new national policy to change significantly the last decades in order to terminate this malicious tradition. Private participation, including co-financing, seems to be an effective method to accomplish an improved time, cost and quality control in the implementation of infrastructure projects (Koppenjan, 2008). In case of early market involvement the creativity of the market might result in innovative solutions as well. These two approaches are captured by the terms of Availability-Based Contracting (ABC) and Early Contractor Involvement (ECI) and are applied as a result of advices from the Ruding Committee with the ‘Market, unless..’ policy and the Elverding committee in a ‘Faster & Better’ policy. Their added value is shown in projects, but no simultaneous application of these forms has been applied yet, which might be a missed opportunity to create additional value from the combination. Therefore this research will elaborate on the implications of a combination of ABC and ECI, in order to determine a successful combination that can be composed in a model.

METHODOLOGY
Following from the topicality of the subject and the rather new nature of the developments, literature about this combination is lacking and no information can be gained from combined cases in the Netherlands, so the research strategy implies a practical, qualitative, specific methodology. This entailed the collection of scientific information from several fields of research and the gaining of practical information from both interviews and cases with one of the components in it. After an extensive analysing phase the findings are used as input for a new model design. As a result of the lacking experiences with this topic, the model cannot be tested in a real-life situation, thus the findings and the model are validated in a workshop with a group of experts, to ensure valid conclusions and recommendations (Verschuren & Doorewaard, 2007).
ANALYTICAL FRAMEWORK

The theory of uncertainties, more specifically: in the negative interpretation as risks threatening the project and positively explained as opportunities to realise added value, is selected as a suitable analytical framework to structure the research. This is explained by the fact that uncertainties are having a considerable role in this combination as both approaches require uncertainty management: On the one hand by handling risks that are threatening the project properly (Loosemore), on the other hand by exploiting opportunities to create added value (Versteegen & Rijkens). The best way to handle uncertainties requires identification in an early stage. Conflicting aspects need to be solved and complementing aspects have to be used in order to ban risks that threat the project result and to realise synergy from the opportunities to add value.

COMBINING ABC AND ECI

An analysis on the separate approaches of ECI and ABC is executed. Several complementing aspects are identified, namely the controllability as a result of the private ability to manage projects properly, which leads to in acceleration of procedures and execution within time and budget. Optimisation is realised as well from the private creativity and the integration of activities. Also the long-term relationship as a result of the involvement of the market in an early stage and the awarding of a single contract for design, build and maintenance activities is considered to be a complementing aspect. Conflicting aspects are found in the contrast between fencing-off the contract vs. broad solution space and in the requirement of committed funding at final bid vs. involvement before Draft Route Decision when no financial party is willing to provide funding due to the high amount of uncertainties in this phase.

The opportunities in the combination of ECI and ABC in projects are found in the following aspects:

- **Innovation**
  As a result of the creativity of the market that is used as input early in the process (ECI).

- **Acceleration of procedures**
  Following from the interweaving of the public planning and private tendering procedure (ECI) (Tillema & Arts, 2009).

- **Lifecycle optimisation**
  The addition of maintenance in the contract ensures a focus on long-term ‘value for money’, which implies better project result for a certain budget (ABC).

- **High availability**
  As result of the payment mechanism that is based on the availability of the road (ABC).

- **Realisation within time and budget**
  Following from commercial interests projects are strictly managed (ABC) (Koppenjan, 2008).
The identified risks in the combination are grouped in the next issues

- **Institutional difficulties**
  Projects need support from involved public parties to ensure execution.

- **Legal difficulties**
  Tendering principles need to be guaranteed by the government in processes and contracts.

- **Financial difficulties**
  Committed private funding requires clear risk analyses so a limited amount of uncertainty (Eversdijk & Korsten, 2009).

Strategic preconditions that have to be met in order to find a window of opportunity for the combination are:

- **Institutional consensus**
  Public entities admit the problem and recognise the necessity for the project.

- **Complex project**
  The market is needed to solve a certain complexity as the public client is not able or willing to do so.

- **Capable client**
  The government is able to guarantee tendering principles circumstances and criteria.

- **Capable market**
  Private parties have the required knowledge and experience to deliver input.

Perceptions of involved actors are identified as well because it predicts the desirability of a combined application of ECI and ABC. Findings about this topic show a relation with the professional role of parties and ideas about the combination can be coupled to their perceptions about the separate approaches. A striking finding here is the fact that experts expect difficulties in their own knowledge field and see opportunities for application in others, that are subsequently invalidated by others. This is considered as a signal that ABC and ECI cannot easily be combined because tricks need to be applied in order to realise a successful combination.

