Controlling BVP Projects

An explorative research contributing to the utilization of expertise in the execution phase of BVP projects.

Master Thesis
Kim Vollenhoven
CONTROLLING BVP PROJECTS

Master thesis

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Preface

This thesis represents the end result of my master Construction Management and Engineering at TU Delft. The task of graduating was challenging, which makes it all the more satisfying to complete.

The formulation of my research topic arose from my desire to learn about the practice of the realization of construction projects and the collaborative challenges that occur in the industry. Following from the enthusiastic response from Peter Remmerswaal, we initiated the research together with Royal HaskoningDHV. I am very happy that I had the chance to work with Peter, who made it easy to keep the enthusiasm high. While working together, I was able to learn about professional aspects of the construction industry and business in general. I am grateful for the opportunities that he created not only during my research, but also for my starting career.

I want to thank Sicco Santema, the chairman of the committee, who helped me organize and focus my thoughts about the research topic. His direct way of giving feedback motivated me to improve my work, as well as the skill to present and stand behind my work. This lesson already helped me in different ways outside the context of my thesis.

I was fortunate to have Sander van Nederveen join the committee. I thank Sander for his availability and readiness to help. He took the time to read and respond to my work, even on short notice, and kept a sharp view on my work. He helped me maintain a critical view on the applied theories, the chosen research approach and finally the recommendations. This enabled me to write a structured thesis with scientific integrity.

While Peter and I went through the formalities of starting a graduation research, the graduation committee was still missing a first supervisor from TU Delft. Despite the missing first supervisor we decided to start the research. While traveling to the office for the first day, I received an enthusiastic email from Leon Laureij. The first day of my thesis started with good news, as I now had a complete graduation committee! Leon’s role in my thesis was enormous. He gave me guidance through all the different aspects of writing a master thesis. He helped in planning and time-management, formulating the methodology, advised me to move on when I was obsessed in details, he gave me tips on how to improve and prepare committee meetings and presentations and building a line of reasoning in the text. Besides talking about the work he always showed interest in the personal experience of the research, which was beneficial for the moral. I’m very grateful for his high amount of selfless support for me and my work.

This thesis is created by group effort. Therefore I consider myself very lucky with the enthusiastic committee of which every member was highly involved. Besides my committee I received support from different directions. I would like to thank the people who were willing to participate in the interviews and gave me valuable lessons and ideas for during my thesis and after graduating. My thanks go to the people at Royal HaskoningDHV, who attended my presentations, listened to my ideas, gave me feedback on my work and shared their knowledge about the practice of contract management. I felt supported and welcome in your company. I thank my family, June for lending her skills, Nils, my parents and grandparents who have supported and believed in me throughout all my academic and personal endeavors. My friends who make life bigger than working and studying: Baptiste, with whom I experienced the journey from MBO to WO and much more besides that. Jur, Beda and Gourav, my friends in knowledge and fun who keep my eyes on what is important. Floor, who keeps surprising me by always knowing what I need to hear when I face personal challenges. Sander and Anne, whose presence is always relaxing and enjoyable. Thanks to the brilliant people who share my passion and made my time in Delft really worthwhile: Gonzalo and the incredible Hu family and all my other friends at the dojo where I like to blow off some steam and strengthen body
and mind. Mari, thanks for cooking and bringing sunshine into my house when I was glued to my computer and for encouraging me to give my 100%. I want to thank Aditya, a source of inspiration who set me up to take the most out of the time at TU Delft. Special thanks go to my teacher Sri Sri Ravi Shankar who propelled my growth as a person and provided me the stimulation and opportunity to enhance my skills. I want to thank everyone who contributed to the many projects we realized in and around the university. The group effort and growing together made it an amazing time in Delft.

I would like to conclude with an impression that stayed with me since the start of the research when I first met with Sicco to discuss the options for a research topic: he suggested me to approach the execution of a graduation research as an adventure. I believe that choosing to perceive any situation as an adventure provides the right mindset to adopt during the dynamic execution of a master thesis and any challenge on one’s path. It is therefore a positive and powerful attitude, worthwhile to cultivate in life.

Kim Vollenhoven
07-07-2017
Summary

BVP/PIPS is a procurement method that has been extended to a collaboration model that can also be applied during the execution phase of a project. The purpose of BVP/PIPS is the minimization of risk by means of utilizing expertise. The utilization of expertise is made possible through the proposed procurement methodology, which focuses on selecting the expert contractor. During the execution phase, the methodology suggests a hands-off approach by the client and a leading role for the contractor. BVP/PIPS is often successfully implemented during the procurement phase of a project. However, there is a discrepancy between theory and practice, as traditional (MDC) behaviour still occurs during the execution phase of BVP/PIPS. Consequently, expertise is not always utilized to its maximum potential.

The goal of this research is to support BVP/PIPS principle ‘utilization of expertise’ in the execution phase of BVP/PIPS projects in the Netherlands. The research question contributing to a solution to the problem is as follows:

What are elements of a contract management model that would support the BVP/PIPS principle utilization of expertise during the execution phase?

The theory

Different research methods have been applied to formulate an answer to the research question. The examination of literature is the first step towards the formulation of contract management elements. BVP/PIPS suggestions for the utilization of expertise has been studied in order to find contract management elements that would fit the approach. Additionally, SCM literature was researched for the identification of contract management elements that are supported with scientific literature. The literature study concludes that both theories are based on different challenges. SCM focuses on reducing the negative effects of opportunism and bounded rationality, while BVP/PIPS focuses on eliminating the reason for opportunism by means of creating a win-win situation. In that scenario expertise can be utilized in the execution phase. In this phase, BVP/PIPS proposes quality assurance. SCM literature describes the usefulness of behaviour-based monitoring in win-win situations, which is applicable in BVP/PIPS projects.

The practice

Essential to the practical implementation of the suggested contract management elements, the second step of the research provides the practical insight in contract management. The practical insight is acquired through preliminary research consisting of document study and interviews with experts in the field of Dutch building contracts and contract management. This investigation provided knowledge about the practical context of UAV-gc wherein BVP/PIPS projects, and therefore the contract management model, is implemented. It also gave insight in the contract management methods that are being applied in the Netherlands. The main method of contract management is defined is SOCM, a risk-based testing system that allows clients to assure quality through system-, process- and product tests.

Challenges and best practices in four cases have been studied in order to formulate potential contract management elements that support the utilization of expertise. The challenges and best practices have been linked to other research and literature in order to provide more generalizability.

Challenges

It was observed that both clients and contractors tend to fall back in traditional behaviour. Clients were observed to return to managing, directing and controlling (MDC) the contractor, while contractors did not demonstrate expert behaviour. They adopted a more passive attitude, waiting for instruction by the client, and did not control their own quality. It is also observed that clients and contractor started to discuss about responsibilities, which caused delay and transaction costs.
**Best practices**

In two cases it was observed that clients and contractors created a win-win situation. Both situations could have developed in juridical escalation, but the win-win approach led to quick resolution and continuation of the project without unnecessary transaction costs. Walking through a good clarification phase allowed the client to ‘let go’, because he knew before execution how the contractor would deliver the project. A good clarification phase was beneficial for the contractor, because he already walked through the project before execution, allowing him to consider potential risks. Clearly defining the scope of the project and both parties prevented discussions about responsibilities. It allowed client and contractor to take responsibility for risks that appeared in their sphere of influence. Accepting risk prevents in own sphere of influence prevented discussion and transaction costs. Transparency allowed the client to be aware of the state of the project and enabled both client and contractor to perform joint problem solving. Expert behaviour allowed the client to maintain a hands-off approach during the execution phase. Quality assurance was performed in a hands-off fashion through risk-based testing, without relying on traditional behaviour.

**Conceptual model**

Based on the challenges and best practices observed in the case studies, contract management elements have been formulated. These elements have been supported with the findings of the literature study in order to provide scientific support. The contract management elements have been brought together in a conceptual model for contract management in BVP/PIPS projects. The pyramid shaped model exists of four layers: mindset, behaviour, conditions and quality assurance, constructed by different elements, of which each is necessary for the implementation of the proposed model. The top layer fulfils the function of quality assurance by the client in BVP/PIPS projects. The implementation of quality assurance is designed based on SCM literature’s definition of behaviour-based monitoring and observations in case studies. The conceptual model stresses the importance of the right conditions, behaviour and mindset for the application of the proposed quality assurance method. Mindset is the foundation of the conceptual model. A desire for a win-win and hands-off approach, together with the necessary soft-skills are the basis for the required behaviour and conditions for the proposed method of quality assurance. A guideline of implementation per BVP/PIPS phase is presented with the conceptual model.

**Further research**

The explorative nature of this research allowed the researcher to get a deeper understanding of contract management in BVP/PIPS projects and construction projects in general. Based on this research the conceptual model is formulated. The scope of the research did not include an evaluation of the conceptual model in practice, which provides room for further research.

Experts repeatedly claimed that the behavioural aspect of contract management is recognized as an important factor. Scientific literature in the field of social studies and psychology might be able to contribute to the literature and practice in construction management. Studies about the effect of intrinsic and extrinsic motivation can potentially provide useful insights for the utilization of behavioural aspects of contract management.
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### Abbreviations

<table>
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<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>BVP/PIPS</td>
<td>Best Value Procurement/Performance Information Procurement System</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IMT</td>
<td>Information Measurement Theory</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>MDC</td>
<td>Management, Direct and Control</td>
</tr>
<tr>
<td>NIE</td>
<td>New Institutional Economics</td>
</tr>
<tr>
<td>PBC</td>
<td>Performance Based Contracting</td>
</tr>
<tr>
<td>SE</td>
<td>Systems Engineering</td>
</tr>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>SOCM</td>
<td>System Oriented Contract Management</td>
</tr>
<tr>
<td>SSC</td>
<td>Service Supply Chains</td>
</tr>
<tr>
<td>TCE</td>
<td>Transaction Costs Economics</td>
</tr>
<tr>
<td>UAV-IC</td>
<td>Uniform Administrative Conditions for Integrated Contracts</td>
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<td>WR</td>
<td>Weekly Report</td>
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1. Introduction

The Dutch construction industry has been going through several developments during the last decade. The construction fraud led to the implementation of new policies. In order to deal with the challenges in the construction industry, tender procedures were adapted as were contract forms and contract management methods. In the meanwhile, developments in the US that went by the name of BVP/PIPS were gaining momentum. These developments later proved valuable to the Dutch construction industry.

Dean Kashiwagi aimed to contribute to the procurement and management of construction projects by reducing risk through selecting the expert and aligning expertise (Rijt & Santema, 2013). He created BVP/PIPS, a philosophy and system that can potentially counter the unintended by-products of traditional contracting by utilizing expertise. Kashiwagi (2016b) identifies BVP/PIPS as: “a futuristic management model, a powerful risk management model and an optimizing model for organizations and supply chains”. The author elaborates that the BVP/PIPS approach is a supply chain approach where everyone wins. A win-win situation is created by a use of resources that result in the maximization of value to all participants in an event (Kashiwagi, 2016b).

During the introduction of BVP/PIPS in the Netherlands, the focus was on procurement agents and their role (van de Rijt & Santema, 2012). That is why in the Netherlands it got introduced under the name BV Procurement. Later the focus of the implementation of the method extended to the execution phase. At this moment BVP/PIPS in the Netherlands is generally referred to as the Best Value approach. Despite the increased focus on the execution phase, BVP/PIPS in the Dutch construction industry often does not get implemented according to its ideal model as described in literature (van de Rijt & Santema, 2012). For instance, Heim (2015) describes that the first two phases of BVP/PIPS, which focus on selecting the contractor, have been developed in detail. However, as soon as the client and chosen contractor start working together to execute the project, there is less guidance from the procedure. With the occurrence of challenges, both parties tend to return to familiar traditional behaviour (Heim, 2015).

There is a clear discrepancy between theory and practice. This research aims to develop a contract management model that supports the core principles of BVP/PIPS: a win-win approach to supply chains, minimization of risks and the utilization of expertise in the execution phase.

Reader’s guide

This thesis is structured in four parts. Part 1 describes the research design by elaborating the research problem, research questions, and methodology. Part 2 studies and compares the theory of BVP/PIPS with SCM literature in order to find contract management elements that support BVP/PIPS projects. Part 3 covers the practice of contract management and identifies contract management elements as a solution to the discovered challenges in contract management. These solutions will be suggested contract management elements and the end result of this thesis, which is presented in part 4.
Part 1 presents the research design. Herein the problem statement will be elaborated. The research goal, questions and methodology, validity and research will be described in detail.
2. Conceptual design

This chapter presents the conceptual design of this research, which will elaborate the contribution that this research will make to the implementation of BVP/PIPS principles in BVP/PIPS projects. The main purpose of the conceptual design is the steering function for the technical design of this research project as well as for the execution of this research (Verschuren & Doorewaard, 2010).

2.1 Problem Statement

Ang (2011) claims that the construction industry is very vulnerable to malicious effects of traditional competitive procurement approaches, which have a tendency to lead to abuses which take the shape of collusion on pricing and the allocation of work. This continues to impede competition and innovation, and as a result diminishes the advancement of quality standards and productivity (Ang, 2011). Kashwagi (2016a) proposed that the collusion in the Dutch construction industry was caused by clients and not the contractors, whose profit margins were minimized, which forced them to collude to survive. The author characterizes this vicious cycle by the concept of Management, Direct and Control (MDC). The next section discusses in more detail how MDC behaviour, as an unintended and undesired by-product of traditional procurement and contracting, arises.

Management, Direct, and Control

Traditional contracts in the Netherlands are formed based on the Uniform Administrative Conditions for the Execution of Works 1989 (UAV 1989) and unintendedly generate the ‘traditional relationship’ between client and contractor. The outcome of such a structure is usually a client who contracts one or more consultancy firms like architects that design and a contractor who realizes the project. Such an agreement with the contractor makes the client responsible for the design (Boot, Bruggeman et al. 2008). This traditional division of responsibilities and the traditional tender selection based on lowest price unintendedly creates the space for opportunistic behaviour to occur (Ang, 2011).

Ang (2011) provides the example of the situation wherein a client selects a contractor based on lowest price, without recognition of differences in vendor quality, value, and performance, he will accidentally stimulate contractors to be more reactive, offer lower quality, not pre plan nor utilize expertise. Due to selection on lowest price, the best available contractor (who delivers quality and foresees risks and opportunities) might not be selected, because the focus is not on quality during this type of selection process. Instead, by selecting based on lowest price and not quality, the client unintentionally allows contractors with low expertise to enter and possibly win the tender, and in turn misses the expert contractor. In this scenario contractors are involuntarily motivated to behave opportunistically to make a profit. Duren & Dorée (2008) describe the often developing adversarial relationship between client and contractor and the resulting cost blowouts, delays, and dissatisfaction for both parties. As a result of the chance for opportunistic behaviour, the client has to implement MDC behaviour during the execution of the project in order to make sure that the contractor does not get the chance to behave opportunistically. In this scenario, which Kashwagi (2016a) defines as price based, the goals of both parties are not aligned, trust is absent and expertise is not utilized (Duren & Dorée, 2008). Kashwagi (2016a) claims that without a win-win approach to supply chains, expertise will not be utilized due to the increased MDC behaviour due to a win-lose approach.

The implementation of BVP/PIPS did not fully solve the challenges in the Dutch construction industry. BVP/PIPS is a procurement method that has been extended to a collaboration model that can also be applied during the execution phase of a project. BVP/PIPS is often successfully implemented during the procurement phase of a project. However, there is a discrepancy between theory and practice, as the current ideal model of BVP/PIPS is not purely being applied in practice (van de Rijt & Santema, 2012) and MDC behaviour still occurs during the execution phase of BVP/PIPS projects (Heim, 2015; Witteveen & van Rijt, 2013) which means that expertise is not always utilized to its maximum potential.
The problem definition that will be addressed and aimed to solve is as follows:

*There is an observable difference between the ideal model of BVP/PIPS theory and its application in practice. BVP/PIPS’ aim to utilize expertise does not always live up to its potential. BVP/PIPS is mainly used as a tender model during the procurement phase and is somewhat discarded as a contract management mechanism during the realization phase. MDC behaviour takes its place and the BVP/PIPS principle ‘utilization of expertise’ does not stay intact and is not practised through the various phases of a project.*

2.2 Scope
This research will focus on the challenges faced in applying the principle of utilization of expertise during the execution phase of BVP/PIPS projects concerning contract management.

2.3 Research Goal
At this moment BVP/PIPS contract management methods do not appear to be sufficient in the construction industry (Samson, 2015). The principles of the ideal model of BVP/PIPS are not practiced in reality. In order to make the BVP/PIPS method more suitable for the application in practice and keep the principles intact during the execution phase of a project, a contract management model for BVP/PIPS projects will be designed. The goal of this research is:

*To make recommendations for a BVP/PIPS applicable contract management model for the implementation of the principle utilization of expertise in contract management during the execution phase.*

2.4 Research questions
In order to achieve this goal, the following main research question has been formulated. The purpose of this question is to keep the principles of BVP/PIPS intact during the execution phase of construction projects in the Netherlands.

*What are elements of a contract management model that would support the BVP/PIPS principle utilization of expertise during the execution phase?*

The main research question has been divided into three research questions that answer abstract parts of the research question (Figure 1). In order to find a solution to contribute to the utilization of expertise in the execution phase, one first has to know what this means according to BVP/PIPS. Therefore, the first research question answers this part by asking:

1. What is utilization of expertise according to BVP/PIPS?

In order to know which contract management could contribute to the utilization of expertise in the execution phase of BVP/PIPS projects, the researcher should know which contract management elements exist. This will be answered by the second research question:

2. What are contract management elements?
After answering the first two questions, the researcher can find out which elements can potentially contribute to the utilization of expertise in the execution phase of construction phase. This is found by answering the third research question:

3. Which elements can contribute to the utilization of expertise in the execution phase?

![Figure 1: Research questions](image)

### 3. Research methodology

This section describes how the research will be executed while motivating the activities and purpose of each step. The three research questions will first be further divided into smaller parts by formulating sub-questions. Based on answering the sub-questions, a research methodology will be chosen for each sub question. The next section then describes how the sub questions will be answered by operationalizing them into the research methods and more specific questions. A research model has been designed in order to provide a structure for the research and to demonstrate which steps are taken in order to answer the research questions.

#### 3.1 Research question one

In order to answer research question one: *what is utilization of expertise according to BVP/PIPS?* the following two sub questions will be answered:

1. What is utilization of expertise according to BVP/PIPS?
   a. What are the core principles of utilization of expertise?
   b. What are the underlying concepts that facilitate the utilization of expertise?

**Methodology and instruments for sub questions**

Sub questions 1a and 1b will be answered through the study of BVP/PIPS related literature. The choice for literature study is made because the principles are theoretical and the focus of this thesis is to find contract management elements that allow these theoretical principles to be implemented in the execution phase. Therefore, the meaning of these principles must be correctly understood.

#### 3.2 Research question two

Research question two: *what are contract management elements?* will be answered by finding contract management elements in literature and in practice through the following sub questions:

2. What are contract management elements?
   a. What contract management elements exist in BVP/PIPS literature?
   b. What contract management elements exist in SCM literature?
   c. What contract management elements exist in practice?
Methodology and instruments for research sub questions
Sub questions 2a and 2b will be answered through literature study, while 2c will be answered through preliminary research and case studies. The motivation for literature study for question 2a is that BVP/PIPS presents its own methods that support its principles. These can be found in its literature about the methodology.

Contract management elements will be found in literature by observing challenges and their solutions. This will provide more insights for contract management elements and the implementation of BVP/PIPS elements or elements that will be found in practice by answering research question 2c.

Preliminary research and case studies will lead the researcher to contract management elements that exist in practice. A qualitative approach enables the researcher to find elements that support practice and that are not solely based on theory.