Although the realisation of added value with the combination of ABC and ECI is not broadly recognised as a result of the many difficulties that have to be faced and the advantages of the separate approaches that are questioned, a model is designed to provide solution directions that enable a combination of the two approaches. Four directions are identified:

- **Maximizing Planning Solution Space**
  Broadening solution space in such a way that creative ideas from consortia will fit the Draft Route Decision in order to pass procedures quickly and to ensure financial close within the validity of the bid.

- **Postponed Funding**
  Postponing of funding activities with potentially varying partners to a moment that parties are willing to participate in projects, as the party that is best able to execute the funding is responsible for it. This can f.i. be realised with a dept funding competition or the splitting of short- and long-term funding.

- **Stepwise Procurement: Partnership >> Price**
  Selection on partnership and pricing in competition as this fits the abstractness of the early phases better and detailing happens in a one-to-one situation.

- **Provisions for Risk Settlements**
  Contract close is executed with regulations to compensate parties in case of alterations. This option parries the assumed difficulties, f.i. by roll-over commitments or margins/assumptions.
MODEL DESIGN

Two models have been developed in this research in order to identify a window of opportunity for the combination and to provide direction for solutions in case a this window occurs.

The first model represents the identification of a window of opportunity for combining ECI and ABC, that occurs when the four preconditions are met: The C4 Model with Compulsory Conditions for the Combination. This abstract model consists of two axes: The horizontal axis represents conditions based on supply and demand, the vertical axis shows the options with a certain role for the client.

In case all these preconditions are met in projects, a window of opportunity for the combination of ECI and ABC occurs which implies that the project might be suitable for this purpose. In case a considerable assumed value can be expected that transcends the costs of this approach, added value might be created with the combination of ECI and ABC. In this case several difficulties have to be parried, for which directions for solutions are developed.
The proposed directions for solutions in order to realise the combination of ECI and ABC are composed in an abstract model as a plan of approach for projects that are considered to be suitable for the combination: The ‘P4 Model for Project Planning’. This model consists of two axes: The horizontal axis represents solutions with a phasing element in it, the vertical axis shows the amount of freedom in the contract.

The model does not claim to be complete, because this field is still developing, so the model is consciously exposed in an open, outwarding structure as shown in the figure and can be extended when new findings are gained in the future.

**CONCLUSIONS AND RECOMMENDATIONS**

The cumulation of advantages of the separate approaches is considered to result in the actual added value of the combination, namely innovation, acceleration of procedures, lifecycle optimisation, high availability and realisation of the project within time and budget. Following from the institutional, legal and financial difficulties that have to be faced in the application, it can not unconditionally be stated that combining of ECI and ABC will deliver synergy. It has to be considered per specific project since only in case all preconditions of complexity, capability, circumstances and consensus are met a window of opportunity is found for the combination. Following from these aspects, the combination of DBFM and interweaving model 1 seems to be a bridge too far. Model 2 might realise added value, but solutions only have to be explored in case a considerable added value in contrast to the actual costs can be created, because it must be prevented that both the one-on-one consultations with the contractor and the higher discount rates from the private funding result in higher costs, while no innovation or optimisation is realised.
Recommendations for future projects are developed as well:

- **Application of the combination**
  Is only recommended when preconditions are met in Interweaving Model 2 situations in projects that show an assumed added value that is considerably higher than the extra costs from the private funding and the one-to-one negotiations. The ‘P4 model for Project Planning’ should be used to provide direction for application then.

- **Selection of a direction for the combination**
  The P4 models' directions seem to be equally applicable in general, so in projects a group of experts must take project specific elements in consideration in the decision;

- **Role of the government**
  The governments’ role as a facilitator needs to be acted professionally by ensurance of the tendering principle of transparency, objectivity and competition already from the start as the combination is complex.

- **Perceptions of involved actors**
  These need to be kept in mind as it increases the probability of proper identification of risks and opportunities and thereby the realisation of added value.

When these recommendations are kept in mind in the future the likelihood of a successful application of the combination of ABC and ECI increases, which might result in the realisation of added value in new projects.

**SOURCES**

Appendix F – Nederlandse Samenvatting

Dit rapport bevat een afstudeeronderzoek over het combineren van vroege marktbenadering en contractering op beschikbaarheid in complexe infrastructuurprojecten. Het is uitgevoerd bij consultancy en managementbureau AT Osborne en vormt tevens de afsluiting van de master Construction Management & Engineering aan de TU Delft.