3.3 Research question three
Research question three: which elements can contribute to the utilization of expertise in the execution phase? aims to apply the found elements to the BVP/PIPS principle of utilizing expertise in the execution phase of construction projects in the Netherlands.

Which elements can contribute to the utilization of expertise in the execution phase?
   a. What is the practical context that a new contract management model should consider?
   b. Which contract management elements appear to contribute to or obstruct the utilization of expertise according to literature?
   c. Which contract management elements appear to contribute to or obstruct the utilization of expertise according to practice?

Methodology and instruments for research sub questions
In order to be able to select contract management elements that comply with practice, the researcher has to be aware of the boundaries that contract management in the execution phase presents and which elements appear to contribute to or obstruct the utilization of expertise. These boundaries are provided by answering question 3a through preliminary research. Question 3b will be answered by confronting the potential elements with literature when possible in order to provide more validity. Question 3c provides extra validity to the potential elements by confronting the potential elements with practice. This will be done through the confrontation with knowledge and insights from case studies and preliminary research.

3.4 Research model
The research model can be described in the following manner: (a) the confrontation of different theories and research results in the fields BVP and SCM delivers potential contract management elements that are substantiated with scientific literature. Confronting the identified potential contract management elements with a study of contract management in the Netherlands, based on conversations with contract management experts (preliminary research), document study (policy documents) and an orientation in literature on Dutch contracting and contract management ensures the applicability of the potential contract management elements in the context of contract management in the Netherlands. (b) Case studies will provide insight in the challenges and best practices in the practice of contract management. (c) A cross-case analysis of the different cases links to relevant literature generalizes the findings (d) which are then, in combination with the findings in literature, used as input for the in (e) recommended contract management elements.
3.5 Research outline

The first step is the construction of a theoretical framework of contract management in BVP projects. This is achieved through the examination and confrontation of BVP/PIPS and SCM literature, which results in potential contract management elements. Solutions from SCM literature with similar goals and challenges will be examined and learned from in this step. The, for BVP/PIPS projects, suitability of the elements that are found in SCM literature is enquired and the BVP/PIPS elements are, where possible, supported with SCM literature in order to provide a scientific basis for these elements. This means that the effect of the principles of BVP/PIPS are explained and examined based on SCM’s field of theoretical expertise. This step will substantiate the principles of BVP/PIPS that can be useful during the execution phase with scientific literature and gives a theoretical foundation on which the solution in the form of contract management elements can later be built. The application of these and new elements is examined by studying the challenges and best practices in practice of contract management through case studies. The practical context of contract management will be studied and described in order to formulate a solution that fits the practice of contract management. Based on the challenges and best practices in practice and substantiated scientific theories, potentially effective principles that fit the practical context of contract management are proposed.

3.6 Validity

This research is qualitative and explorative in nature. In order to increase validity of its findings, the research methodology uses a triangulation of methods. For example: the contract management elements are identified through different methods (triangulation). If these methods point out the same results, the validity of the findings is increased. The research methods that are used to collect the data (contract management elements) which is necessary to answer the research questions are literature study, preliminary interviews and document study, case studies and in-depth interviews. The case study information is provided via connections through RHDHV. Preliminary research information is acquired through literature, documents and interviews through connections in other organizations.
The literature study consists of a study of BVP/PIPS literature and literature in the field of SCM. This will provide theoretical insights and elements for the, to be developed, contract management model. The preliminary research is done through literature about contracts, document study and informal interviews and will provide practical insights and will be used to define the restrictions that practice places upon a contract management model. For further validation the triangulation of methods will be completed through case studies. The case studies consist of document studies and in-depth, semi-structured interviews and will provide insights in the problems with the execution of BVP/PIPS problems and elements. The confrontation of the three different outcomes with their insights and elements allows the researcher to identify contract management elements for BVP/PIPS projects. These elements will then be presented to a group of contract management experts and discussed in order to implement any feedback that may result from the group discussion.

Figure 3: Data gathering and triangulation of methods
PART 2
THEORY

This section studies and compares the theory from BVP with SCM literature in order to find contract management elements that support BVP/PIPS projects. First, BVP/PIPS theory is studied and second SCM literature. The theories will be compared to each other. The conclusions in the literature study will support the suggested contract management elements in Part 3.
4. Best Value Procurement

This chapter first answers the first research question: what is utilization of expertise according to BVP/PIPS? It does so by answering sub questions 1a and 1b: What are the core principles of utilization of expertise? What are the underlying concepts that facilitate the utilization of expertise during the construction phase? The core principles provide insight in the challenges that characterize BVP/PIPS. For a thorough understanding of BVP/PIPS philosophy, its origin and core principles will be discussed first. Secondly, the underlying concepts that support its core principles will be analysed. Finally, research question 2a: Which contract management elements exist in BVP/PIPS literature? will be answered by studying the practical implementation of its solutions to its challenges according to those concepts as described in BVP/PIPS literature. Identifying contract management elements is done through the operationalized research questions:

- What challenges are there according to BVP/PIPS?
- What solutions does BVP/PIPS suggest?

4.1 Core principles BVP/PIPS

BVP/PIPS was originated and introduced by Dean Kashiwagi at the Performance Based Studies Research Group of Arizona State University, USA (www.pbsrg.com). He initiated his research in 1994 and developed the method with the purpose of enhancing the procurement and management of construction projects by lowering risk in selecting the best performer (Duren & Dorée, 2008). BVP/PIPS is a procurement method with chain thinking at its centre (Rijt & Santema, 2013). Kashiwagi (2016b) defines the BVP/PIPS approach as a supply chain approach where everyone wins. A win-win situation is created by focusing on choosing the best suitable contractor for the given project, to trigger this selected contractor to his highest possible performance (utilizing expertise), and to reduce the client’s management and control tasks (Kashiwagi, 2016b). An expert is one who knows how to minimize risk and utilize opportunities. Kashiwagi (2016a) states that an expert does not have any technical risks within his organization and that the risks are mostly outside the boundaries of the contractor’s sphere of influence (Samson, 2015). When an expert is enabled to perform, there is no need for MDC (Kashiwagi, 2016b).

The core principle of BVP/PIPS in this thesis is described as: ‘utilization of expertise’, which has the goal to minimize risk and utilize chances. The focus of this thesis is to enhance these goals during the execution phase of construction projects. Utilizing expertise happens in, and supports a win-win environment. Therefore, an essential element in BVP/PIPS is the supply chain approach focused on creating a win-win.

Principles and challenges BVP/PIPS:

1. Creating and maintaining a win-win situation, which is without opportunism and MDC;
2. Minimizing risk;

4.2 Concepts

This subsection summarizes the main concepts laying at the foundation of BVP/PIPS. Santema (2011) states that with information that is so readily available as in our day and age it becomes obvious who is the expert in his field and who is the best vendor to supply the client. Supply chains consisting of experts are faster, cheaper and more effective, because they contribute to the value creation of the supply chain. An expert is able to foresee risks and anticipate opportunities. When the expert gets encouraged to excel, the only criterion left to manage is the risk that the client does not control, together with that expert. In a win-win situation, goals will be better aligned and MDC behaviour not needed, but how will this practically work? How does a client know that he has the right expert for
the job? The method of procurement is an essential part in this process. Although this thesis focuses on the execution phase, a short description of how the client finds an expert is described below, because it lays the foundation of a win-win situation based execution phase that enables clients and contractors to fully benefit from the principles of BVP/PIPS.

Goal alignment
Kashiwagi (2016a) explains that the contractor that wins a tender based on minimum standards is not an expert and probably has risk in his own sphere of influence and therefore adds risk to the project and the client, which raises the need for MDC and makes him more costly in the end. Minimum standards create an antagonistic (win-lose) relationship between client and contractor because of the opposing goals between the two parties. Then the contract is used as a means to manage that relationship (Rijt & Santema, 2013).

Minimum standards
Van de Rijt and Santema (2013) explain the impact of minimum standards and price based selection. Traditionally clients define minimum standards or requirements in their Request for Proposal (RFP). The purpose of this minimum is to make sure that contractors achieve at least that level of quality of performance by excluding non-performers. However, the minimum standards that are set become the maximum performance that the client will receive. For instance, when an expert who has experience on a similar project knows how to increase value sees the RFP, he will not likely add value to the requested standards, because this might add to his price. When his price is higher than that of another contractor who simply complies with the minimum standards, the expert will lose the tender when selection is based on price. Minimum standards therefore do not utilize expertise. Instead, performing contractors will lower their performance. Non-performing contractors might pretend that they can achieve the set standards in order to win the tender, possibly for a lower price. Minimum standards and price based selection are the start of a win-lose situation.

Focus on quality
A client that requests minimum standards basically asks for the lowest price that delivers that standard and does not allow contractors to demonstrate their skill and capability. Non-performing contractors, who increases risk, are attracted to the tender and decrease the supply chain efficiency (Rijt & Santema, 2013). Focusing on quality instead of price during selection allows experts to win a tender based on their expertise. After procurement BVP/PIPS claims that simple, dominant information is needed as a way of interaction between parties in the supply chain and for selecting the expert (Santema, 2011). Information Measurement Theory (IMT) (Kashiwagi, 2016a), which is discussed in appendix B, describes the foundational theories and mechanisms that support the utilization of expertise.

The implementation of alignment of goals:

1. Minimum standards create an antagonistic (win-lose) relationship between client and contractor because of the opposing goals between the two parties. No minimum standards diminishes this cause for not aligning goals.
2. Experts are allowed to demonstrate their skill and capability and win a tender based on their expertise by focusing on quality.

Resulting principle supported by this implementation:

1. Creation of a win-win situation;
2. Minimization of risk;
3. Situation wherein expertise can be utilized.
4.3 Implementation BVP/PIPS

BVP/PIPS is the name of the structure that facilitates the practical implementation of the logic of IMT (appendix B). BVP/PIPS provides a structure wherein decision making, and therefore risk, of the buyer is minimized by use of dominant information. Hiring an expert based on dominant information and, through past performance information, demonstrated expertise ensures the client that the expert can see into the future. BVP/PIPS enables utilization of expertise and minimizes MDC of the expert (Kashiwagi, 2016b).

This section thoroughly describes and examines the complete BVP/PIPS process in practice in order for the researcher to find a solution for the utilization of expertise in the execution phase that fits BVP/PIPS projects. This examination also entails the identification of contract management methods in order to identify potential contract management elements that could support BVP/PIPS principle utilization of expertise.

Application

The selection phase has five selection criteria: 1) Level of Expertise submittal; 2) Risk assessment submittal; 3) Value added submittal; 4) Interview rating of key project manager; 5) Price (Kashiwagi, 2016b). In order to decrease the risk for the client, BVP/PIPS is built upon six “filters” (Duren & Dorée, 2008), which aim to separate high from low performers. Four filters are applied for contractor selection. The remaining two are associated with project control (Duren & Dorée, 2008).

One has to find the highest-performing contractor and enable him to work at his full potential in order to get the best results possible (Duren & Dorée, 2008). BVP/PIPS utilizes past performance information (“P”) as a leading indicator for choosing the best contractor. Clients enable contractors to demonstrate performance ratings provided by previous clients. These ratings are based on delivering within budget, planning and meeting the client’s expectations. Decisions concerning contractor selection should be made rationally, explicitly, and based on flawless information (“I”). Kashiwagi (2016a) finds systematic information gathering and processing essential to know whether a contractor will perform or not. Therefore, contractors are obliged to give information concerning relevant past performance in order to demonstrate their appropriateness for the desired functionalities according to controlled criteria. This filter concerns risk assessment plans and interviews. Contractors are asked to point out which risks they see for project realization, as well as the solutions and strategies to minimize and manage them. This separates the high performers from low performers. Risks are carried according to sphere of influence. Kashiwagi (2016b) claims that contractors do not carry technical risks if they are an expert. In that line of thought, all risk is in the sphere of influence of the client who is therefore financially responsible. Key personnel’s insight in the project, experience, capability to cooperate and communicate is probed into during interviews (Kashiwagi, 2016b). It is necessary to determine the project leader who will be responsible for the project’s realization. The interviews give the client the chance to establish if the project will be properly led and executed by a leader with vision, influence, and experience to accomplish their goals. During project realization, information gathering and processing are the keys to control (Kashiwagi, 2016b). The third filter is found in the next “P”, which represents Procurement, in which the most appropriate contractor is selected considering price/performance ratio. The project approach and plan are examined and compared to the contractor’s price. The “S” represents the fourth and last filter in the pre-award phase and is short for the System, which is based on a structured approach in different phases (Duren & Dorée, 2008). At this point every detail related to

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1 Due to the challenging aspect of applying ‘past-performance’ during the tender phase in the public sector, and because it introduces political challenges, this criterion is not used in the Netherlands. Instead, the contractor is asked to describe his capability and demonstrate why he can perform and why he does not have technical risks. This is called the Performance Substantiation (Dutch: Prestatieonderbouwing) or project proficiency (Dutch: Projectbekwaamheid) (Rijt & Santema, 2013).
risk sharing, planning and quality management is worked out. The fifth filter is focused on gathering performance data during the execution phase. The final, sixth filter is the post-realization score, which is provided by the client after project delivery (Duren & Dorée, 2008).

Duren & Dorée (2008) describe BVP/PIPS as: a predominantly information-based system which makes predictions about expected result based on performance (Duren & Dorée, 2008). The practical implementation of BVP/PIPS is made up of four phases: Preparation, Selection, Clarification, and Execution. This part of the thesis discusses only the execution phase. A complete overview of the phases of BVP/PIPS can be found in Appendix C.

Execution:
During execution, the contractor is allowed to manage his performance, based on minimized risks (Duren & Dorée, 2008). In the case that the contractor works according to its risk dossier, mitigates foreseen risks, and a new risk occurs, then the client is financially subject to carry the risk (Samson, 2015). The by the expert created transparency exposes risks caused by other stakeholders and makes all stakeholders minimize the risk they cause.

The contractor’s performance is monitored from a distance, by means of the Weekly Report (WR) (Kashiwagi, 2016b). The WR serves as the mechanism for the detection and minimization of project deviations. The contractor is in the lead and controls his own quality. Performance comes with simplicity and transparency (Kashiwagi, 2016b). The purpose of the WR is for the expert to create transparency concerning project deviations with dominant information (Samson, 2015), which the expert measures himself (Kashiwagi, 2016b). This will result in the minimization of activity, management, control, directives, and decision making by the client’s personnel (Kashiwagi, 2016b). During execution the client fulfills a role of quality assurance by making sure that the contractor is using his quality control system. After project realization, the client awards the contractor with a post-construction rating, which influences opportunities in forthcoming tenders (Duren & Dorée, 2008).

Summary of BVP/PIPS
Table 1 demonstrates the solutions and their practical implementation that BVP/PIPS proposes in order to support its principles. The tools with which they are implemented will be considered as potential contract management elements. Note that the PPI and Performance substantiation are used to find an expert and create the situation for the utilization of expertise (win-win). They will not be considered as contract management elements.

<table>
<thead>
<tr>
<th>Solutions BVP/PIPS</th>
<th>Application (potential elements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal alignment</td>
<td>Focus on quality, no minimum standards and risk allocation</td>
</tr>
<tr>
<td>Hiring an expert</td>
<td>PPI and Performance substantiation</td>
</tr>
<tr>
<td>Metrics</td>
<td>Weekly Rapport</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Not specified</td>
</tr>
</tbody>
</table>

Table 1: Summary BVP/PIPS

4.4 Theoretical framework of BVP/PIPS theory
Table 2 demonstrates the BVP/PIPS theory, the challenges it identifies and addresses and the solutions it proposes. The challenges in this thesis are the core principles that BVP/PIPS strives for. The first two solutions will not be considered as contract management elements as they are applied in the procurement phase. However, for analysis purposes they are important, because these solutions partially create the win-win environment wherein BVP/PIPS can be implemented.
### 5. Supply Chain Management

The purpose of this chapter is to find contract management elements in literature and answer research question 2b: *What contract management elements exist in SCM literature?* The first section describes the methods and theories as written in scientific literature related to contract management. Examining similar challenges that these theories address provides findings that can contribute to elements that help maintaining the principle of utilization of expertise in BVP/PIPS projects. In order to find applicable contract management elements for BVP/PIPS projects, these elements and their supporting theory will then be confronted with BVP/PIPS theory in the next chapter. This step will partially answer research question 3b: *Which contract management elements appear to contribute to or obstruct the utilization of expertise according to literature?*

### 5.1 Relevance SCM

SCM theory grew along with practical developments in different industries. The theory describes the increasing focus on services and how to steer manufacturers to deliver the desired performance. Although BVP/PIPS did not directly spring SCM and PBC literature, the view on supply chain optimization and contract management in SCM and PBC has parallels with BVP/PIPS principles and its aim to optimize supply chains. Because the theories discussed in SCM and PBC are linked with optimizing supply chains and contract management, the insights of these theories can directly benefit the implementation of BVP/PIPS in the execution phase. For that reason, these theories are analyzed by searching for their challenges and suggested solutions, which will lead the researcher to potential elements for a contract management model and theoretical principles that potential elements can be validated with.

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**Table 2: Theoretical framework BVP/PIPS**

<table>
<thead>
<tr>
<th>BVP/PIPS theory</th>
<th>BVP/PIPS Challenges</th>
<th>BVP/PIPS Solutions</th>
<th>BVP/PIPS Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Measurement Theory <em>(Appendix A)</em></td>
<td>• Minimizing risks <em>(p. 18)</em>&lt;br&gt;• Creating a win-win situation <em>(p. 18)</em>&lt;br&gt;• Utilizing expertise <em>(p. 18)</em></td>
<td>• Goal alignment <em>(p. 19)</em></td>
<td>• Focus on quality&lt;br&gt;• No minimum standards&lt;br&gt;• Risk allocation&lt;br&gt;&lt;br&gt;• Hiring experts <em>(p. 20)</em>&lt;br&gt;&lt;br&gt;• Metrics <em>(p. 21)</em>&lt;br&gt;• Quality assurance <em>(p. 21)</em></td>
</tr>
</tbody>
</table>
5.2 Theoretical perspectives SCM

SCM literature describes multiple theories, such as the agency theory, which is well established in SCM (Selviaridis, 2015), and discusses several contract schemes such as Performance Based Contracting (PBC). The methods used in PBC can be viewed from different theoretical perspectives. Ring and van de Ven (1992) state that one can mainly frame the design and management of (performance-based) contracts in buyer-supplier relationships as a governance and control issue. Selviaridis (2015) notes that there are three theoretical frameworks related to governance and control, which are especially applicable for studying PBC: agency theory, management control theory and transaction cost economics (TCE). These theories are further examined in the next sections as they provide more theoretical depth in the methods of PBC and SCM. Analyzing those theories will provide more insight in the reason for the application of their methods, and later contract management elements.

This section summarizes the relevance of the aforementioned theories, which are studied in order to find elements for a contract management model that is in line with scientific literature. This is done through the operationalized research questions:

- What challenges are there according to theory x?
- What solutions does theory x suggest?

This section will find contract management elements from scientific literature by asking these questions for each theoretical perspective. Table 3, which summarizes the findings of this section.

Agency theory

One challenge lies in the reason for the formation of a contract. Forming a contract is often required, because parties may have different goals and risk preferences (Eisenhardt, 1989). According to the agency theory (Jensen & Meckling, 1976), the information asymmetry between client and contractor should be balanced. With unbalance the client is not capable of gauging the behaviour of the contractor and leaves the client in the dark to whether the contractor is behaving opportunistic or not. The agency problem can be defined as a problem of information asymmetry and surfaces when it is uneasy or expensive for the client to see if the contractor acts according to the client’s interests (Jensen & Meckling, 1976). Bergen et al. (1992) describe the agency problem as twofold. One is the pre-contractual problem of ‘hidden information’ (‘adverse selection’), wherein the agent (contractor) does not express his authentic capability towards the principal (client) so that he can win a tender or attain propitious terms (Selviaridis, 2015). Second is the post-contractual problem of ‘hidden action’, which refers to ‘moral hazard’ or opportunism. In this case the contractor does not act according to the objectives of the client. Instead he pursues his own interest by eluding costly efforts (Ross, 1973). This situation introduces uncertainty, raises transaction costs and has the potential to turn into an antagonistic relationship (Duren & Dorée, 2008). Only the latter, post-contractual problem of hidden action, will be described in more detail in the next section, because this considers the execution phase and might deliver contract management elements.