Op dit moment worden vroege marktbenadering en contractering op beschikbaarheid nog niet gecombineerd toegepast in Nederlandse wegenprojecten, wat mogelijk een gemiste kans om meerwaarde te creëren betekent voor de publieke opdrachtgever. Daardoor twijfelt de opdrachtgever momenteel over de bruikbaarheid van deze combinatie: Een gezamenlijke toepassing van de aanpakken wordt niet aangedurf vanwege de te verwachten moeilijkheden, maar beleid vanuit de onderzoeken van de commissies Ruding en Elverding sturen hier wel op. Dit onderzoek wordt daarom uitgevoerd om de opdrachtgever richting te geven, met als doel het identificeren of en hoe toegevoegde waarde kan worden gerealiseerd met de gecombineerde toepassing van vroege marktbenadering en contractering op beschikbaarheid. Vanwege deze aanleiding zijn de aanpakken daarom afgebakend op aanbesteding voor ontwerp Tracebesluit (vervlechtingsmodellen 1 & 2) als de invulling van vroege marktbenadering en DBFM contracten als interpretatie van contractering op beschikbaarheid. Het toepassingsgebied ervan is nationale wegenprojecten met Rijkswaterstaat als de publieke opdrachtgever. De theorie van onzekerheid is daarnaast gebruikt als wetenschappelijk kader om het onderzoek te structureren.

Als gevolg van de actualiteit van het gekozen onderwerp en het redelijk nieuwe karakter van de ontwikkelingen in het algemeen is er geen literatuur of praktijkvoorbeeld te vinden, waardoor het onderzoek praktisch, kwalitatief en specifiek van aard wordt ingestoken als geschikte methodiek. Dit houdt in dat wetenschappelijke informatie van diverse onderzoeksvelden wordt verzameld en praktische ervaringen en inzichten in interviews als input worden verkregen. Na een uitgebreide analyse worden de bevindingen vervolgens gebruikt als input voor een nieuw model. Het ontbreken van ervaringen met dit specifieke onderwerp impliceert dat het niet mogelijk is om de toepasbaarheid van het ontworpen model te testen in een bestaande casus. Daarom zijn de bevindingen en het model gevalideerd in een interactieve workshop met een expertgroep zodat geldige conclusies en aanbevelingen kunnen worden gedaan.

De hoofdvraag in dit onderzoek was:
Hoe kunnen vroege marktbenadering en contractering op beschikbaarheid dusdanig worden gecombineerd dat er toegevoegde waarde ontstaat voor de publieke opdrachtgever?
Er wordt gestart met het uitvoeren van een analyse op de afzonderlijke aanpakken van vroege marktbenadering en contractering op beschikbaarheid. Verschillende completerende kenmerken worden geïdentificeerd, te weten de controleerbaarheid als gevolg van de private kwaliteit om projecten goed te beheersen, wat een versnelling van procedures (vanuit vervlechting) en een realisatie binnen tijd en budget (vanuit DBFM) tot gevolg heeft. Tevens worden er optimisaties gerealiseerd, zowel vanuit de creativiteit van de markt (vanuit de vroege marktbenadering) als in het integreren van activiteiten (vanuit DBFM). Daarnaast wordt de lange relatie tussen opdrachtgever en opdrachtnemer genoemd als completerend aspect vanuit de vroege marktbenadering en de lange duur van het contract door de onderhoudscomponent.
Conflicterende kenmerken worden gevonden in het contrast tussen enerzijds het aftimmeren van het contract bij DBFM en anderzijds de brede oplossingsruimte bij vroege marktbenadering, en de eis voor gecommitteerde financiering bij de inschrijving op een DBFM contract die niet te combineren lijkt met de betrokkenheid voor OTB, een moment waarop nog geen enkele financier bereid is om financiering te verstrekken vanwege de vele onzekerheden in dit vroege stadium.

Onzekerheid speelt een aanzienlijke rol in de combinatie van DBFM en zeer vroege marktbenadering omdat beide aanpakken vragen om de beheersbaarheid hiervan: Aan de ene kant moet er goed worden omgegaan met de risico’s die het project bedreigen, aan de andere kant moeten kansen worden gegrepen omdat er toegevoegde waarde mee kan worden gecreëerd. De beste manier om dit invulling te geven is door er zorg voor te dragen dat onzekerheden reeds in een vroeg stadium in kaart worden gebracht. Conflicterende aspecten dienen dan te worden opgelost en complementerende aspecten benut, zodat risico’s die het projectresultaat bedreigen uitgebannen worden en de kansen gebruikt kunnen worden om meerwaarde te realiseren.

Mogelijkheden en moeilijkheden in de combinatie van zeer vroege marktbenadering en DBFM moeten daarom op voorhand duidelijk zijn omdat zij de toegevoegde waarde die in het project behaald kan worden bepalen. Ook moeten voorwaarden worden geïdentificeerd, zij bepalen namelijk of een project überhaupt in aanmerking komt voor de combinatie.

De mogelijkheden in projecten waarin DBFM en zeer vroege marktbenadering worden toegepast zijn te vinden in de volgende aspecten:

- **Innovatie**
  Als resultaat van de creativiteit van de markt die wordt gebruikt als input in een vroeg stadium.

- **Versnelling van procedures**
  Vanuit het vervlechten van de publieke plan- en private aanbestedingsprocedure.

- **Levenscyclus optimalisatie**
  Doordat de onderhoudscomponent partijen dwingt tot een lange termijn focus in projecten.

- **Hoge beschikbaarheid**
  Als resultaat van het betalingsmechanisme dat gebaseerd is op de beschikbaarheid van de weg.

- **Realisatie binnen tijd en budget**
  Inherent aan de commerciële belangen van partijen is projectbeheersing goed op orde.

De risico’s in de combinatie kunnen worden gegroepeerd onder de volgende moeilijkheden:

- **Bestuurlijke moeilijkheden**
  Projecten moeten worden gesteund door de betrokken publieke instanties omdat dit de kans op uitvoering vergroot

- **Juridische moeilijkheden**
  Aanbestedingsrechtelijke beginselen moeten worden gewaarborgd door de overheid in processen en contracten

- **Financiële moeilijkheden**
  Gecommitteerde private financiering vereist een heldere risico analyse en dus een gelimiteerde hoeveelheid onzekerheden
Strategische voorwaarden waaraan voldaan moet worden voordat zich een kans voor de combinatie voordoet zijn:

- **Bestuurlijke consensus**
  Publieke instanties erkennen het probleem en de noodzaak voor het project

- **Complex project**
  De markt is benodigd om een zekere complexiteit op te lossen omdat de publieke opdrachtgever daar niet toe bereid is

- **Capabele opdrachtgever**
  De overheid is in staat om aanbestedingsbeginselen te garanderen

- **Capabele markt**
  Private partijen hebben de vereiste kennis en ervaring om input te leveren.

Dit kan vertaald worden naar een abstract en gesloten model waarin zich enkel een kans voor de combinatie voordoet indien aan alle voorwaarden is voordaan. De oplossingen op de verschillende assen zijn aan elkaar gerelateerd: De horizontale as betreft voorwaarden met betrekking tot vraag en aanbod, de verticale as schept voorwaarden die te maken hebben met de rol van de overheid. Dit resulteert in het volgende voorwaardenmodel:

Voorwaardenmodel voor de een kans op succesvolle combinatie van zeer vroege marktbenadering en DBFM
Percepties van betrokken actoren zijn ook geanalyseerd omdat zij de wenselijkheid van gecombineerde toepassing van zeer vroege marktbenadering en DBFM kunnen voorstellen. Bevindingen over dit onderwerp tonen een relatie met de professionele rol van partijen en daarnaast kunnen hun ideeën over de combinatie aan de percepties over de losse aanpakken worden gekoppeld.

Een opvallende bevinding hierbij is het feit dat experts in hun eigen kennisveld voornamelijk moeilijkheden zien voor de combinatie, maar wel mogelijkheden daarbuiten verwachten, die dan vervolgens weer worden ontkracht door experts in dat onderzoeksveld. Dit wordt gezien als een signaal dat DBFM en zeer vroege marktbenadering niet eenvoudigweg gecombineerd kunnen worden maar dat er kunstgrepen benodigd zijn om de combinatie te laten slagen. De toegevoegde waarde uit de combinatie wordt daarom betwijfeld en er zijn mogelijk andere opties dan deze aanpakken om de veronderstelde meerwaarde te bereiken.

Hoewel de realisatie van meerwaarde met de combinatie van DBFM en vroege marktbenadering niet alom wordt erkend omdat het minder zal zijn dan op voorhand verwacht werd vanwege de moeilijkheden en de twijfels over de voordelen van de losse benaderingen, is er een model ontwikkeld dat poogt oplossingsrichtingen aan te bieden waarmee de combinatie kan worden gerealiseerd in het geval wordt besloten tot gecombineerde toepassing.

Vier hoofdrichtingen zijn hiervoor geïdentificeerd, namelijk:

- **Het maximaliseren van de ruimte in de planprocedure**
  Het verbreden van de oplossingsruimte zodat alle te verwachten oplossingen van de consortia in het OTB zullen passen zodat procedures snel doorloopen kunnen worden en de financial close binnen de gestanddoeningstermijn plaats kan vinden.