Hidden action

The hidden action problem states that a contractor will strive to maximize his own benefit by choosing the best action available (Bergen, et al., 1992). Due to incompatible goals and risk preferences of the two parties, beneficial actions for the client are often relatively costly to undertake for the contractor. Therefore the contractor might try to elude such actions (Bergen, et al., 1992). The authors state that the problem defined as opportunism or moral hazard, or as hidden action by Arrow (1985), is based on three assumptions about the client and the contractor. The first assumption is that both parties are usually motivated by self-interest. The second assumption is that clients work with incomplete information (Bergen, et al., 1992). The authors explain that even though the client is expected to have knowledge about the contractor’s skills, his awareness about what a contractor does during project realization is neither perfect nor complete. Information
asymmetry in the sense that one party possesses information that the other desires, characterizes most agency relationships. The problem with this situation is that self-interest often makes the contractor unwilling to share the information with the client. The contractor might even be motivated to provide the client with false information (Bergen, et al., 1992). In the case when behaviour is not obviously observable, the contractor can be incentivized through payment, in order to align contractor’s behaviour to the desired outcome (Eisenhardt, 1989; Kim, et al., 2007). Bergen et al. (1992) describe the third assumption in hidden action as: that besides contractor behaviour, project outcomes are partially defined by environmental factors, e.g.: economic conditions in the market and technological changes. Environmental uncertainty exists due to the changing nature of these factors over time, the difficulty of predicting them, and the fact that they are outside the sphere of influence of the client or contractor. Bergen et al. (1992) state that this uncertainty makes it impossible to design a contract that foresees and considers all contingencies and therewith makes clients and contractors consider the resulting risk when making contractual decisions. Problems in principal-agent relationships begin when the client and contractor have different risk preferences and conflicting goals, which makes them prefer different courses of action (Bergen, et al., 1992). The problem of hidden action is addressed by monitoring- and contracting design. The theory that entails these solutions is also called management control theory.

Management control theory

Management control theory sees contracts as coordination devices (Macaulay, 1963) and examines the choice between several types of formal controls (process vs. output) represented in contractual obligations and formal organizational mechanisms (Selviaridis, 2015). Management control theory considers the contract management phase and can specifically add to PBC research about the knowledge requirements for the client, and the possible effects of monitoring processes on contractor behaviour (Selviaridis, 2015). It addresses the problems of hidden information and hidden action of the agency theory. The challenge in management control theory can be seen as one of coordination and control of a contractor’s actions. Specification and control of a contractor’s action is basically a choice between establishing behaviour (through rules and directives) or what to accomplish, by means of defining, measuring and rewarding outcomes (Fayezi, et al., 2012). This is accomplished through of behaviour- or outcome based contracts and behaviour- or outcome based monitoring, which are named the solutions to the challenge of management control theory.

Contracts

The choice between behaviour- and outcome- (performance-) based contracts should reflect efficient organization of information and risk-bearing costs (Hypko, et al., 2010; Jensen & Meckling, 1976). This is because both contract forms need specific type of information gathering and measurement. Outcome-based contracts focus on substantially defined and measurable performance. Rewards are based on this performance (Bergen, et al., 1992). Behaviour-based contracts place their attention on the necessary processes and actions that assist in accomplishing the performance and are in place when it is possible to manage and measure provider behaviour (Eisenhardt, 1989). In this case rewards are based on these measurements.

Monitoring

Challagalla and Shervani (1996) note that controls have two different functions: providing information that is required for monitoring contractual compliance and the direction of rewards and penalties. A definition of monitoring is: one party’s effort to measure the performance of the other party (Heide, et al., 2007). Behaviour-based or process monitoring suggests methods and procedures that the controlee (contractor) should adopt (Selviaridis, 2015). Output monitoring stipulates wanted outputs (Kirsch, 1996; Ouchi, 1979). Selviaridis (2015) explains that for the application of the right behavioural controls it is necessary that one has understanding of the means-end relationship. This means that, for process monitoring, the client needs substantial knowledge of the definite
transformation process. Applying output controls raises the need for the capability of measuring and evaluating output (Ouchi, 1979).

**Choice between behaviour- or outcome based**
Management control theory states that the choice between behaviour- and outcome based contracts can be reduced to considering the risk preferences between parties. Bergen et al. (1992) state that outcome-based contracts shift the risk from client to contractor and that high risk and uncertainty introduces high cost of risk transfer. Transferring risk through an outcome-based contract to a less risk averse contractor is less costly. The solution depends on the level of environmental uncertainty, the kind of tasks the contractor is expected to perform, and the goals and risk preferences of both parties (Bergen, et al., 1992). Based on Eisenhardt (1989) the authors established some propositions as to when to apply which kind of approach.

- In the case of more alignment of goals, behaviour-based contracts are more efficient in relation to outcome based contracts, because when goals are more aligned, the contractor is more probable to behave in accordance with the client’s desires regardless of the incentives built in the contract. Therefore, there is less motivational necessity for outcome-based contracting;
- In the case of increased environmental uncertainty, behaviour-based contracts gain more efficiency in comparison to outcome-based contracts, because the latter shifts risk from the principal to the agent. High uncertainty and risk can increase the client’s costs of transferring risk to the agent (Bergen, et al., 1992).

**Conclusions agency theory**
Agency theory aims to decide on the most efficient contract, mainly from the client’s point of view, considering the situation of environmental uncertainty and incomplete information (Jensen & Meckling, 1976). Agency theory researches contracts as mechanisms that align incentives and share risks (Mitnick, 1973). Different solutions to the problem of information asymmetry can be applied in both the pre- and post-contractual problems. One could say that the solution to the challenge of different goals and risk preferences lies in formation of contracts in order to align incentives and share risks. Bergen et al. (1992) note that agency problems can be alleviated by means of information gathering to observe contractor behaviour, supplier selection and contract design.

Challenges agency theory:
1. Opportunism;
2. Bounded rationality.

Solutions agency theory:
1. Contract design (align incentives and allocate risks);
2. Monitoring design (incentivize through payment).

**Transaction Cost Economics**
Any form of transaction in a supply chain has corresponding transaction costs. TCE focuses on keeping transaction and production costs as low as possible provided a required quality level (Duren & Dorée, 2008). Minimizing transaction costs will be considered as a challenge of TCE. The costs consist of everything dealing with finding, evaluating, selecting, contracting, planning, inspection, sanctioning, monitoring, bonding, dealing with conflicts, inefficiencies due to misunderstandings, interfacing problems and risks (Williamson, 1985). TCE theory’s focal point is on efficient economic organization by means of alignment of transactions, with their different attributes, with governance
structures (Williamson, 1985). Argyes et al. (2007) state that TCE postulates that contract design should be in line with such transaction attributes so that buyer-supplier relations are efficiently governed. From a procuring point of view, the goal is the minimization of the transaction price in order to reduce the costs in an organization. Opportunism is a main concern in transaction costs research (Williamson, 1985).

**Opportunism**

Opportunism is more relevant when transaction specificity is high and is seen as the most influential factor leading to increased transaction costs (Duren & Dorée, 2008). TCE proposes that formal contracts deal with behavioural uncertainty by involving measures that protect against opportunism under incomplete contracting conditions (Kim & Mahoney, 2005).

**Bounded Rationality**

Incomplete information provides parties to a contract to behave opportunistically by exploiting any information asymmetry (Parker & Hartley, 2004). Traditional contracts aim to anticipate all possible future occurrences. For large and complex projects this is a huge task and brings big transaction costs. Duren and Dorée (2008) state that bounded rationality makes the job practically impossible. Parker & Hartley (2004) support this difficulty, claiming that in a situation wherein buyers and suppliers have imperfect and asymmetric information when contracting, contracts cannot be optimal in a full information sense. Duren and Dorée (2008) conclude that project scopes and contracts are not able to predict all possible contingencies and that people cannot oversee all contingencies. Not all information is directly available- and in any situation, it is costly to gather “all” information (Duren & Dorée, 2008). The authors stress the importance of selecting only relevant data and the creation of contracts that anticipate this. New Institutional Economics provides the perspective of relational contracting. Relational contracting is related with types of procurement that place more dependence on reputation. Nevertheless the possibility of opportunistic behaviour remains (Parker & Hartley, 2004). Relational contracting treats the relationship between a firm and a stakeholder as one consisting of an incomplete or relational contract, which means that it does not consider beforehand all contingencies that may occur (Macneil, 1978). These contracts focus on the relationship between parties and consist of a number of rules and safeguards which cover main risks (Duren & Dorée, 2008). Geykens, et al. (2006) state that relational governance properly aligned with transaction dimensions results in enhanced performance.

Challenges management TCE:

1. Opportunism;
2. Bounded rationality.

Solutions TCE:

1. Contract design;
2. Relational contracting.

**Property rights theory**

Property rights theory, or incomplete contracting theory (Kim & Mahoney, 2005), approaches another aspect of bounded rationality, which causes most contracts to be incomplete (Hart, 1988). The incompleteness of contracts means that there exist non-contractable elements as a result of the impossibility of considering all future events (Kim & Mahoney, 2005). The modern property rights theory adds to agency theory and transaction costs theory through the introduction of ownership concepts in an incomplete contract setting (Kim & Mahoney, 2005). Property rights theory states that when a contract party owns a risk, then that party will act differently compared to the when someone else owns the risk (Duren & Dorée, 2008). The authors continue to describe that conscious risk transfer facilitates the alignment of goals, which increases corporatism. Subsequently this contributes to better project results and the decrease of transaction costs. They note that trust
between client and contractor should be encouraged because economic relationships based on trust are very efficient. Wherever there is more trust, the inclination to opportunism reduces, as will the need for inspection and control. This makes for a better base for cooperation (Duren & Dorée, 2008).

Challenges property rights theory:

1. Bounded rationality;
2. Opportunism;

Solutions property rights theory:

1. Conscious risk transfer;
2. Trust.

5.3 Summary of relevant theories
This section summarizes the challenges and their accompanying theories and proposed solutions in literature related to contract management. The elements that will be used to evaluate contract management in practice will be chosen or designed in such a way that they comply with those theories, which will give them a strong theoretical foundation. The next section confronts the theories and their solutions with BVP/PIPS theory in order to find potential elements for a contract management model.

Demonstrated in table 3, the theories that were analyzed for challenges and solutions mainly address the same challenges, namely: how to influence the contractor in the situation of uncertainty, opportunism and bounded rationality, and provide similar and different solutions. The main problems can be categorized as opportunism and bounded rationality, which are interrelated. The problem of opportunism (misuse of information asymmetry) can occur in situations of incomplete information and uncertainty due to bounded rationality. The primary assumption of opportunism is that both parties are motivated by self-interest.

<table>
<thead>
<tr>
<th>SCM theory</th>
<th>SCM Challenges</th>
<th>SCM Solutions</th>
<th>SCM Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency theory (p. 32)</td>
<td>• Opportunism</td>
<td>• Monitoring design</td>
<td>• Outcome- or behaviour based</td>
</tr>
<tr>
<td></td>
<td>• Bounded rationality</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Risk allocation</td>
<td>• Based on monitoring ability client</td>
</tr>
<tr>
<td>Transaction Costs Economics (p. 33)</td>
<td>• Opportunism</td>
<td>• Risk allocation</td>
<td>• Based on monitoring ability client</td>
</tr>
<tr>
<td></td>
<td>• Bounded rationality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property rights theory (p. 33)</td>
<td>• Opportunism</td>
<td>• Efficient relationships</td>
<td>• Trust</td>
</tr>
<tr>
<td></td>
<td>• Bounded rationality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Goal alignment</td>
<td>• Conscious risk transfer</td>
</tr>
</tbody>
</table>

Table 3: Theoretical framework SCM
6. Confrontation BVP/PIPS with SCM literature

This chapter confronts BVP/PIPS with SCM literature. First, a comparison of the problems and assumptions that are the foundations of both theories will be made. Second, the solutions from SCM literature will be confronted with BVP/PIPS solutions in order to find where SCM solutions can contribute to BVP/PIPS theory. Subsequently, BVP/PIPS solutions will be confronted with SCM theory in order to underpin the methods that BVP/PIPS proposes. Complying with literature is not a necessity for the elements of the, to be created, contract management model. However, support by literature gives these elements more validity to suggest them for contract management elements that support the utilization of expertise in the execution phase.

6.1 Challenges

The main problems can be categorized as opportunism and bounded rationality, which are interrelated. The problem of opportunism (misuse of information asymmetry) can occur in situations of incomplete information and uncertainty due to bounded rationality. The primary assumption of opportunism is that both parties are motivated by self-interest. SCM literature addresses the same problems as BVP/PIPS, which are opportunism and bounded rationality. This chapter will first examine the usefulness of literature solutions to those challenges in BVP/PIPS projects in order to find potential contract management elements. Second, BVP/PIPS solutions will be examined on their usefulness on the challenges in literature in order to underpin BVP/PIPS methods.

SCM literature’s challenges are based on the perspective of different goals and risk preferences. This situation brings along the occurrence of bounded rationality and opportunistic behaviour. The theories contribute several solutions to deal with the latter challenges, but do not probe into the cause for their existence. Different goals and risk preferences are a given.

Bounded rationality

Bounded rationality is a main concern in transaction costs research (Williamson, 1985), agency theory (Ross, 1973) and property rights theory (Hart, 1988). Opportunistic behaviour is the main cause for transaction costs as it increases the need for inspection and control and complicates goal alignment. It is also one aspect of the agency problem of information asymmetry.

Opportunism

Opportunism is a main concern in transaction costs research (Williamson, 1985), agency theory (Ross, 1973) and property rights theory (Hart, 1988). Opportunistic behaviour is the main cause for transaction costs as it increases the need for inspection and control and complicates goal alignment. It is also one aspect of the agency problem of information asymmetry.

Challenges SCM vs challenges BVP/PIPS

An essential observation is that although the problems that both theories address come from the same source, which BVP/PIPS describes as a win-lose environment and agency theory as the situation of different goals and risk preferences, the way in which the theories handle this situation is fundamentally different. Where SCM literature mainly focuses how to deal with the resulting problems of bounded rationality and opportunism, BVP/PIPS focuses on the root cause of the problem and both assumes and aims to create and sustain win-win situations. A win-win environment is a pre-condition for the utilization of expertise and the practices that BVP/PIPS proposes all support and maintain this environment. Therefore, bounded rationality and opportunism are not the main problems in BVP/PIPS, because they do not occur in the ideal model of BVP/PIPS. The main challenge is to reduce MDC behaviour and therefore a big part of BVP/PIPS focus
addresses the client’s behaviour in a win-win environment, while SCM literature aims to reduce the chances and inclination to opportunism by focusing on controlling the contractor in a win-lose environment. However, it does not appear to be that black and white. Although the perspective on the situation is different, the practices that the theories produce have a lot of similarities. Even though the focus is not on creating a win-win situation, property rights theory also mentions the importance of conscious risk transfer for the alignment of goals, and trust in order to reduce the inclination towards opportunism. These solutions to opportunism cannot be labelled as control of a contractor’s behaviour or MDC. They are more in line with BVP/PIPS win-win principle. The described difference between the perspectives, theories and practices of both fields are visualized in figure 4. The flowchart in figure 4 demonstrates the perspectives of BVP/PIPS, which are: a win-win environment, minimization of risk and the utilization of expertise. These are supported by the theory in IMT and implemented through BVP/PIPS practices. These practices will be considered as potential contract management elements. The hiring of experts is considered in this stage for analysis purpose and an understanding of BVP/PIPS and is a condition to the principle of utilizing expertise and not a contract management element.

![Figure 4: Comparison approach BVP/PIPS & SCM](image)

### 6.2 Solutions SCM vs solutions BVP/PIPS

This section discusses the difference and similarities between the theories in order to find out where they can complement each other.

#### Goal alignment

Compared to BVP/PIPS literature, goal alignment is not a big topic in SCM literature. Property rights theory addresses the importance of goal alignment for corporatism and states that conscious risk transfer can facilitate goal alignment. Property rights theory addresses incomplete contracts due to non-contractible elements through ownership concepts (Kim & Mahoney, 2005) and states that when a party owns a risk, that party will act differently compared to when someone else owns the risk (Duren & Dorée, 2008). Duren and Dorée (2008) explain that opportunistic behaviour increases the need for inspection and control and complicates goal alignment. The authors conclude that the inclination to opportunism will be lower when the alignment of goals between contractor and client
is clearer, because behaviour will be more predictable and cooperative. BVP/PIPS utilizes this concept with its clear risk allocation. Duren and Dorée (2008) support BVP/PIPS method by stating that conscious risk transfer facilitates goal alignment, which increases corporatism. Subsequently this contributes to better project results and the decrease of transaction costs.

Findings comparison SCM and BVP/PIPS:

1. Property rights theory supports the BVP/PIPS practice of goal alignment (win-win environment) and claims that conscious risk transfer facilitates this situation.
2. BVP/PIPS provides a suggestion to property rights theory on how to consciously divide risks for goal alignment.

Relational contracting vs hiring experts

TCE and NIE address the problem of bounded rationality through relational contracting, which places more dependence on reputation. BVP/PIPS also focuses on reputation by requesting PPI and/or performance substantiation. The difference is that BVP/PIPS makes reputation and contractor selection thereon more tangible than SCM literature.

Findings comparison SCM and BVP/PIPS:

1. TCE and NIE use the same approach for dealing with uncertainty, but in a less tangible way;
2. BVP/PIPS provides a suggestion to TCE and NIE for the operationalization of reputation, namely through PPI.

Risk allocation

Agency theory suggests allocating risks based on the monitoring capability of the client. If it is possible to measure outcome and the client is risk averse, then risks can be placed more on the contractor’s side. However, this might give an inclination to opportunism. If goals are more aligned and there is less inclination for opportunism (as proposed in property rights theory), risks can be carried by the client and a behaviour based contract is suggested. Risk allocation is always a trade-off between the costs of carrying the risk and the costs of monitoring the contractor who carries the risk. BVP/PIPS suggests that the risks are allocated within sphere of influence. It assumes that the contractor does not have technical risks as an expert and therefore says that the client carries all the remaining risks, which are outside the sphere of influence of the contractor.

Findings comparison SCM and BVP/PIPS:

1. Agency theory deals with the allocation of risk from the perspective of non-alignment of goals and corresponding expectation of opportunism, by implementing control measures towards the contractor. BVP/PIPS addresses the cause of opportunism and reduces the need for MDC.

Trust vs Metris

Property rights theory claims that trust reduces the inclination to opportunism. Duren and Dorée (2008) state that trust between client and contractor should be encouraged, due to the high efficiency of economic relations based on trust. BVP/PIPS says different, namely that you should know instead of trust and that trust based relationships introduce unnecessary communication and transaction costs. However, Duren and Dorée (2008) state that wherever there is more trust, the inclination to opportunism reduces, and with that the need for inspection and control.