- **Uitgestelde financiering**
  Het uitstellen van de financieringsverplichtingen met potentieel wisselende partners, zodat de partij die het meest geschikt is voor de financiering er ook verantwoordelijk voor wordt. Voorbeelden hiervan zijn de financieringscompetitie en het splitsen van korte- en lange termijn financiering.

- **Afspraken over veranderend risico**
  De contract close vindt plaats met regelingen om partijen te compenseren als zich wijzigingen voordoen. Deze optie pareert de gestelde mogelijkheden met mogelijke interpretaties als roll-over commitments en aanbesteding op aannames of marges.

- **Stapsgewijze aanbesteding: Consortium >> prijsvorming in competitie**
  Er wordt geselecteerd op consortium waarna prijsvorming plaatsvindt in competitie omdat dit beter past bij de abstractheid van de vroege fase, detaillering vindt daarna plaats in een één-op-één situatie.

Deze richtingen worden samengesteld in een abstract model als plan van aanpak voor projecten die geschikt lijken voor de combinatie. Het bestaat uit een horizontale as met oplossingsrichtingen die een faserend element in zich hebben en oplossingsrichtingen waarin wordt gevarieerd in de mate van vrijheid in het contract tussen partijen.

Omdat dit vakgebied sterk in ontwikkeling is wordt het model bewust gestructureerd op een open en naar buiten gerichte wijze zodat het kan worden aangevuld met nieuwe bevindingen als die in de toekomst worden opgedaan.
Er worden tevens aanbevelingen gedaan voor toekomstige projecten:

- **Toepassing van de combinatie**
  Is enkel aanbevolen indien alle voorwaarden zijn ingevuld met een Vervlechtingsmodel 2 situatie indien er sprake is van een aanzienlijke te verwachte meerwaarde ten opzichte van de additionele kosten. Het Oplossingenmodel kan in dit geval gebruikt worden om richting te geven voor de toepassing van de combinatie.

- **Selectie van een richting voor de combinatie**
  De richtingen uit het oplossingenmodel lijken in het algemeen vergelijkbaar te scoren op toepasbaarheid, dus in projecten dient een groep van experts de projectspecifieke kenmerken in acht nemen bij de beoordeling hiervan.

- **Rol van de overheid**
  Rijkswaterstaats rol als faciliterende organisatie moet professioneel worden ingevuld door het garanderen dat de aanbestedingsrechtelijke beginselen van transparantie, objectiviteit en competitie vanaf de start van het project omdat de combinatie erg complex is.

- **Percepties van betrokken actoren**
  Deze moeten in acht genomen worden omdat dit de waarschijnlijkheid van goede risico en kansen identificatie en daarbij de realisatie van toegevoegde waarde vergroot.

Indien deze aanbevelingen in acht genomen worden in de toekomst zal de kans op een succesvolle toepassing van de combinatie van vroege marktbenadering en contractering op beschikbaarheid toenemen, wat kan resulteren in de realisatie van toegevoegde waarde in nieuwe projecten.
### Appendix G – Glossary

<table>
<thead>
<tr>
<th><strong>PPP</strong> (Public-Private Partnership)</th>
<th>A temporary organised collaboration between public and private parties, founded to realise a specific project with input of resources and risk acceptance from both parties.</th>
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</thead>
<tbody>
<tr>
<td><strong>ABC</strong> (Availability-Based Contracting)</td>
<td>The contract is composed in such a way that the goal of the project, availability, is strongly related to the payment mechanism.</td>
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<tr>
<td><strong>DBFM Contract</strong></td>
<td>Integrated contract with Design-Build-Finance and Maintain activities</td>
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<tr>
<td><strong>ECI</strong> (Early Contractor Involvement)</td>
<td>The actual contracting of a contractor for both design and execution activities in an early phase of the project.</td>
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<tr>
<td><strong>Interweaving</strong></td>
<td>Parallel running of plan and tendering procedures with crosslinking of information.</td>
</tr>
<tr>
<td><strong>Interweaving Model 1</strong></td>
<td>Most profound form of ECI: Start tender of draft structure vision and program of requirements, winning bid becomes structure vision</td>
</tr>
<tr>
<td><strong>Interweaving Model 2</strong></td>
<td>Start tender of preferred decision, program of requirements and draft EIA, winning bid becomes draft route decision</td>
</tr>
<tr>
<td><strong>BAFO</strong> (Best and Final Offer)</td>
<td>Final bid of the private consortium in a tendering procedure.</td>
</tr>
<tr>
<td><strong>MEAT</strong> (Most Economically Advantageous Tender)</td>
<td>Awarding criteria in the tender that imply selection of the contribution with the best value for money instead of the lowest price.</td>
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</table>