Findings comparison SCM and BVP/PIPS:

1. SCM literature supports trust based relationships, while BVP/PIPS proposes knowing.
Monitoring design vs Quality assurance
The problem of bounded rationality is addressed through contract design and monitoring design, which is elaborated in management control theory. The definition of monitoring by Heide et al. (2007): *one party’s effort to measure the performance of the other party*, is an approach that is not supported by BVP/PIPS, which claims that every action of one party measuring performance of the other party should stop, because it introduces unnecessary transaction costs and accountability. Monitoring can be output-based or behaviour-based. The choice between behaviour- and outcome-based contracts depends on the risk preferences of both parties. Behaviour-based monitoring is fit for BVP/PIPS practices, because it can comply with the suggestion of quality assurance by the client. The theory behind behaviour-based monitoring is relevant for BVP/PIPS contract management as it can support contract management elements for BVP/PIPS projects with theory.

Findings comparison SCM and BVP/PIPS:

1. Agency theory can add to BVP/PIPS literature with its supporting claim for behaviour-based monitoring. While BVP/PIPS states that the client can perform quality assurance, it does not describe how this should be done in detail. This is the place in the execution phase where clients and contract managers often get stuck and fall back into traditional behaviour. The tools in BVP/PIPS do not comply with the practical reality of contract management, which leaves contract managers in the dark on how to implement BVP/PIPS in the execution phase. Behaviour monitoring appears to fit with the space for quality assurance in BVP/PIPS.

Summary of confrontation SCM and BVP/PIPS
Table 4 presents comparable solutions in both BVP/PIPS and SCM literature. Some of the solutions contradict each other, which may help find new contract management elements for BVP/PIPS projects. Other elements support each other. These cases can be used to underpin BVP/PIPS.

6.3 BVP/PIPS’ contribution to literature
While the previous section searched for a contribution from SCM literature to BVP/PIPS, this section considers the potential contribution that BVP/PIPS might provide to SCM literature.

Looking into the cause of opportunism
The agency theory poses the challenge of different goals and risk preferences (Eisenhardt, 1989). Resulting from this situation, combined with uncertainty and information asymmetry, the challenge of opportunism arises. Agency theory addresses the challenges of uncertainty through contract design. Information asymmetry and opportunism are addressed through information gathering and coordination and control (monitoring design). However, the challenges of information asymmetry and opportunism are symptoms resulting from the non-alignment of goals and risk preferences and agency theory aims to solve the problems instead of the cause.

From a BVP/PIPS perspective, one could say that the root of the problem is targeted, because it focuses on creating and working from a win-win situation, in which goals are aligned. In the ideal case that BVP/PIPS strives to establish, both parties are committed to a win-win situation. Information gathering as a preventive to moral hazard, i.e. opportunistic behaviour, will not be needed, because the contractor is incentivized to act in accordance with the client’s and his own needs. The mechanisms that facilitate this situation and deals with the agency theory challenges are described next.
Focus on quality
Selection on quality in the tender phase is a mechanism to align goals and create a win-win situation, because the client is willing to pay a fair price for the project. Duren and Dorée (2008) state that the focus on quality and the fact that contractors are enabled to differentiate themselves based on quality affects competition and reduces risks and failure costs. Focus on quality allows the contractor to deliver quality and make a profit while the client makes it possible to receive higher quality. The higher quality comes from the competition on quality instead of price. In this way, BVP/PIPS addresses the pre-contractual problem of hidden information (adverse selection). The focus on quality in the tender phase aligns goals. This creates space for the application of behaviour-based contracts, which are more efficient in this situation, because when goals are more aligned, the contractor is more probable to behave in accordance with the client’s desires regardless of the incentives built in the contract. Therefore, there is less motivational necessity for outcome-based contracting (Eisenhardt, 1989).

Risk allocation
Responsibility for risks according to sphere of influence allows the contractor to be transparent with the occurrence of risks, since he does not hold financial responsibility when a risk occurs outside of his sphere of influence. This structure for risk allocation makes the contractor support the goals of the client. This is supported by property rights theory, which claims that clear distribution of risks facilitates goal alignment. If according to BVP/PIPS, a client takes financial responsibility for the risks that the contractor cannot control, the contractor will carry less risk and this decreases the client’s costs of transferring risk to the agent. Also, the inclination to opportunism would decrease when the contractor knows that the client pays for unforeseen risks that might occur.

Past Performance Information
PPI also acts as an incentive that contributes to the alignment of goals, for example: if a contractor delivers a good project, he will receive a high rating, which will motivate him to perform.

6.4 Conclusions
SCM theories are mainly based on benefitting one party in the supply chain, which creates win-lose situations wherein goals are not aligned. SCM theory then strives to solve the problems that occur in this situation without changing the situation itself. The situation creates inclination to opportunism and the solutions are, from the client’s perspective, focused on controlling contractor behaviour so that he cannot behave opportunistically. BVP/PIPS attends to the cause of the problem and aims to create and work from a win-win situation. When goals are aligned, the inclination to opportunism is reduced and the need for monitoring and control decisions simplified. In terms of management control theory this can steer more towards behaviour-based monitoring instead of outcome-based.
### Table 4: Comparison solutions BVP/PIPS & SCM

The problems that BVP/PIPS addresses are not new to SCM literature and its corresponding theories. The difference is that BVP/PIPS identified and addresses the cause of these problems. Although BVP/PIPS provides solutions, problems of opportunism and excess direction and control still occur. There might be something missing in the implementation of BVP/PIPS in the execution phase. The method for quality assurance that BVP/PIPS proposes is not defined in detail, leaving its application open for interpretation. The application of quality assurance is further researched in practice.

<table>
<thead>
<tr>
<th>BVP solutions and applications</th>
<th>SCM solutions and applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Win-win:</td>
<td>Goal alignment:</td>
</tr>
<tr>
<td>• Focus on quality;</td>
<td>• Risk allocation (conscious risk transfer)</td>
</tr>
<tr>
<td>• No minimum standards</td>
<td></td>
</tr>
<tr>
<td>• Risk allocation (100% - 0%)</td>
<td></td>
</tr>
<tr>
<td>2. Hiring experts:</td>
<td>Relational contracting:</td>
</tr>
<tr>
<td>• PPI;</td>
<td>• Based on reputation</td>
</tr>
<tr>
<td>• Performance subtenance</td>
<td></td>
</tr>
<tr>
<td>3. Creating transparency through metrics:</td>
<td>Monitoring:</td>
</tr>
<tr>
<td>• Weekly Report</td>
<td>• Outcome- or behavior based</td>
</tr>
<tr>
<td></td>
<td>Efficient economic relationship:</td>
</tr>
<tr>
<td></td>
<td>• Trust</td>
</tr>
<tr>
<td>4. Quality assurance:</td>
<td>Monitoring:</td>
</tr>
<tr>
<td>• Not specified</td>
<td>• Outcome- or behavior based.</td>
</tr>
</tbody>
</table>

The problems that BVP/PIPS addresses are not new to SCM literature and its corresponding theories. The difference is that BVP/PIPS identified and addresses the cause of these problems. Although BVP/PIPS provides solutions, problems of opportunism and excess direction and control still occur. There might be something missing in the implementation of BVP/PIPS in the execution phase. The method for quality assurance that BVP/PIPS proposes is not defined in detail, leaving its application open for interpretation. The application of quality assurance is further researched in practice.
This section first examines the practical context of contract management as the suggested solutions have to fit this practice. Secondly, existing contract management methods and their potential contribution to a solution are identified and examined. Thirdly, four case studies are analyzed in order to find the challenges and best practices that occur in contract management.
7. Practical context of BVP/PIPS projects

In order to find the boundaries that limit a contract management model for BVP/PIPS models in practice, this chapter describes the context of contract management relevant to BVP/PIPS projects. This chapter aims to answer question 3a: *What is the practical context that a new contract management model should consider?*

Research questions 2c and 3a are answered through conversations with experts in the field of contract management and document study. Firstly, policy documents are studied in order to identify the contract management elements that are being applied. Also, the context of contract management is defined by studying literature. The next step of the preliminary research is based on conversations with experts. In order to obtain relevant knowledge, suitable experts have to be selected. This is done according to the required field of expertise as demonstrated by table 5. The specialist professionals that will be consulted will be BVP experts, UAV-gc experts and SOCM experts.

<table>
<thead>
<tr>
<th>Key concept</th>
<th>Theoretical framework</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract management practice</td>
<td>UAV-gc</td>
<td>Monika Chau-Duivis</td>
</tr>
<tr>
<td></td>
<td>SOCM</td>
<td>Eldert van der Lee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rudie van Kruijsbergen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>David van Hasselt</td>
</tr>
</tbody>
</table>

Table 5: Selecting experts

The context of contract management is defined by different influences. One is the internal causes that are imposed upon clients. Another influence is externally formed by Dutch construction law. There are also influences from outside the client-contractor relationship that influence the possibilities for contract management. This chapter discusses these influences as they shape the solution space for the contract management model that will fit BVP/PIPS in practice as it is bound by the contractual context in which BVP/PIPS has evolved.

7.1 Contractual context: UAC-IC 2005

The execution phase of construction projects is partially characterized by the contract that shapes the legislative boundaries of contract management. This section discusses the legal influences that shape the solution space for the contract management model that will fit BVP/PIPS in practice as it is bound by the contractual context in which BVP/PIPS has evolved. The integrated model demonstrated in figure 5 is the only identified model fit for BVP/PIPS projects. The essence of this model and their relevance to BVP/PIPS projects are discussed in the next section.
Dutch construction law under UAC-IC 2005

Clients in the construction industry want to be assured that they receive a high-quality product. Chau-Duivis, et al. (2013d) state that in terms of quality assurance, the concept behind an integrated contract is that the contractor is more active in the sphere of inspection, while the client becomes less active.

**Quality control and the quality plan**

§19 of the UAC-IC 2005 attends to quality assurance in general. §19 (1) places responsibility for quality control of all work and the quality of the result of work and documents in the hands of the contractor (Chau-Duivis, et al., 2013d).

The main concept that facilitates this responsibility is the quality control plan, which the contractor is required to draw up. The quality control plan puts the contractor in the position to grant information about his production and business processes. An inspection plan can be added if necessary or if required by the client (Chau-Duivis, et al., 2013d). The quality plan may consist of several aspects considering the contractor’s organization and production process, among which: the responsibilities and powers of the employees inside the organization; information flows; a detailed work description; an explicit description about how risks should be identified and shortcomings recorded, and how these are mitigated (Chau-Duivis, et al., 2013d).

As mentioned earlier, it should be kept in mind that under UAC-IC 2005, the client does not carry the obligation to test performance. If the client decides to test for quality assurance, which happens under the legal name of verification and acceptance, the client has to consider the Explanatory Notes to the UAC-IC 2005 (p. 67), which are devised to audit if the contractor has executed or is executing the work in correspondence with the contract provisions (Chau-Duivis, et al., 2013d).
Verification and acceptance
The purpose of verification is to administer the client with information that demonstrates in which manner the contractor brings the contract to completion, and not as a tool to inform the contractor on if he is executing his work properly (Chau-Duivis, et al., 2013d).

Besides the work, the client has the right to verify the accordance of quality assurance of the work with the quality system, the quality plan/partial quality plan, the inspection plans and more requirements that quality assurance is expected to comply with (Chau-Duivis, et al., 2013d).

In the Explanatory Notes it is stressed that a client would be wise to communicate errors that he observes during verification. Not informing the contractor can introduce risk, because §20 (4) of the UAC-IC 2005 states that the client is obligated to inform the contractor if he notices a failure from the side of the contractor (Chau-Duivis, et al., 2013d).

The risk that the client attracts by testing can be examined through the liability clause in UAC-IC 2005. UAC-IC 2005 does not oblige the client to test performance and if the client does not test, his liability is limited. However, if a client decides to test performance, he has to consider certain legal principles that increase his liability.

Liability
The contractor’s liability for defects that occur following the de facto completion date is described in §28. The principle is that after completion the contractor is not liable anymore for the defects in the works or part of the works (Chau-Duivis, et al., 2013d). An exception can be made to this principle. According to UAC-IC 2005 §28, the principle for non-liability for defects following completion may be overthrown if three cumulative criteria are met:

a. The defects are the fault of the contractor or he is responsible for them in accordance with the law, a juridical act or commonly held opinion, and
b. The client did not notice these defects prior to completion, and
c. The client could not reasonably have been expected to detect the defects at the time of accepting the works.

One can observe that the second criterion under §28 of the UAC-IC is of a factual nature: what has the client in fact observed during the execution of works? The nature of the third criterion is normative: what should the client reasonably have been able to detect? This means that an amount has to be made for the extent and depth of the inspection that could be expected from the client in question, given his expertise (Chau-Duivis, et al., 2013d).

In §28 (3) of the UAC-IC 2005 a limitation for liability is provided: the compensation shall be limited to 10% of the price stated in the basic contract insofar as that price is related to the execution of the works by means of design and construction work (Chau-Duivis, et al., 2013d).

The researcher notes that this makes it reasonable that clients would like to know if contractors comply with contractual obligations and that the product is delivered as desired, as clients take over the project after completion and simultaneously take over responsibility for any defects. The fact that the contractor can only be held liable for maximum 10% of the price stated in the basic contract carries a risk for the client as the price of a defect may be much more costly.

Contractual context:

1. Quality control and the quality plan;
2. Verification and acceptance;
3. Liability.
7.2 Non-contractual context BVP/PIPS projects
There are reasons that create a possible need for contract management methods other than legislation.

Regulations
Depending on the type of client, regulations influencing contract management options can be in force. Governmental agencies, such as RWS and regional water authorities, are bound by the justification of payment regulation. Justification of payment is one of the reasons for clients to test performance of the contractor. Testing performance under UAC-IC 2005 contracts is mostly done through risk oriented testing by applying the contract management method SOCM, on which will be elaborated in section 7.3.

Image
Besides the aforementioned reason, occurrences of risks that will influence the client need to be acknowledged and mitigated. The control of risks from the client’s perspective is important because, when risk occurs (e.g. delay, stakeholder disturbance or accidents) in the public sector the client will be held responsible. The image of clients is an important aspect to consider. Also, the responsibilities for failures to important infrastructure resulting in calamities after delivery or accidents during realization cannot simply be transferred to contractors. Clients will be held accountable for their projects in public opinion.

Non-contractual context:
1. Regulation;
2. Image.

Conclusions BVP/PIPS context
It appears that clients are bound by some form of verification of the contractor. Although legislation does not obligate clients to verify the works according to §21 (10) and §22 (3) of the UAC-IC 2005, some amount of ‘hands-on’ is required for different reasons; regulations that ask for the ability to demonstrate justified payments, the high possibility that contractors will not be the only party that suffers after the occurrence of a risk, and the fact that clients will be held responsible for defects in important infrastructure (they have to be able to demonstrate that they did everything possible to mitigate risks).

However, according to UAV-IC 2005 the client has to inform the contractor in writing if he notices a shortcoming during verification. If he does not fulfill this duty he can give the contractor an argument with which he can defend himself against a claim based on that shortcoming (Chau-Duivis, et al., 2013d). This implies that when a client tests performance of a contractor by verification, he has to be involved to some extend in order to decrease the risk of attracting liability of defects that he has, or should have seen.

How does the client do this in effective manner? The next sub-section will examine the contract management methods that occur in practice in order to find contract management elements that support the BVP/PIPS principles.
7.3 Contract management: System Oriented Contract Management

The prominent method of contract management for contracts under UAC-IC 2005 is risk oriented testing, commonly known as SOCM. The main principle of SOCM is the transfer of responsibility of quality of the work from client to contractor (Verboom, 2007). Altamirano (2010) describes SOCM as the way the Dutch have operationalized the so called ‘own responsibility principle’. SOCM is developed by RWS, for whom the introduction of integrated contracts supported its objective to take a step back from technical involvement in projects and hand over more responsibility to the market. The market would take more of the work so that RWS could become less technical as a client and focus more on the procurement part of a project. RWS created a collaboration model, called External Quality Management (Externe Kwaliteitsborging (EKB)), for managing project risks in 1998. In this model, quality control became the responsibility of the contractor and RWS could take a step back. EKB was a practical method wherein the client has to place more trust in the qualities and validation steps of the delivered results of the contractor. EKB obliged the contractor to demonstrate that the delivered results and processes complied with the contractual determined requirements and conditions. EKB developed through experience and eventually was replaced by System Oriented Contract Management (SOCM) (Systeemgerichte Contractbeheersing (SCB)) in 2004.

SOCM is based on the assumption that with a well-functioning quality system the contractor will deliver a good product. The client ensures quality delivery by testing the contractor’s quality system rather than their work. This should fulfil the main goal of SOCM, namely: efficient (meaning from distance) and effective (minimal effort) project control and quality assurance (Rijkswaterstaat, 2011). SOCM obliges the contractor to control, manage and validate their processes by means of a quality scheme. This means less involvement and responsibility for the client. In order to measure the progress and successful realization of a project, SOCM determines criteria in advance on which to examine a project. These criteria are tested by means of system-, process-, and product tests. Based on the results of these tests, payments to the contractor can be justified. SOCM is based on the following principles which are comparable with BVP/PIPS methods.

**Quality management**

Contractors are responsible for compliance with the requirements in the contract. Contractors should be able to demonstrate the achievements of the quality requirements during and after the realization of a project. The most important element of quality management of the contractor is that he himself describes his processes, controls risks, identifies deviations, takes suitable (corrective and/or preventive) measures and regularly evaluates this process (Rijkswaterstaat, 2011).

**Control from a distance**

The client gives the contractor freedom in project- and quality management. This means minimal interference of the client with the project- and quality management. The client examines the progress with a mix of tests based on project risks. Activities in which the client foresees risks are examined during the realization of a project. The mix of tests can change due to new insights and during the progress of the project, notifications or shortcomings (Rijkswaterstaat, 2011).

<table>
<thead>
<tr>
<th>Contractual context</th>
<th>Non-contractual context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality control and the quality plan</td>
<td>Regulations</td>
</tr>
<tr>
<td>Verification and acceptance</td>
<td>Image/responsible role</td>
</tr>
<tr>
<td>Liability</td>
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</tbody>
</table>

*Table 6: Practical context*
8. Case studies
The goal of the case studies is to identify challenges and best practices in relation to contract management in practice. The cases are used to examine what keeps the BVP/PIPS principles intact during the execution phase and how contributing or opposing factors manifest. Understanding the mechanics in the practice of contract management allows the researcher to propose contract management elements that support BVP/PIPS principles in the execution phase of BVP/PIPS projects, based on the observed challenges and best practices.

8.1 Case study design
The case study design is presented in figure 6. Findings from the literature study are used to select the cases and design an interview protocol for the systematic gathering of data. Next, the cases are studied after which the observations of challenges and best practices are confronted with each other and literature in a cross-case analysis for the creation of generalizability.

The chosen case study design facilitates the replicability of the observed challenges and best practices. Replication of the same findings in multiple case studies strengthens the generalization (Yin, 2014). Based on analytic generalizability by Yin (2012): the observations are generalized to a more abstract level of ideas through cross-case analysis of the observations. In line with Yin (2012), the analytic generalization is further generalized and made applicable to new situations through identifying overlaps and gaps in related research literature from the literature study. The challenges are presented to a group of professionals of which most confirm the observed challenges.

Figure 6: Case study design (own illustration inspired by Heim (2015))

Interview protocol
The literature study from the previous chapter forms the input for the selection of cases and the formulation of the interview protocol (Appendix G). In order to increase the validity of the findings of the case study, the interviews follow a specified method. The interviews are used to find contract management elements that work in practice. Therefore the researcher examines what works and what does not work in contract management practice. The protocol is formulated such that it does
not steer the interviewees’ behaviour in searching for contract management elements that are identified in the literature study. Second level questions about the previously identified elements are used to further investigate the identified contract management elements.

**Interviewees**
Interviews are taken with the client, contractor and contract manager from each case, leading to a total of twelve interviews. Characteristics of the interviewees are that they: are involved from the start of the execution phase or before; are in contact with most actors in the project; are involved in the decision making process and are involved with the implementation of contract management methods.

**8.2 Case selection**
Four cases have been selected to assess potential contract management elements for BVP/PIPS projects. Two projects were BVP/PIPS projects and the other two were UAC-IC projects, not BVP/PIPS. The other variables have been kept constant as far as possible, as similarity of the cases supports the validity of the findings.

**Case properties**
2 BVP water treatment vs. 2 Non-BVP water treatment.

<table>
<thead>
<tr>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same client;</td>
</tr>
<tr>
<td>Similar construction work;</td>
</tr>
<tr>
<td>Same contract manager;</td>
</tr>
<tr>
<td>One in execution phase, other one in maintenance phase;</td>
</tr>
<tr>
<td>Budget ranging from 6.000.000 – 6.900.000.</td>
</tr>
</tbody>
</table>

BVP water engineering project vs. Non-BVP water engineering project:

<table>
<thead>
<tr>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both clients are water agencies in the Netherlands;</td>
</tr>
<tr>
<td>Wet construction;</td>
</tr>
<tr>
<td>Same contract manager;</td>
</tr>
<tr>
<td>One delivered, other in execution phase;</td>
</tr>
<tr>
<td>Budget ranging from: 600.000 – 1.800.000.</td>
</tr>
</tbody>
</table>

**Case specifics**
- All project’s clients are water agencies. Water agencies work according to shared guidelines considering market approach, which creates a common approach for different clients leading to increased validity of the observations.
- The clients in the BVP/PIPS projects followed the BVP method during procurement. The non-BVP projects were D&C contracts under UAC-IC 2005.
- The water treatment projects were innovative projects while the water construction projects were more common construction work.
- The applied contract management methods in the cases were progress meetings (wherein risks, planning and progress were discussed), risk oriented testing (SOCM) with in the BVP/PIPS projects additional WR’s.
9. Challenges BVP projects

This chapter discusses the challenges that were observed in contract management during the analysis of the four cases. The challenges support the contract management elements by giving examples of what needs to be avoided in the execution phase of BVP/PIPS projects. Each challenge is first described according to what happened. Then, for thorough understanding of the described phenomenon, the background of the challenge is examined through the opinions of the interviewees and comparison with the other cases. For increased generalizability, the challenges are then linked to related scientific literature and discussed with experts in a workshop. In the next chapter, observed best practices are discussed and analysed. Throughout the discussion of the challenges and best practices interviewees are referred to in the following manner:

- CO #X = contractor case X
- CL #X = client case X
- CM #X = contract manager case X

9.1 MDC

Client involvement in the design phase caused several problems in case A. In case A, the client and contractor designed the project together after insistence of the client (CL #A, 2017). The client prescribed design changes to the contractor; client: “Zo wil ik het niet hebben, het moet zo” (CO #A, 2017). The client explains that in this aspect they fell back in their old role: “OG bepaalt wat goed en slecht is” (CL #A, 2017). This can be interpreted as MDC behaviour as described by Kashiwagi (2016b) and does not facilitate the utilization of expertise.

Involvement of the client led to discussions on the level of technical detail. CO #A (2017) notes that it was difficult to go through these discussions and make decisions that everyone agrees on.

Cross-case analysis

The client’s insistence on collaborative design effort in case A does not correspond with the proposed methods of BVP. The occurring client behaviour in terms of prescribing changes rather corresponds to MDC behaviour in BVP methodology. In Case A, the collaborative design took shape of discussions about technical details and MDC behaviour by the client. The discussion on non-dominant information led to MDC behaviour in case A. BVP proposes that the client does not interfere in technical discussions involving non-dominant information, however, CO #A (2017) states that refraining from technical discussions was not possible, because: “dat gaat om technisch heel inhoudelijk werk. Dat kun je nog lang niet allemaal uit concretiseren. En die ontwerpen ga je opstellen en daar vindt die OG gewoon iets van. En dan is het ook niet realistisch om te denken dat een OG al in de concretiseringsfase al helemaal te zien krijgt wat ie krijgt. Dat kan gewoon niet” (CL #A, 2017).

Related research

Based on correlation with the findings of other researches, it appears a challenge for clients to refrain from the use of non-dominant information. Heim (2015) observed the same tendency to talk about details and in three cases the difficulty of letting go at the client’s side. As did Samson (2015), who observed the tendency to share non-dominant information, especially after procurement. One interviewee Heim (2015) explains that both parties felt too much in their traditional role as a reaction to the way collaboration developed after
kick-off, which resulted in a lot of emphasis on formulation instead of an expert elaborating in detail on their offer and a client posing questions. The author concludes that this has had a negative impact on performance. Samson (2015) observed that a contractor requires non-dominant information in order to produce a product that would fit with the client’s organization and that the client shared a lot of non-dominant information throughout the execution phase in order to manage expectations about the end result.

**Influence on BVP principles**

MDC behaviour by the client did not facilitate BVP principle utilization of expertise in case A. In terms of BVP, the parties in case A did not stick to their role. The contractor stepped away from his role as leading expert while the client took the lead and directed the work of the contractor (CO #A 2017). Occurrence of MDC behaviour was not observed in the non-BVP projects. MDC behaviour might be used in order to ‘safe’ the project in the situation of a lack of expert behaviour of the contractor and challenges in defining the scope. These challenges are described next.

**Challenges:**

1. The client in case A fell back in their traditional role;
2. Discussion on level of non-dominant information in case A;
3. Design changes were requested by client in case A, leading to delay.

9.2 Non-expert behaviour

The contract manager in case A states that the planning was not kept by the contractor continuously (CM #A, 2017). The client claims that the contractor changed planning up to 25 times (CL #A, 2017).

The initial project leader of the contractor was pulled of the project, because he did not work according to BV (CM #A). He worked traditional (not even UAC-IC) and that brought along a lot of costs for both sides. Requirements and wishes of the client were ignored in the design and the contractor did not take the client by the hand (CM #A, 2017). He further explains that the client’s team immediately took action to solve this situation.

*CM #A (2017)* explained that the client made valid warnings and suggestions that could have prevented surprises when taken into account. One example is that the client suggested the contractor to investigate the state of a, to be removed, concrete floor to prevent unexpected effort in removal. However, the contractor ignored the client’s input after which the risks occurred, which resulted in delay (CM #A, 2017).

**Cross-case analysis**

Procurement according to BVP did not work in the case of a too low budget and an unrealistically low bid of the contractor. According to CM #A (2017), the client did not select the potentially better expert contractor, because their price was above budget. The second choice was chosen, based on their price. The client did not change their budget, because in that event the tender had to be started again and they wanted to start the project (CL #A, 2017). CM #A (2017) states that: “*Als je expert bent en goed bent in je vak, dan kan je goed vooruitkijken dan kun je het dus goed in je planning zetten en kun je je ook aan die planning houden. Dat is ook wat ik verwacht van een goede BV ON*” (CM #A, 2017). He further explains that it is natural that things happen that can influence the planning, but a planning can be mostly correct (CM #A, 2017). CM #A (2017) explains that he changed from how he wanted to approach according to BV, towards almost classical contract management.
through SCB including sending warnings and withholding payments. He continues to explain that it became ‘almost’ classical SCB, because he still tried to keep providing the contractor with the possibility to return to a BVP approach (CM #A, 2017).

Related research
Another aspect of the appearance of non-expert behaviour is that the contractor also felt comfortable in leaning on the knowledge provided by the client, because they know a lot (CO #A, 2017). In three cases Heim (2015) observed the struggle of adopting new roles for the contractor. In one case the author specifically describes the difficulty of adopting a leading expert role at the contractor’s side. One interviewee in Heim (2015) explains that both parties felt too much in their traditional role as a reaction to the way collaboration developed after kick-off, which resulted in a lot of emphasis on formulation instead of an expert elaborating in detail on their offer and a client posing questions. Heim (2015) concludes that this has had a negative impact on performance. Another interviewee in Heim (2015) his cases relates the clear distribution of responsibility and the disburdenment of the client to the ability for the client to take on his role more comfortably. The interviewee states that this is accomplished through a contractor who takes the lead, creates transparency in clarifying his plan, identifies lack of clarities in the information and making responsibilities explicit.

Influence on BVP principles
The absence of expert behaviour did not facilitate BVP principle utilization of expertise in case A. As a result to the lack of quality and not meeting planning, the contract manager of case A adapted his approach and applied more forceful contract management methods (CM #A, 2017). Notifications and letters were sent to the contractor and payments for postponed. Eventually the escalation model was applied (CM #A, 2017).

Challenges
1.4 Contractor steps away from role as leading expert in case A, possibly due to pro-activeness client;
1.5 Contractor did not meet planning continuously in case A;
1.6 Contractor did not take client by the hand in case A;

9.3 Discussing about responsibilities
In case A, the client did not deliver documents in time, which resulted in changes of the contractor’s design due to a different design situation (CO #A 2017). The contractor explains that assigning the responsibility for this type of situations is difficult due to the interrelatedness of events. Discussions about responsibilities led to transaction costs resulting from discussion and delay in Case A.

Cross-case analysis
During the collaborative design phase, necessary documents for the contractor were delivered late by the client, which resulted in design changes by the contractor (CO #A 2017). It was difficult and time consuming to appoint the responsible party for delay and additional work, as roles and responsibilities were not clearly defined. Instead they were shared. CO #A (2017) describes clearly defined responsibilities as challenging, as the allocation of responsibility is never crystal clear. He questions if it is really the risk of the client, or if they share responsibility due

“De grote mate van bemoeienis is ook wel weer fijn, want de OG weet ook heel veel, dus daar ga je toch ook in mee” (CO #A, 2017).

“De situatie is nooit kraakhelder. In de praktijk is het weerbarstiger want er spelen meer dingen mee. Is het echt alleen maar risico OG of heb je zelf ook nog een bijdrage? Heb je zelf ook vertraging?” (CO #A, 2017).
to mistakes of the contractor. One can consider the possibility of an unclear situation due to lack of expert behaviour, because the expert contractor should be able to identify risks in the client’s sphere of influence. If the contractor does not identify these risks due to not keeping up with the information flow, he might not be an expert in this aspect. Discussions about responsibility were not observed in the other BVP/PIPS project (case C).

Related research
Heim (2015) observed similar challenges as an interviewee in a case study of Heim (2015) stresses the division between responsibilities and that it must be clear who has to take responsibility.

Influence on BVP principles
In case C client involvement was less and assigning responsibility was more obvious. Discussions about responsibility did not facilitate BVP principle utilization of expertise in case A.

Challenges:
1.7 Design changes requested by client, leading to delay in case A;
1.8 Discussion about responsibility in case A led to transaction costs;
1.9 Lawyers involved in case A.

9.4 Quality control
The client of case A claims that there were several scenarios wherein the quality control system of the contractor was not functioning. During the first pouring of concrete the auditor of the client stopped the work, because the concrete cover was not sufficient and the reinforcement bars were not placed conform drawings (CL #A, 2017). The client furthermore states that despite this situation, according to the list in the quality control system of the contractor the quality was good. In the verification plan everything seemed correct, therefore the contractor did not manage their own quality control system (CL #A, 2017). In case C, the contract manager explains that the documented quality initially only stated that a requirement was fulfilled, but not how it has been fulfilled (CM #C, 2017). He afterwards showed that it costed him money to get the quality system up to standard. That is learning/development money for a later project.

Cross-case analysis
Non-functioning quality control systems of contractors is a challenge that the researcher firstly identified during the preliminary research interview with Vis (2017). CM #C (2017) states that the improvement of the quality control system in case C worked because in this case the contractor was willing. According to CM #C (2017) the contractor initially failed on demonstrating the 'how', because contractors are not used to make pictures in the execution phase. The same contract manager was positive about how the contractor in case D worked with the quality system because it was organized (CM #D, 2017). He claims that he stressed the importance of knowing the 'how' from the contractor since the first day of the project. The contractor made pictures of the work to proof the quality (CM #D, 2017). When the contractor does not have a quality control method, that is where it goes wrong. Then people just act without thinking about the requirements (CM #C, 2017).
Influence on BVP principles
The non-functioning quality control system did not facilitate BVP principle utilization of expertise in case A, because the contract manager had to control more. In case C expertise was utilized. The lack of quality control prevented the client from staying in his role as quality assurer.

Challenges:
1.10 Non-functioning quality control system in case A;
1.11 Initially no proof in quality control system contractor case C, due to way of working.

Improved after feedback contract manager case C.

10. Best practices BVP projects
This chapter discusses the best practices that were observed in contract management during the analysis of the four cases. The best practices support the proposed contract management elements by providing examples of what works in the execution phase of BVP/PIPS projects. Each best practice is first described according to what happened. Then, for thorough understanding of the described phenomenon, the background of the challenge is examined through the opinions of the interviewees and comparison with the other cases. For increased generalizability, the best practices are then linked to related scientific literature. Throughout the discussion of the challenges and best practices interviewees are referred to in the following manner:
- CO #X = contractor case X
- CL #X = client case X
- CM #X = contract manager case X

10.1 Creating a win-win situation
In case A, after a period of demanding by the client and refusing by the contractor, both parties got together, discussed what happened during the last two months and expressed their interests (CL #A, 2017). The contractor expressed that he was tight in budget and that they need to make a living (CL #A, 2017). According to the client of case A, some people argued that the contractor took the risk of making a bid on the project. However, he states that: “Als wij geen aannemer hadden gehad dan hadden wij geen project gehad en dan hadden wij een giga probleem” (CL #A, 2017). Therefore, the client aligned both parties in order to stay on speaking terms. CL #A (2017) claims that as a result there were two escalations, while there could have been much more.

Cross-case analysis
The creation of a win-win situation during a stressful scenario was also observed in non-BVP project case B. The client of case B explains that they changed course from submitting fines on un-achievable technical requirement promises by the contractor, to looking into the client’s goals, which were the reduction of silt and winning back energy. The client then said: “We geven jullie de kans om dat te optimaliseren, hoe, dat is aan jullie” (CL #B, 2017). They also lengthened the maintenance phase in the project to 10 years to give more security to the client. The contract manager of case B shares the client’s enthusiasm about maintenance in the contract, as an effective incentive for quality: “Want je ON wordt gelijk geprikkeld van ‘hoe kan ik dit voor mijzelf nou ook gunstig maken?’” (CM #B, 2017).

The contractor explains that this approach was possible, because the client was ‘coolant’ and understood that it was an innovative project (CO #B, 2017). In case B the change of approach was enabled by the client’s understanding of their needed end-result and knew that fighting for costs
would not bring them there. This awareness allowed them to change approach when the situation got tense. The contractor then gained the position in which he was able to make a profitable and innovative project for the client (CL #B, 2017; CO #B, 2017). CL #B (2017) elaborates that it is important as a project leader to gain insight in what is happening in the world of contractors and that with whatever contract you write, it has to be attractive to the other party. “Je moet je gewoon afvragen: ben jij er als opdrachtgever bij gebaat om dingen van de markt te vragen die niet reëel zijn” (CL #B, 2017). This insight led the client to, from his role as project leader, create long-term contracts in which they work together with the other party. The client further elaborates that it is important to understand what this means for the market that will pick up the contract, that you understand the risks of the market, and that you enter a dialogue with that market (CL #B, 2017).

Related literature
As proposed by property rights theory, goal alignment and creating a win-win situation through risk allocation led to better cooperation and facilitated BVP principle utilization of expertise in case B and C. Duren and Dorée (2008) state that the inclination to opportunism will be lower and behaviour will be more predictable and cooperative when the alignment of goals between contractor and client is clearer.

Influence on BVP principles
This approach is what BVP describes as creating a win-win situation. The scenarios in case A and B are examples of how it can be applied and that it leads to a better project. The contract manager of case C shares this perspective on win-win by stating that you have to think and act on: “what is best for the project?” (CM #C, 2017) He also does so with traditional contracts. He explains: the best we can do for the project: what does this mean for, you, me and the client? Can we live with that? Yes? Then we have found a good solution. If someone cannot live with it, we have to see what is necessary to make it possible. Sometimes you need to change the contract. This is discussed in the beginning of the project, during the project you have to remember and apply it (CM #C, 2017).

Best practices
- Creating a win-win situation led to less transaction costs in cases A and B;
- A win-win situation reduces the inclination towards opportunism;
- Creating a win-win situation during the project required an attitude of understanding and compromise.

10.2 Clarification phase
In case C, a big investment by many meetings during the clarification phase was followed by less need for meetings during the execution phase (CM #C). CL #C (2017) confirms that both parties sat together once a week during the clarification phase and once a month after procurement, from start design until realization.

Cross-case analysis
In case C, the clarification phase was executed...
according to BVP methodology. CL #C (2017) claims that: “Het systeem werkt als je aan de voorkant veel investeert” (CL #C, 2017). This is supported by the smooth execution phase, wherein there was no need for many meetings. The client explains that: “Als je in staat bent om los te laten als OG is het comfortabel, omdat je voordat er een schop in de grond gaat, het hele project al aan tafel gemaakt is. Dus alle risico’s heb je van tevoren goed doorgrond met elkaar. Dus het is comfortabel voordat je daadwerkelijk aan de slag gaat als je goed voorbereid hebt” (CL #C, 2017). The clarification phase in case A was characterized by a lot of influence of the client. The contractor of case A states that there were a lot of negotiations and changes in work during the clarification phase. The client of case A explains that both parties were arguing about what the client wants versus what is possible and that these wishes cannot be realized by the contractor (CL #A. (2017). Because of this, the client decided to join in the collaboration phase (CL #A, 2017). CL #A (2017) explains that the problems occurred because of the short schedule for the project and that they did not have time to thoroughly finish the clarification and design phase.

Related research findings
Heim (2015) also observed the scenario of a high level of interaction between client and contractor during the clarification and execution phase, which resulted in both parties feeling informed about the activities of the other resulting in a positive influence on performance. CL #C (2017) claims that the design does not need be finished in the clarification phase, you can even do it based on a picture or a preliminary design. The contractor from case C showed enthusiasm for the BVP method in relation to the clarification phase. Case C stresses the importance of a good clarification phase. If trust (the client knows that the contractor can deliver the requirements) is established during the clarification phase, control is less necessary during the execution phase. Heim (2015) describes that the client developed trust towards their contractor by being well prepared for the kick-off meeting, which gave the client the feeling that the contractor had a good feeling for the project.

Influence on BVP principles
A good clarification phase facilitated BVP principle utilization of expertise in case C. It is possible for the client to stay in his role when the contractor demonstrates how he will realize the project.

Best practices
- Investment in the clarification phase led to less involvement of the client during execution phase in BV case C;
- Maintaining the win-win situation as a mindset when discussions occur improved cooperation.

10.3 Scope definition
Procurement in case C was done with technical requirements in the form of dimensions, but the choice of materials and the construction method were left to the contractor (CO #C). This did not have negative consequences during the execution phase.

Cross-case analysis
The technical requirements in the form of dimensions in case C did not hinder the BVP principles. CO #C (2017) understands that the client cannot procure the project with fewer requirements in this project, because they already know what is needed in particular situations. CL #C (2017) explains that: “Als je een OG hebt die zelf veel kennis heeft, zal je vaak meemaken dat er al iets meer ligt dan een schetsontwerp, een voorontwerp. Dat is de keuze van de OG. Maar hoe meer hij verzint, des te
minder creativiteit hij bij de markt vraagt” (CL #C, 2017). CO #C (2017) elaborates that for a contractor it is not a problem if the client asks for some requirements in the form of dimensions. Furthermore, the contractor explains that they would enjoy being even more free, as they can make their own plan. The client in case D asked for functional requirements in terms of a sluice door that has to be able to close under pressure of certain water levels (CO #D). Based on these requirements, the contractor made a bid, partially based on an engine that is necessary to generate the needed power. In case D, functional requirements did not lead to any problems. The scenarios in the two cases fit the perspective of BVP/PIPS.

Related literature
The provision of technical requirements in case C corresponds to van de Rijt et al. (2016) who explain that the ‘how’ is up to the contractor and the client should define the ‘what’. The abstraction level of ‘what’ is up to the client and does not mean that the client cannot have specific requirements (van de Rijt, et al., 2016). Seen from the BVP perspective, the client in case C defined the ‘what’ in terms of technical dimensions. The contractor decided the ‘how’ by proposing the plan for meeting these requirements. Van de Rijt et al. (2016) state that it is possible for the client to define the tendered assignment when the deliverable is established and his own activities (scope) are determined. The deliverable is the work of the contractor, including the activities of the client (van de Rijt, et al., 2016). In Case C, the scope of both client and contractor was clearly defined. The tendered assignment in this case existed of technical requirements, which formed the ‘what’. The contractor worked on the ‘how’.

A different observation was made in non-BVP case B, wherein the contractor and client had discussions about data with which the client procured the project. The contractor made a bid on to be achieved technical performance, which appeared unachievable after procurement (CL #B, 2017). The perspective of CO #B (2017) is that the data given by the client was not accurate, while CL #B (2017) saw the contractor as creative with the numbers, allowing them to win the tender based on promises that they were not able to realize. This led to lot of discussions and delay (CO #B, 2017).

Influence on BVP principles
Transaction costs due to unnecessary discussions can be reduced when scopes are clearly defined.

Best practices
- Technical requirements in tender are applied while engineering choices are left to the contractor, leading to a clear scope definition in BV case C.
- Clear scope definition (‘what’ by client and ‘how’ by contractor) prevents discussion about accountability for occurring risks.

10.4 Accepting risks
The client in Case C accepted a risk that was not in the sphere of influence of the contractor (CM #C, 2017). CM #C (2017) describes the scenario of a crane that sunk into the mud. Due to the tight time schedule that was asked for by the client, the contractor had to continue the works under heavy rain, which caused the crane to sink. The client accepted the risk as outside the sphere of influence of the contractor, which saved both parties from long discussions about responsibility (CM #C. 2017). In another scenario in case C, CL #C (2017) explains that the contractor took responsibility for an occurring risk that was in his own sphere of influence. The contractor solved this risk overnight without notifying the client.
The client of case D explains a similar example of allocating responsibility which reduced discussions. In this case the works are being executed in the breeding season for protected birds. That means that you cannot disturb a nesting bird. The contractor and the client had discussions about who will carry the consequences of that possibility. Eventually the client took the risk and they saw it as an obligation of effort, instead of an obligation of result of the contractor, meaning that the contractor had to do everything possible to prevent the risk (block openings and checking the site in the weekend for prevention). If the risk occurred despite the effort of the contractor, the client would take risk (CL #D).

Cross-case analysis

The three instances described above are implementation of risk allocation principles of BVP, which prevented unnecessary transaction cost due to discussion and delay. The client in case D was willing to accept the risk as an effort obligation of the contractor, meaning that if he complies with the effort, it is okay (CL #D, 2017). This corresponds with the BVP/PIPS concept that the contractor aims to mitigate risks that are not in his sphere of influence. If the risk still occurs, the client is accountable for the consequences. The scenario in case C was not straightforward, as the sinking of the crane happened partially in the sphere of influence of the contractor. However, CM #C (2017) explains that the client was dependent on subsidy and therefore the scenario was characterized by big time pressure which both parties were aware of. This is his risk. If the client would have made a wider planning, the contractor would have been able to perform better (CM #C, 2017). According to CM #C (2017), risk allocation according to BVP requires a realistic way of thinking, i.e.: “sometimes you have setbacks and it is not always the fault of contractor. If you have a tight deadline, you should be realistic about the possibility that it does not happen. It can work according to planning, the contractor is willing to go for it, but if you suddenly have couple of weeks of rain in area with very soft soil. Then you can get problems and productivity goes down. The contractor knows he is working with time pressure and the weather type, so he has to make a choice” (CM #C,2017). In this case the contractor knows he takes the risk, but feels supported. Then there are no long discussions, because everyone takes their part realistically (CM #C). The other scenario in case C, wherein the contractor mitigated a risk in his own sphere of influence, CL #C (2017) was happy because he was not even aware of the risk that occurred overnight. He explained that the potential outcome in a traditional contract could have been troublesome, as the contractor would simply blame the client for design mistakes, in which case discussions would begin and money would be lost. These are clear examples of the positive attributes of BVP considering scope definition. Allowing the contractor to create his own idea for the project makes him responsible for the design and execution, which clearly defines the scope of both contractor and client. The contractor took this responsibility and mitigated a risk that was in his sphere of influence/scope. Under the influence of an occurring risk, this caused the project to proceed without unnecessary transactions in form of discussion, without delay and keeping the relation between client and contractor intact. This is a result of a clearly defined scope during procurement.

Related literature

The client decided to take responsibility for risks that could occur outside the sphere of influence of the contractor. This would according to BVP facilitate goal alignment as the contractor is now motivated to prevent the risk from occurring and mitigate the risk when it does occur, since he does not have to worry about costs. The client defined the prevention of the risk as an effort obligation.
One can relate this to behaviour-based monitoring in SCM literature, which describes that behaviour can be monitored and rewarded instead of outcome (Bergen, et al., 1992). SCM claims that behaviour-based monitoring works best in an environment when goals are aligned (Eisenhardt, 1989). The BV approach works in this scenario with clear scope definition and is supported by SCM literature. Accepting risk facilitated BVP principle utilization of expertise in cases B, C and D.

**Influence on BVP principles**

Accepting risks can prevent unnecessary discussions and related transaction costs. At the same time it facilitates goal alignment if both parties accept risks in their own sphere of influence. In case of goal alignment and risk allocation according to BVP, behaviour-based monitoring is applicable.

**Best practices theme**
- Risks allocation and acceptance according to sphere of influence reduced transaction costs due to discussions in case C and D;
- Clear definition of scope contributed to clear allocation of responsibilities in case C and D.

10.5 Transparency

The contractor and contract manager both say that communication was open throughout the execution of case C (CO #C, 2017; CM #C, 2017). According to the contractor; he called the client when something was going on (CO #C, 2017). “In een technische ingewikkelde situatie hebben we met OG erbij gebrainstormd hoe we dat moeten aanpakken” (CO #C, 2017). The contract manager states that concerns were openly communicated and received from both parties (CM #C, 2017). The contractor of case B explains a similar situation wherein: “De uitvoerder had gewoon een goed overleg met de beheerder van de zuivering, dus als hij een vraag had ging hij gewoon naar de beheerder, en na overleg hoe dat moet, kon hij daar weer verder mee” (CO #B, 2017).

In case A the situation improved after the change of project manager at the contractor (CL #A, 2017). According to the client, the new project manager exposed the troubles of the contractor. CL #A (2017) claims that the client thought these troubles existed. However, he explains that by being open about it the client felt more understanding for the contractor and that as a client they do not benefit if the contractor suffers. The client therefore made the effort to stay on speaking terms, which resulted in that there were two escalation sessions while there could have been more (CL #A, 2017).

**Cross-case analysis**

CL #A (2017) states that they mostly solved issues with mutual respect. He elaborates that it often worked out good due to proper communication. It was different with the first project manager of the contractor as there was no connection between them (Dutch: ‘klik’) and trust played an important role in communication (CL #A, 2017). The contractor in case B underpins the importance of good communication with the scenario of arguable data in the tender phase. Despite the discussions and delay, he claims that: “Uiteindelijk hebben we wel een goed overleg kunnen doorspreken en is het gewoon goed gekomen” (CO #B, 2017). He claims that there were other scenarios wherein risks occurred and good communication made the mitigation of occurring risks much more smooth. This happened when there was a need for adjustment in design for which the client allowed the contractor more time in exchange for a longer maintenance period for the contractor.

According to the contractor of case B, the good communication was a partial result of the personnel involved getting to know each other. The fact that both parties were often together had a good influence on the communication (CO #B, 2017). From the response of various interviewees it appears that for transparency to be implemented, communication has to be good. After analysis of the interviews, behaviour client and behaviour contractor both appear important for transparency. The
client in case B and C enabled the contractor to be transparent by being open to dialogue in the occurrence of risks, which enables both parties to identify solutions that facilitate a win-win scenario. The contractor in case C was transparent because they dared to share when they were worried about something (CM #C, 2017). The contract manager of case C explains that he wants to be aware of these situations in to be able to consider ‘what we can do together to keep up the pace’. They did that constantly. Openness is very important and the contract manager created that in the kick-off, by exposing vulnerability. By creating an atmosphere. You can walk into risks and if you do not know something sometimes, just talk about it. People think it is incapability when you share that you do not know something, but it is a capability to talk about it. The client was there with the kick-off and because of this we had a successful project with all parties. It is about people work, and daring to share. You have the contract as measurement besides the project, but in the end you realize the project with the people involved. Trust is important, being able to dare to say what is important, if something goes wrong (CM #C, 2017). Trust is a term that is not suggested in BVP. In this context however, the contract manager of case C identified it as an important factor to facilitate in his words ‘openness’, which one can see as transparency. CM #C (2017) claims that relations and connecting people are important for the realization of a project in BV. Soft-skills such as daring to be vulnerable and giving and receiving trust are important in order to maintain transparency and safeguard a win-win environment. Focus on quality, i.e.: what is best for the project should be maintained throughout. A project is realized by working together. A contract can be seen as the framework wherein you work, more like a partnership model. The client of case D also claims that the relation is very important. Inside the company they sometimes ask for a certain person, because then there is a match. You often see that if the personal match is good, the rest follows (CL #D, 2017). “Je moet een bepaalde klik, bepaalde chemie, waardering hebben. Als iemand een hork van een vent is, maar in zijn werk wel goed, dan gaat dat op een bepaald moment toch wringen” (CL #D, 2017). He also states that they sometimes do project-team building with the client and contractor in order to get a feeling of what someone contributes to the project (CL #D, 2017). Where BV aims to objectify the procurement process as much as possible, the client of case D emphasizes the importance of these more personal forms of trust and states that without those, friction will arise between the parties. CL #D (2017) also notes that it may be because of the current time spirit and the reduction of procurement based on lowest price that makes the relationship more important.

Related literature
Samson (2015) observed the importance of soft-skills such as communication and relationships in the consideration of unforeseen risk, which have to be discussed between client and contractor if they occur outside the sphere of influence of the contractor. Heim (2015) recognized that interaction in the form of consultation for an occurring contingency led to satisfying solutions when there was proper communication.

Influence on BVP principles
Transparency facilitated BVP principle utilization of expertise in cases B, C, and D. A win-win situation can be created when the contractor shares problems and unforeseen circumstances can be solved effectively together.

Best practices
- Transparency served joint problem solving during project realization;
- Trust and soft-skills (daring to share, openness) contributed to transparency.
10.6 Expertise
The contractor of BV case C behaved themselves as experts. “Het werken vanuit BVP, wij pretenderen dat wij dat altijd al een beetje doen” (CO #C, 2017). Unburdening the client is high in their priorities and that is how they want to realize their projects (CO #C, 2017). CL #C (2017) confirms that there were very technically capable people with the contractor and that this project was in their field of expertise.

Cross-case analysis
The client of non-BV case D perceived the contractor as professionals. They took the client by hand and transparently and consistently showed them what they were doing and what they were going to do (CL #D, 2017). This happened in the scenario of choosing the colour of the cement, wherein the contractor on his own initiative invited someone from the monument commission to help decide the colour. CL #D (2017) felt trust when he saw that the contractor is an expert. It is easier to assume something when you demonstrated expertise (CL #D, 2017). Additional work that occurred was accepted and carried out without delay due to the trust that was gained. The client could see that they control their processes and describes the contractor as truly leading. They were consistent in their behaviour and also shared their challenges in which they sometimes asked for assistance from the client (CL #C, 2017). Trust appears important for the execution according to BV, because if trust is present, decisions can be taken swiftly without arguing over costs and responsibility. Trust is gained by knowing in this situation, because the client first saw the professionalism from the contractor’s side. (trust = knowing?). CM #C explains that the people have to be good. Team formation of the right people is very important (CM #C, 2017).

Influence on BVP principles
The presence of expertise facilitated BVP principle utilization of expertise in case C and D. If the contractor demonstrates expertise, the client has less need for control.

Best practices
- Experts facilitated the utilization of expertise, because the client knew they were capable of delivering.
- The client was able to stay in their role as facilitator.

10.7 Quality assurance
CO #C (2017) states that WR’s caused transparency about the state of the project (everyone was up to date about progress and occurring risks) and were delivered every week. The contractor also states that the client performed two audits on the quality system (as suggested in BVP). CM #C (2017) confirms that system tests were performed on the quality system of the contractor. The quality system was improved by the contractor after the notification of the auditor (CM #C, 2017). Furthermore he elaborates that the contractor added pictures to the quality system, which created sufficient proof of quality and performance information. CO #C (2017) states that stop moments were used by the client a couple of times. Design products were also discussed with the client during progress meetings, which took place every 4 – 6 weeks. Progress meetings occurred once a month in all four cases.

Cross-case analysis
The progress meetings did not have a negative effect on utilization of expertise in cases B, C and D. The contractor of BV Case C states that: “Overleg werkt sowieso nog heel goed, ondanks dat het niet helemaal BV gedacht is” (CO #C, 2017). CL #C (2017) thinks that the theory for quality assurance is simple, but that practice may be more complex and that it also depends on which party executes the
contract and if this is a contractor that is used to work with BVP contracts. The contractor of case C showed a lot of enthusiasm for the application of the WR’s: “Je was echt altijd bij. Je wist waar je stond, je wist wat de risico’s waren. Als er iets voordeed wist iedereen dat gelijk. Qua informatievoorziening is dat fantastisch” (CO #C, 2017). CM #D (2017) explains that if the contractor proofs the stated quality, he has less need for product tests. Nevertheless, the contract manager has to perform product tests sometimes since it is his job to guarantee quality towards the client (CM #D, 2017). The client of case D shares this perspective on proof and states that although it can be good to leave certain responsibilities with the contractor, it is always healthy to see how it is going sometimes. Especially with the kind of work that becomes invisible later on. As soon as the work is finished you cannot correct much. Just a check mark as verification is not enough when it concerns important work. More proof is needed (CL #D, 2017). Also because the work is often going underground and the nature of the work is such that you cannot easily go back. When reinforcement bars are not good, a client will not often ask to break up and start again. The client states that if you know something, then why would you not want to participate? You can show your face, but do not have to walk around all day (CL #D, 2017).

**Related literature**
Adding documented proof in the form of pictures or reports can demonstrate the compliance with the quality system. In this way behaviour can be monitored in terms of behaviour based monitoring in SCM literature.

**Influence on BVP principles**
In order to implement behaviour based monitoring, the contractor needs to deliver documented proof of the quality claimed in his quality system. Quality assurance methods applied in case C facilitated BVP principle utilization of expertise.

**Best practices**
- System, process and some product tests were used in case C and D to test the contractor’s quality control system without turning into MDC;
- WR’s kept the client and contractor of case C up to date about project progress and occurring risks;
- Stop moments were used as quality assurance while maintaining BVP roles in case C;
- Progress meetings with the client did not have a negative influence on BVP roles in case C.
After studying the practice of contract management, this section delivers solutions to the discovered challenges in contract management. These solutions are based on the findings from literature and practice and form the suggested contract management elements and the end result of this thesis.

This section first describes the conceptual model of proposed contract management elements. Then the answers to the research questions are outlined in the conclusions of this research. Finally, a reflection on the research is written for the understanding of this research in a bigger context.
11. Suggested contract management elements

This chapter presents solutions to the observed challenges in contract management. The solutions are based on the practice of contract management as examined in chapter 9 and 10 and are compared to and supported by literature. Opinions of the interviewees are also considered as supporting arguments for the suggested contract management elements.

Different aspects of contract management have been observed in the case studies and literature. Therefore, the contract management elements are categorized in four groups: quality assurance, conditions, behaviour, and mindset. Quality assurance contributes to the gap in methodology for quality assurance as described by Kashiwagi (2016b). This contains the instruments that can be used to assure quality from the client’s perspective in the execution phase of BVP/PIPS projects. In order for these tools to be applicable, certain conditions have to be in place. The elements under this category present the necessary conditions for the proposed method of quality assurance to be implemented. The conditions and tools can only be realized through certain behaviour. This behaviour is described under the next category. Behaviour comes forth from a certain way of thinking. Therefore, a certain mindset and understanding is needed for the necessary behaviour to express itself.

11.1 Mindset

The needed behaviour expresses itself through proper understanding of the chosen approach. A certain mindset is essential for the BVP/PIPS approach to be implemented successfully. Mindset forms the foundational layer of the contract management pyramid for BVP/PIPS projects and is built of three stones: win-win, hands-off and soft-skills.

Win-win

The approach that is needed in BVP/PIPS projects is one wherein all parties benefit. The inclination to opportunism will be lower and behaviour will be more predictable and cooperative when the alignment of goals between contractor and client is clearer (Duren & Dorée, 2008). The BVP/PIPS approach of risk allocation therefore supports the property rights theory, which underpins the importance of goal alignment for corporatism and states that conscious risk transfer can facilitate goal-alignment. A win-win situation is created in the procurement phase by selecting on quality instead of lowest price. This allows contractors to demonstrate and apply their expertise instead of needing to turn down quality for costs to win the tender. The win-win approach should be maintained during the execution phase. If the client carries the risks outside the sphere of influence of the contractor as suggested in BVP/PIPS, the contractor does not hold financial responsibility and can therefore be transparent and do what is best for the project when a risk occurs. For this the client has to realistically look at and accept risks. In this way time-consuming discussions can be avoided and the contractor can support the goals of the client. If a risk occurs, client and contractor should communicate and find a solution to the problem that is agreeable for both parties. In finding a solution, both parties need to focus on what is best for the
project in order to find a satisfying solution. Good communication and an agreeable solution will align goals easier and unnecessary transaction costs due to discussions can be avoided. An example scenario is observed in case B, wherein the client stepped away from unachievable technical requirements to functional requirements, allowing the project to continue without discussions about money. In order to realize this situation, the client needs to look at risks realistically and accept the risks that occur outside the sphere of influence of the contractor. The contractor should use his expertise to identify and mitigate risks outside his sphere of influence. It is therefore necessary that scopes are clearly defined and taken responsibility for.

**Element**

- Creating and maintaining a win-win situation through understanding, willingness and good communication facilitates the utilization of expertise and should be maintained throughout the project.

**Desire for hands-off approach - client**

The client needs to understand and desire the hands-off approach. The strength of BVP/PIPS is that it utilizes expertise and refrains from MDC. The BVP/PIPS approach is not designed for a partnership model. If the client desires, or is needed to actively contribute to the project, the chosen approach must be honestly reviewed with this in mind. It is likely that the client has his set of activities that he is responsible for in order to contribute to the deliverable (see figure 10). These activities ought to be clearly defined in order to have a clear scope for client and contractor. Working together and sharing responsibility or accountability leads to questions and decisions when risks occur (Kashiwagi, 2016b), which was also observed cases A, B and D. Responsibility for an activity assigned to one party reduced questions and decisions in the other cases.

**Element**

- Desire for a hands-off approach facilitates the utilization of expertise.

**Soft-skills**

Transparency can be supported by soft-skills, good relationships and trust. Property rights theory claims that trust reduces the inclination to opportunism. Duren and Dorée (2008) state that trust between client and contractor should be encouraged, due to the high efficiency of economic relations based on trust, which is characterized by less inclination to opportunism and less need for inspection and control. The importance of good relationships is emphasized by the findings in the literature study and case studies.

For both parties to collaborate effectively and be transparent in the relationship, soft-skills such as communication, openness and daring to share are important. The contractor needs to dare to share when he does not know something. Sharing what you do not know should be seen as a capability instead of incapability. The client can facilitate transparency of the contractor by keeping an open attitude towards his concerns. As observed in cases B and C, this facilitates the relationship between both parties, which leads to good collaboration, transparency and the identification of solutions that create a win-win scenario. In case A, issues were resolved as a result of good communication, which was described by a personal connection and mutual trust. The importance of good communication is underpinned in case B, wherein the contractor claims that: “Uiteindelijk hebben we wel een goed overleg kunnen
doorspreken en het gewoon goed gekomen” (CO #B, 2017). Heim (2015) also observed that interaction in the form of consultation for an occurring contingency led to satisfying solutions when there was proper communication. Samson (2015) also observed the importance of soft-skills such as communication and relationships in the consideration of unforeseen risk, which have to be discussed between client and contractor if they occur outside the sphere of influence of the contractor. Communication can be improved by regular contact between parties, as suggested by CO #B (2017). He claims that communication became better after getting to know each other. CL #D (2017) offers the option of team-building sessions between client and contractor teams so that both parties get to know each other in an informal setting. In line with the dominant information oriented nature of BVP/PIPS, trust should not be a replacement of knowing. Rather trust should lead to more transparency because the effectiveness of communication increases.

Element
- Soft-skills contribute to the maintenance of good communication and joint problem solving.

11.2 Behaviour
For the conditions and tools to be implemented and the conditions to be set, certain behaviour is required. The client has to stay in his role as facilitator in order to utilize expertise. The contractor has to take the lead and take the client by the hand. The contractor does this by creating transparency and controlling his own quality.

Facilitate – client
The client his role in BVP/PIPS projects is to facilitate the expert contractor (Rijt & Santema, 2013). The client needs to maintain this behaviour throughout the project and not return to traditional behaviour, which is an observed challenge in BVP projects (Case A; Heim, 2015) In the clarification phase, facilitating means that the client should not manage, direct and control the contractor (Kashiwagi, 2016b). In the execution phase, the client utilizes expertise by refraining from managing, directing and controlling the expert contractor.

Element
- A client who stays in his role as facilitator can utilize expertise.

Lead – contractor
The implementation of the BV approach requires experts to lead, control their processes and be an expert in their field. This requires them to be transparent and control their own quality.

Transparency
The contractor should take the client by the hand and transparently and consistently show the client what they are going to do and, depending on the project and client, how they are going to do it, as was observed in case B, C, and D. The client in case D felt trust when he saw the contractor behaving like an expert and states that it is easier to assume something when the contractor demonstrates expertise. As observed in Case A, if the contractor does not lead and take the client by the hand, it is not possible for the client to rely on the contractor’s expertise and act solely as facilitator. The client has to know about the status of the project and the occurrence of risk. If the client is aware of the status of the project, sees that the contractor foresees risks and knows how the contractor will mitigate these risks, the client can stay in his role as facilitator. Therefore communication has to stay open and transparent. The contractor should start taking the lead in the clarification phase, wherein
he demonstrates to the client what he will do to achieve the desired result. In the execution phase, the contractor foresees and mitigates risks and informs the client about the project status and decisions. The contractor as expert creates transparency. Transparency is not only facilitated by WR’s, but also entails that the contractor calls the client when a risk occurs. When the contractor does not know how to deal with a complex situation in his sphere of influence, it can be helpful to discuss a solution together. Therefore, the contractor can also share their challenges and ask for assistance from the client. If he does this, problems can be solved together, in which case the assignment of responsibility for decisions should be clear.

Quality control
In BVP and UAV-IC contracts, contractors are responsible for compliance with the requirements in the contract. SOCM is based on the assumption that with a well-functioning quality system the contractor will deliver a good product and obliges the contractor to control, manage and validate their processes by means of a quality scheme. In order for the client to be able to apply quality assurance and not check the work of the contractor, the contractor needs to have a well-functioning quality control system. Rijkswaterstaat (2011) describes that contractors should be able to demonstrate the achievements of the quality requirements during and after the realization of a project. The most important element of quality management of the contractor is that he himself describes his processes, controls risks, identifies deviations, takes suitable (corrective and or preventive) measures and regularly evaluates this process (Rijkswaterstaat, 2011). This notion is also applicable in BVP/PIPS projects.

In practice, contractors are still developing this new approach, wherein they carry responsibility for their own quality and its documentation. Because of this, some contractors lack the needed quality control system. Contractors need to learn how to implement such a system throughout their organization. This requires a different approach, as the contractor’s personnel is currently not used to document the needed information for the quality control system.

Verification
Contractors can demonstrate their quality with verification plans and checklists that contain documented proof (in the form of pictures and test reports). Proof enables the client to refrain from testing products.

WR
Characteristic to BVP/PIPS, the WR can facilitate the client in his hands-off approach. Contractors might have to learn to implement the WR, but when integrated, it can be a great tool enabling transparency and awareness about the project’s status.
Element
- Transparency facilitates the client to stay in his role and is created by the contractor who openly discusses about unforeseen circumstances.
- Unforeseen circumstances can be handled together.
- A functioning quality control system (including the WR) is necessary for the client to maintain a hands-off approach and perform quality assurance.

11.3 Conditions
Quality assurance can only be implemented as suggested when the conditions are favourable. The client has to prepare the tender, select an expert and walk through a good clarification phase with the contractor.

Preparation
During preparation the scope and requirements in the form of technical data has to be clearly determined.

Technical requirements
Data with which the project is procured has to be correct and not open for interpretation. Technical requirements can be requested while procuring the project. This can be necessary or useful in practice as the client often possesses experience and expertise in aspects of the project. In case C the BVP/PIPS principles were not hindered when the requirements were procured in the form of technical dimensions and the choice of materials and construction methods were left to the contractor. For a contractor a certain level of technical requirements does not have to be a problem. However, the less the client specifies, the more room for creativity, innovation and utilization of expertise he leaves to the market.

Scope
Because the deliverable is part of a bigger system, the scope of both parties has to be clearly defined in the clarification phase. The client describes the goal of the project (i.e.: the what; or the deliverable) and his contribution to this goal, while the contractor determines the ‘how’ (van de Rijt, et al., 2016). The scopes of both parties together form the deliverable (see figure 10). As demonstrated by figure 10, both client and contractor contribute to the deliverable. The client also contributes, because he has expertise over his own activities over which he has to take the lead (van de Rijt, et al., 2016).
The scope of both parties has to be clearly defined. In case A it was observed that shared responsibilities led to discussions about responsibilities, leading to delay and transaction costs. Therefore, according to figure 10 (van de Rijt, et al., 2016) responsibility for activities has to fall under the scope of one party and should not be shared.

Allowing the contractor to create his own idea for the project makes him responsible for the design and execution, which clearly defines the scope of both contractor and client. When risks occur in this situation, the responsibility can be clearly assigned without unnecessary transaction in form of discussion, without delay and keeping the relation between client and contractor intact.

**Element**
- Data submitted for procurement need to be clear and not open for interpretation in order to prevent later discussions.
- A clear scope prevents discussions about responsibilities for occurring risks.

**Selection**
During the selection phase, all efforts must be made to select the best possible expert. If an expert is not available, it is difficult for a client to control the project hands-off through quality assurance. The client has the possibility to adapt an approach different from BV in the execution phase or he might consider to procure the project under a different contract form (e.g.: building team or traditional). Important is that contractor selection is based on quality and not on minimum standards as discussed in chapter 4.

**Element**
- Finding a contractor who behaves like an expert is required for the client to stay in his role as facilitator and utilize the contractor’s expertise.
Good clarification phase
The clarification phase is required to develop trust in the client. Based on the observations in the case studies and research of Heim (2015), one can infer that if the client sees that the contractor knows how to deliver, he knows and therefore can trust the future actions of the contractor. For the client this is comfortable, because he has already walked through the project and discussed the risks together with the contractor. For the contractor this is positive, because he can realize his own project which he designed in the clarification phase.

Element
- A good clarification phase after which the client knows that the contractor can realize the project allows the client to stay in his role and utilize expertise.

11.4 Quality assurance - client
The definition that Kashiwagi (2016b) provides for quality assurance is the following: “the plan a client uses to ensure that the vendor has an effective quality control plan, risk management plan and weekly report (WR)” (Kashiwagi, 2016b). Quality assurance is also one way for the client to ensure that the contractor meets all the requirements of the contract (Kashiwagi, 2016b). Although the way that the client assures quality is not described in BVP/PIPS literature, Kashiwagi (2016b) does explain that quality assurance is the assurance that the vendor uses the WR to ensure the delivery of planned service with minimal deviations in time and costs. The principle behind this can be explained according to Kashiwagi (2016b) as, that when BVP/PIPS is set up properly, a high level of project management (that is continuously testing the experts and their work) is not necessary. Quality assurance’s purpose is to ensure that the BVP/PIPS structure is implemented. The client’s project manager and procurement personnel are to ensure that deviation is being documented. This is quality assurance according to BVP/PIPS (Kashiwagi, 2016b). This section proposes behaviour-based contract monitoring as a solution to the in chapter 6 described gap in BVP/PIPS literature concerning quality assurance.

Behaviour-Based monitoring
Behaviour based monitoring (Eisenhardt, 1989; Bergen et al., 1992; Selviaridis, 2015) provides the scientific input for a quality assurance system for BVP/PIPS projects, wherein goals are aligned in a win-win situation. Behaviour-based monitoring proposes that a client can refrain from outcome monitoring and focus on behaviour monitoring by focusing on processes and desired behaviour. SCM literature describes the usefulness of behaviour based monitoring in situations wherein goals are aligned and environmental uncertainty. Reduced motivational necessity for outcome-based
monitoring in case of goal alignment enables clients to focus on behaviour-based monitoring (Bergen, et al., 1992). This situation is relevant to the win-win situation in BVP/PIPS projects. High uncertainty and risk that can increase the client’s costs of transferring risk to the agent also form a situation wherein behaviour-based monitoring is more efficient in comparison to outcome-based monitoring, because the latter is shifts risk from the client to the contractor (Bergen, et al., 1992). This situation is relevant to BVP/PIPS proposal that the client is financially responsible for these risks if the contractor’s behaviour is that of foreseeing and mitigating them.

Behaviour-based monitoring suggests methods and procedures that the contractor should adopt (Selviaridis, 2015). Selviaridis (2015) explains that for the application of the right behavioural controls it is necessary that one has understanding of the means-end relationship. This means that, for behaviour-based monitoring, the client needs substantial knowledge of the definite transformation process.

**Behaviour-Based Contract Management**

In BVP/PIPS projects, the function of behaviour-based monitoring can be fulfilled with the system- and process tests of risk-based testing, i.e.: SOCM. As a contract management method developed by RWS, SOCM allows clients to take a step back from technical involvement in projects and to hand over more responsibility to the market. Comparable to BVP/PIPS, the main principle of SOCM is the transfer of responsibility of quality of the work from client to contractor (Verboom, 2007). The client gives the contractor freedom in project- and quality management. This means minimal interference of the client with the project- and quality management. Through SOCM, the client ensures quality delivery by testing the contractor’s quality system rather than their work, which fits the BVP/PIPS approach. Kashiwagi (2016b) mentions that in BVP/PIPS projects, the client only has to ensure that the contract terms are being met, instead of making decisions. SOCM can be implemented in line with BVP’s quality assurance by the client, which entails that the client ensures that the contractor is working with a functioning quality control system. SOCM does not only fit the BVP/PIPS approach in this aspect, it is also aligned with the legislation in UAV-IC and is the prominent method of contract management under UAV-IC contracts.

**Application**

The purpose and application of SOCM makes it fit with the quality assurance approach of BVP/PIPS. The implementation of behaviour-based monitoring can be done through risk based tests on behaviour provided by SOCM. Instead of outcome, these tests test the behaviour of the contractor and are therefore in line with the theory of behaviour-based monitoring. With that in mind the client can ensure quality delivery and compliance with contractual obligations by testing the contractor’s quality system rather than their work. This can be accomplished by two types of tests: **system- and process tests**. As a change to the standard SOCM as developed by RWS, the product tests are left out in this approach. This is possible when the quality system of the contractor contains proof of the claimed quality. The two tests can be considered as behaviour-based monitoring as described by Bergen et al. (1992). Bergen et al. (1992) state that this type of monitoring is efficient in case of more alignment of goals, because when goals are aligned, the contractor is more probable to behave in accordance with the client’s desires regardless of the incentives built in the contract. It is therefore fit for BVP/PIPS projects wherein a win-win situation is created.

In BVP projects, the tests can be done on two levels according to SOCM by Rijkswaterstaat (2011): system- and process tests, which will be described below:
**System test**
A system based test tests the in the contract demanded quality management systems of the contractor. The actions that the contractor undertakes to ensure that the project management plan functions efficiently and is applied. This includes internal (project) audits, the activities of a quality manager, and the control of the (project) management team.

**Process test**
A process test tests the functioning of processes that the contractor described in the project management plan and derived partial plans (project quality-, work-, examination-, test- or verification plans). In order to verify the reliability of the data of the contractor, the process test can examine if the products comply with the set requirements or technical specifications. This can be done if the contractor while verifying, proofs the quality of his work (through pictures or reports). The client can then verify the reliability of the contractor’s data by comparing the verification or examination details of the contractor with the added documented proof. In this scenario, the client does not take over the responsibility for product quality.

**Product test**
If the other elements are practices, the product tests can be left out. This in order to strengthen the other aspects of BVP/PIPS, because product tests take responsibility for quality away from the contractor. Then the contractor’s expertise is not utilized, because he will have less incentive to take the lead. Besides that, the product tests bring accountability to the client and involve transaction costs.

**Element**
- Quality assurance can be done through behaviour-based contract management.

**Element**
- (Progress) meetings

(Progress) meetings are an optional solution to quality assurance. The relationship and communication can also be improved by having regular contact in the form of progress meetings. Progress meetings can also improve trust, which reduces the inclination to opportunism, as the need for inspection and control. This makes for a better base for cooperation (Duren & Dorée, 2008). They have been applied at least once a month in the four cases. In BVP case C the progress meetings did not negatively affect the utilization of expertise. No negative effect of progress meetings have been observed in non-BVP cases B and D. The client of case A states that when you are together in a project, eye contact is important. CO #B (2017) claims that it improved communication and increased frequency led to better and quicker problem solving. Depending on the project circumstances, one can chose to have progress meetings. If the other quality assurance tools are successfully implemented, one can choose not to have progress meetings.

**Element**
- (Progress) meetings can improve, trust, communication and transparency and lead to better joint problem solving.

*“Ik zit ook in een samenwerking en daar gaat het ook om het persoonlijk contact. Dat lost het op, de gunfactor, hoe gaan ze het doen?”* 
(CL #A, 2017)
11.5 Integration and implementation

The suggested contract management elements fall under four different categories, which support each other. Quality assurance contains the actual implementation of contract management during the execution phase of BVP/PIPS projects. The other categories are needed to enable the client to implement the suggested form of quality assurance. Altogether these elements support the BVP/PIPS principle utilization of expertise.

![Diagram of contract management elements supporting utilization of expertise](image)

**Phase overview**

The application of the elements of the pyramid differs throughout the phases of a BVP/PIPS project. The first layer, mindset, should be reviewed from project initiation until delivery. The second layer, behaviour, comes into play during the clarification phase. The third layer forms the conditions for the suggested approach. These conditions are established in the front-end of the project, i.e.: before the execution phase. Figure 13 demonstrates the relevance of the elements per phase, of which a description is given next.

![Implementation per BVP/PIPS phase](image)
**Preparation phase**
In the first phase, the requirements are determined along with the scope according to the description in chapter 11. It is important that the mindset is honestly reviewed in this phase. If the client is not striving for a *win-win* situation, the contractor will have more incentive for opportunistic behaviour and the suggested approach loses its advantages. If the client does not desire a hands-off approach, the contractor’s expertise will not be utilized and his role as leading expert might not come to right. If the client does not possess the *soft-skills* required to build and maintain relations and open communication, *transparency* will be more difficult to create.

**Selection phase**
In the selection phase it is essential that an expert is selected. Without an expert who can control his own processes and create transparency, the suggested method of quality assurance will not work. In the case of no available expert, the client has to take a more hands-on approach for quality assurance in order to ensure quality. This can for instance be done with product tests. In the selection phase the elements of mindset have to be reviewed again.

**Clarification phase**
The clarification phase provides the client the ability of knowing what the contractor is capable of. As described in chapter 11, it is important to invest in the clarification phase by having enough meetings for the client to know what the contractor will do. If the client sees that the contractor can deliver, he can then trust in the contractor during the realization phase. For the contractor it is also good to walk through the projects and prepare the work, as it allows him to anticipate on risks and utilize chances. In this phase the elements under the second layer, behaviour, become relevant. During the clarification phase the contractor should start taking the lead by showing the client how he will complete the deliverable. The client has a facilitating role from now on, in which he works on his part of the deliverable and utilizes expertise by letting the contractor lead. The client can also ask for clarification about methods of the contractor if he has doubts. The scope should be reviewed again before awarding the contract by making sure that the scopes of both parties are clear, not shared and complete the deliverable (see chapter 11). A review on the aspects of mindset should be done continuously.

**Realization phase**
After awarding the project, the realization phase starts. If the right conditions are set in the front-end of the project, the client and contractor can now work according to BVP/PIPS principles. The suggested behaviour-based contract management model can be applied, while the contractor controls quality and the client monitors the contractor’s quality system. During execution, it is important to keep reviewing the status of the elements in the first and second layer of the pyramid and not return to traditional behaviour.

**Considerations**
If the state of one building block is lacking, the integrity of the chosen approach is questionable and the utilization of expertise may be lost. In case of absence of a building block, the chosen approach needs to be honestly reconsidered in order to decide if it is still effective. Considerations in respect to the lacking of building block are as follows:

- If the client does not strive for a *win-win* approach and aligned goals, the contractor’s incentive to opportunism increases and bounded rationality becomes an issue. Since Bergen et al. (1992) claim that behaviour-based monitoring is effective in situation of goal alignment, the effectiveness of the proposed method of behaviour-based monitoring will then be lost. If during the project, the *win-win* approach is lost due to unforeseen circumstances, discussions may take a long time to resolve, the client-contractor relationship may be
affected and a solution that is best for the project will be more difficult to come to (as observed in case A).
- If the client does not desire a hands-off approach, he will not be motivated to stay in his role as facilitator and takes part in the leading role of the expert. This hinders utilization of expertise and may even develop into MDC behaviour as observed in case A.
- As observed by Samson (2015), Heim (2015) and the case studies, soft-skills are important for good collaboration and joint problem solving. Lacking soft-skills in both parties can negatively influence transparency as this requires good communication from both parties. Bad communication can negatively influence cooperation, assignment of responsibility and problem solving.
- In case of lack of a leading expert as observed in case A, the client cannot maintain a hands-off approach.
- If the contractor does not have a functioning quality control system that documents proof of quality as observed in case A and partially in case C, the client cannot assure quality of the contractor through behaviour-based monitoring.
- If transparency is absent as observed in case A, the client does not know the actions of the contractor, which will lead to lack of trust. After which the client can feel the inclination towards MDC behaviour. Similar problems can arise due to an clarification phase that did not enable the client to maintain a hands-off approach as observed in case A.
- In case C, a clear scope definition enabled both client and contractor to take responsibility for risks occurring in their scope. When scopes are not clearly defined, discussion about the allocation of risks may arise.

Transition
The approach suggested in this conceptual model asks for a change of paradigm, which led to the development of innovative contracts and BVP/PIPS. For the benefits of this paradigm to manifest, the new paradigm has to be acknowledged. If this new paradigm is not yet accepted and understood, its principles will be difficult to implement. According to Vis (2017), the phase we are now in can be seen as a transition. Some time is needed for both client and contractors to adapt to the new approach. Contractors need to learn how to control and measure their own quality and clients have to desire and learn to maintain a hands-off approach. Some learning is involved with innovation (CM #C, 2017). In order to successfully implement these recommendations, a BVP/PIPS advisor or contract manager with BVP/PIPS knowledge is recommended. The advisor can consult the client from the start of the project about his procurement choices and identify any challenges that may occur because of them. During execution he can consult the client how to stay in his role, or change approach if the conditions do not allow the method to be implemented.
12. Conclusions

The previous chapter delivers the suggested contract management elements. The elements are based on explorative research and are presented as a conceptual model. This chapter will answer the main research question:

- What are elements of a contract management model that would support the BVP/PIPS principle utilization of expertise in the execution phase?

First, the main outline of the research is walked through by answering the research questions. Then the main research question is answered in section 12.2 wherein the suggested contract management elements are presented in the form of a conceptual model for contract management for BVP/PIPS project. Section 12.3 is used to reflect upon the research and its contribution to BVP/PIPS and the practice of contract management.

12.1 Answering the research questions

With the purpose of fulfilling the goal of this thesis, the research questions were formulated in chapter 2. The main research question was structurally divided into three research questions, which have been answered throughout the chapters 4 to 11. This section summarizes the findings related to those questions. Chapter 4 answers the first research question by examining the principles and challenges that BVP/PIPS proposes. The second research question is answered over chapter 4 until 10 wherein potential contract management elements are investigated and searched for in literature and practice. The third research question is answered by relating the potential contract management elements to findings in literature and challenges and best practices in practice throughout chapters 9, 10 and 11.

Research question one: what is utilization of expertise according to BVP/PIPS?
The answer to research question one is found by literature study in BVP/PIPS related literature. Utilization of expertise is minimizing risks and benefitting from opportunities.

Research question two: what are contract management elements?
Contract management elements are found through four methods: literature study, document study, interviews and case studies. Contract management elements from BVP/PIPS related literature were identified through examination of practical implementations of the methodology. The in BVP/PIPS related literature identified relevant potential contract management elements are:

- Goal alignment: facilitated by focus on quality, no minimum standards and risk allocation.
- Transparency: facilitated by WR’s.
- Quality assurance.

It was concluded that the method of quality assurance as proposed by BVP/PIPS is not yet specified. This research contributes to the further development of the implementation of quality assurance.

SCM literature was investigated in order to find potential contract management elements that are founded in literature in order to add to and scientifically support the elements in BVP/PIPS. The discovered elements in SCM literature are:

- Goal alignment: through conscious risk transfer;
- Monitoring: outcome- or behaviour-based;
- Trust.

Preliminary research in the form of interviews and document study led to another relevant contract management element that exists in practice:

- Risk-based testing: most commonly under the name of SOCM.
The confrontation of literature led to the observation that BVP/PIPS and SCM have similar solutions to different challenges. Where SCM focuses on working successfully in a win-lose environment, BVP/PIPS aims to create and assumes a win-win environment. Although researchers and contract management practitioners have been working on the unintended malicious side-effects of procurement for decades, problems still occur in the practice of contract management.

The confrontation of BVP/PIPS with SCM literature discusses the support of BVP/PIPS to SCM literature as a method to implement SCM theories in practice. However, did this not contribute to answering the research questions of this thesis.

Research question three: which elements can contribute to the utilization of expertise in the execution phase?
The observed challenges and best practices, confronted with the practical context of contract management and findings in literature, led to the formulation of contract management elements that can support the utilization of expertise in practice. These elements are supported by literature, preliminary research and the observations in the case studies. With this information, the main research question is answered in the next section.

12.2 Answering the main research question
The reason for the topic of this thesis is the practical problem that BVP/PIPS procured projects do not always lead to a BVP/PIPS executed project. BVP/PIPS gets applied as a procurement method without benefitting from its principles in the execution phase. There is a discrepancy between theory and practice; transaction costs arise due to unnecessary discussions and delay and MDC behaviour still occurs. The goal of this research is to make recommendations for a BVP/PIPS applicable contract management model for the implementation of the principle utilization of expertise in contract management during the execution phase. Contract management in the execution phase is characterized by its own specific practical context in which the conceptual model has to fit and be applicable. In order to fulfil this goal the main research question is formulated:

What are elements of a contract management model that would support the BVP/PIPS principle utilization of expertise in the execution phase?
Based on literature study and the challenges and best practices in practice, the identified conceptual contract management elements are presented as interrelated aspects according to figure 12, which is elaborated in the previous chapter. Their interrelatedness comes forth from the prescribed method of quality assurance’s dependence on how far conditions are met. These conditions can be created when the described desired behaviour is present. For the necessary behaviour to manifest, a certain mindset is required. Each layer of the utilization of expertise pyramid exists of building blocks. Before procurement, clients should examine the state of each building block of layer 1 and 2 in their organization in order to decide if procurement according to BVP/PIPS suits their preferences and desires. During and after procurement, clients should examine if the building blocks in level 3 and 4 are properly in place and if the building blocks of level 1 and 2 are in place at the contractor’s side. During execution, all elements from layer 1 to 4 have to keep being reviewed.

12.3 Reflection and validation
This part of the thesis is used to reflect on the executed research. Strengths and limitations in terms of validity and generalizability are discussed first. Then the research’s relevance and opportunities for further research are discussed.
Validity
Due to the time and resources available, some differences in the cases may affect validity. Within the boundaries set by the context of time and availability of projects, the most compatible cases were selected for this study. Aspects that are not optimal in terms of validity are considered next:

- The budget of the cases varied from 600.000 to 6.900.000 euro. This says something about the size and complexity of a project, which might influence the applicability of certain contract management elements. However, the variance in budget and project size also brings forth the opportunity to produce contract management elements that fit different projects.
- Although both water agencies, the clients of the UAC-IC projects are not the same water agencies. The influence on validity should be minimal as the agencies procurement- and market approach policy is governed and (co-)created by the Unie van Waterschappen (UvW). Both clients do this because they, as water agencies, want a uniform approach to the market.

Besides these discrepancies between the cases, the other variables in the cases were minimal. The interviewees from different roles gave insights in different sides of the story in relation to challenges and best practices, which provides clear view. The comparison with non-BVP/PIPS projects left the researcher’s scope open to unexpected elements without becoming narrow minded. This comparison also supported aspects of BVP/PIPS that were observed in other scenarios than a BVP/PIPS projects and underpins the necessary conditions for the elements to be applied. Semi-structured interviews were executed in order to remain open to unexpected elements. The research framework and interview protocol were followed. All interviews were recorded and processed in order to ensure no mistakes were made in interpretation. The observed challenges and best practices were observed in different cases in this research, comparable with other research and literature and shared with experts in workshops, which strengthens their external validity. One can say that this explorative qualitative research can be considered as a relevant contribution to the field of contract management and BVP/PIPS. The in-depth case studies, cross-case analysis and connection with literature increase the validity of the findings and with that strengthen the validity of the recommendations.

Generalizability
The extent to which the recommendations can be applied to other situations is influenced by the case study design. Case specific scenarios have been examined for each case, which does not provide an abstract level of observations. However, the cross-case analysis, feedback from experts, the links to similar findings in related research and correspondence with literature provides analytic generalizability for the observations. The application of the suggested contract management elements is based on these generalized observations and literature, which increases their generalizability. The feedback on recommendations from experts further increases the generalizability of the recommended contract management elements.

Discussion group
The research and proposed contract management elements were presented to a group of 17 experts in contract management. The discussion group did not provide a solid support for the suggested contract management elements. Especially the elimination of product tests was questioned, based on the claimed contractor’s ability to behave opportunistically and his ability to lie about quality with fake reports and proof in the quality system. A counter argument in the group was that lying about quality is not an action that brings positive results, as this would harm the contractor’s reputation and not enhance its expertise. It was said that with a win-win scenario, opportunism would not be a problem and that behaviour-based monitoring would be possible. The proposal of the importance of behavioural and mindset aspects of contract management was received with positive reactions and
its importance was emphasized. Although product tests were deemed necessary in the group, the frequency was allowed to go down after a good test. One could see this as trust developed by seeing results and knowing that the contractor can deliver, which can also result as an element of the suggested element of a good clarification phase. The explorative nature of this research only allowed the researcher to create a conceptual model of contract management in BVP/PIPS projects. This model and its application can be evaluated and validated.

Relevance
The promising method of BVP/PIPS is on a continuously developing course in the Netherlands. The first step in this research is the underpinning of BVP/PIPS principles with scientific literature, which provides additional theoretical relevance to the methodology. Besides that, the contribution of BVP/PIPS principles to theories in scientific literature is argued, which opens up direction for further research. Varying researchers see potential in the methodology and have in their way contributed to its further development. However, the method is still improving. The discrepancy between the ideal model and practice asks for further tuning of its application. BVP/PIPS proposes a paradigm change, which makes it sometimes challenging to implement and utilize its principles to their suggested potential. This research provides knowledge for the practical implementation of BVP/PIPS in the execution phase, allowing the principles to come to their right during the execution of construction projects. This is achieved by contributing to filling the practical and theoretical gap in BVP/PIPS literature concerning quality assurance. Since BVP/PIPS projects are currently being procured and executed, clients, contractors and contract managers can use the developed conceptual model to review their approach and see if it fits to their situation. In this way, the conceptual model can contribute to the practical application of BVP/PIPS and, with more research, develop into a proven methodology for the execution of BVP/PIPS projects.

Recommendations
This section presents recommendations for the roles of client, contractor and advising contract manager. The recommendations are based on the conceptual model for contract management as proposed in chapter 11 and describe the application of the model for each of the three roles in the supplies.

For clients
Based on the proposed conceptual model, clients are recommended to examine the goals of their project and if they can align their goals with the goals of the market. This allows clients to create the basis of a win-win situation, which will reduce the incentive for opportunistic behaviour by the contractor. Clients then should decide if they desire a hands-off approach for the specific project. If the client knows what he wants to realize, a hands-off approach and the choice for execution according to BVP/PIPS may not be desirable. It is advisable to work with personnel that possess good soft-skills in order to maintain open communication. This will facilitate collaboration and joint problem solving. If the BVP/PIPS approach is desired, clients need to find an expert in order to maintain a hands-off approach. Therefore it is recommended to invest in a good selection process and follow the BVP/PIPS method for selecting the expert contractor. Since the client cannot utilize expertise if there is no expert contractor available, the client cannot expect to apply the suggested conceptual model. It is then advised to consider a different approach and contract model. The scope and the requirements should be clearly defined in order to minimize discussions about responsibilities for unforeseen occurring risks. If the scope is clearly defined involved parties can be held accountable by a transparent way of working. In the clarification phase it is important for the client to know how the contractor will realize the project until such extent that the client can trust the contractor and feels comfortable to let the contractor take the lead. If the client does not
perceive the contractor as capable, he can reconsider the chosen approach. The downside of
the client adopting a more hands-on approach is that the contractor’s responsibility for quality control is
smaller and he will have less incentive to take a leading role. Maintaining a win-win situation lies at
the foundation for the suggested model. Therefore, during the execution phase, clients should
maintain awareness of the chosen win-win approach, which means that they should have a realistic
view on risks and accept risks in their sphere of influence. If the other elements are implemented by
both parties and the contractor has a functioning quality system that delivers proof, the client can
apply the suggested hands-off approach for quality assurance through system- and process tests.

The contractor
The contractor’s role in the model starts in the clarification phase. In this phase it is his opportunity
to take the lead and demonstrate the client what he is going to do to complete the requested
deliverable of the client. Contractors should define their scope in such a way that it is clear which
risks fall outside his sphere of influence. During the execution phase the contractor’s job is to
minimize the risks that he cannot control. He should create transparency about these risks and with
that hold the responsible party accountable for that risk. The contractor should therefore control the
information flows and be on schedule in order to identify risks that are created by the client. If the
contractor does this, he can hold the client accountable by creating transparency. In order for the
client to apply a hands-off approach, the client has to know about the status of the project. The
contractor should therefore create transparency by keeping the client up-to-date about the project
status. A tool for this is the Weekly Report. Another way the contractor can create transparency is by
letting the client know when the contractor runs into challenges and does not know how to proceed.
In order to improve the efficiency of joint problem solving it is necessary that contractor personnel
possess soft-skills as it supports communication. It is advised that contractors have a functioning
quality control system that measures their quality and performance. This allows them to
demonstrate their expertise and puts them in a position to remind the client of the chosen hands-off
approach. If contractors take control of their quality system and demonstrate and measure good
performance, they have information that allows them to profile themselves as experts in the market.

The contract manager
The contract manager in this description has an advising role and should support both client and
contractor in applying the proposed model for contract management in BVP/PIPS projects. In
preparation phase, the contract manager should help the client make a conscious choice about the
project approach by helping the client investigate his desire for a hands-off approach and the ability
and desire for a win-win situation. If the client wishes to apply BVP/PIPS for his project, the contract
manager should then guide and advise the client through the different following phases. The contract
manager can assist the client in formulating his scope and translating his desires into requirements to
be procured. He should recommend and support the client in applying the BVP/PIPS method of
selecting an expert. If there is no (or not full) expert available, the contract manager needs to keep
another approach for quality assurance in mind in order to fulfil his responsibilities to the client. The
contract manager should also help the client and contractor to fulfil their duties in the clarification
phase and stress the importance of a good investment in this phase, which prepares both parties for
a smoother execution phase as it provides knowledge about the contractor’s capabilities and trust
for the client and a well prepared contractor. During the execution phase the contract manager can
ensure quality for the client through the proposed quality assurance method based on system- and
process tests. Since clients and contractors are not yet used to the new approach, it is important for
the contract manager to maintain the win-win situation, transparency and the required behaviour by
reminding and educating the client and contractor about the benefits of their chosen approach and
guiding them through actions that are best for the project.
Limitations
Time and the explorative nature of this research did not allow the designed conceptual model to go be evaluated. This keeps the contract management model in a conceptual state. A potential opportunity to strengthen the interrelatedness and contribution of each element, the recommendations can be linked to scientific literature in other fields (for instance: social sciences and psychology). Another option is to implement, evaluate and further develop the conceptual model in practice.

Opportunities for further research
This research is of an explorative nature. The proposed contract management elements are not evaluated in practice and are therefore a conceptual model for contract management in BVP/PIPS projects. A definite model for contract management in BVP/PIPS projects therefore opens up opportunities for new research:

- The suggested method for contract management based on behaviour-based contracting can be further tested, evaluated and developed in practice.
- The emphasized importance of soft-skill, communications and relationships invites for a study on what these factors precisely contain, what their influences are and how they can be developed. A client, contractor and contract managers’ work can exist of relationship management and solving interpersonal issues. It appears important to have a certain type of people with certain skills involved in the realization of construction projects. Research into these aspects can improve the implementation of BVP/PIPS and construction projects in general.
- BVP/PIPS is currently not implemented in DBFM contracts. Can BVP/PIPS contribute to DBFM contracts and how?
- The contribution of relation based contracting to the selection procedure in BVP/PIPS can provide scientific support for the approach of BVP/PIPS and can potentially improve the BVP/PIPS procedure.
- The effect of a win-win situation on opportunism can be further demonstrated in order to further support the effectiveness of a win-win situation and how it is established.
- Research of the effect of risk allocation on goal alignment and the effect on opportunism can provide support for the application of BVP/PIPS. With that, clients might be more understanding and supportive of the win-win approach.
- The effect of BVP/PIPS (for instance: the room for creativity, innovation and creating your own project) on intrinsic motivational aspects can be studied and compared to scientific literature on the topic. This might support the application of BVP/PIPS principles in practice.
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**Preliminary interviews**


Appendix A
Definitions

Definitions
Some important terms used in this thesis are defined below.

BVP/PIPS
BVP/PIPS is a procurement-, risk management- and project management model that enables the utilization of expertise and minimizes MDC of the expert (Kashiwagi, 2016b). Duren & Dorée (2008) describe BVP/PIPS as: a predominantly information-based system which makes predictions about expected result based on performance (Duren & Dorée, 2008). The practical implementation of BVP/PIPS is made up of four phases: Preparation, Selection, Clarification, and Execution. The definition of BVP/PIPS in thesis is:

BVP/PIPS is a procurement- and project management method with the goal to minimize risk by means of the utilization of expertise and minimization of Management, Direct and Control.

Traditional behaviour
Van de Rijt and Santema (2013) characterize traditional behaviour by the following:
- Client is the expert and contractor adjusts to request;
- Management, Direction and Control;
- Applying minimum norms.
This behaviour is a by-product of a traditional contracting model (Appendix E). In this model, the client is at the top of the triangle and initiates the project by first commissioning a design from the architect and consultant engineer through a contract under The New Rules (DNR) 2011 (Chau-Duvis, et al., 2013c). After completion of the design, the client hires a contractor, who is given the design and realizes it.

This thesis applies the following definition of traditional behaviour:
Traditional behaviour is Management, Direct and Control instead of facilitating actions by the client towards the contractor and passive, non-leading attitude and behaviour by the contractor.

Risk allocation
Kashiwagi (2016b) states that an expert does not possess technical risks. Therefore, risk is defined by Kashiwagi (2016b) as “an unforeseen event or situation which the vendor does not control”. The author proposes that in BVP/PIPS all risk is the financial responsibility of the vendor, a 100% - 0% risk approach. Risks are therefore allocated with a ratio of 100% - 0% in BVP/PIPS projects. In practice, contractors can make technical mistakes which the author of this thesis names risk. This thesis’ definition for risk allocation takes into account that the expert contractor still has technical risks and defines risk allocation as:

Risk allocation concerns the assignment of responsibility for a risk, which happens before- and during execution phase.
Appendix B
Information Measurement Theory

Information Measurement Theory
IMT is a theoretical framework that relates to supply chain participants’ ability to make correct decisions by appropriately dealing with information. This ability is not just based on implicit expectation and tacit experience, but rather on demonstrable past performance information (Duren & Dorée, 2008). The exchanged information that is dealt with to lead to correct decisions should be dominant and simple so that participants in the supply chain can perceive the situation for what it is. Kashiwagi (2016a) describes participants in the supply chain as experts and non-experts and stresses the need to interact through dominant information, which the non-experts can understand. He states that most people in the supply chain are non-experts who are ‘blind’, meaning that they are not capable of processing/perceiving available information, and therefore do not possess the knowledge or information to foresee the future. When one is ‘blind’, the need for decision-making arises, for decisions arise out of confusion, and only need to be made when one cannot foresee the outcome of a situation. It is therefore man who makes the difference (Rijt & Santema, 2013) and an expert, who, through past performance, has proper understanding about conditions and the outcome of a certain action, can add value to the supply chain, because he will know the only right course of action. This standpoint is based on IMT’s assumption that chance does not exist, everything is at equilibrium, happens by natural law, and that an event has only one outcome, which is defined by its initial conditions. This leads to the suggestion that hired experts should demonstrate how they envision the project from beginning to end. Kashiwagi (2016a) defines IMT as: “A deductive, logical, and dominant observation/explanation of an event. It includes the use of relative and related data to predict the future outcome of an event.” IMT optimizes the supply chain by implementing a structure based on transparent interaction through metrics based on dominant information, which helps ‘blind’ people see without changing them and creates transparency (Kashiwagi, 2016a). Transparency and simplicity are keys to this structure. The next sections describe how this is realized.

Transparency leading to Accountability
Experts create transparency and simplicity, which is the foundation of BVP/PIPS (Kashiwagi, 2016b). Kashiwagi (2016b) states that experts who use non-technical, dominant information in the form of metrics can increase transparency to make non-expert stakeholders comprehend and minimize risk. Metrics enable immediate understanding by all stakeholders and do not leave room for interpretation (Kashiwagi, 2016b). The author explains that the effect of transparency is based on the assumption that everyone wants to do a good job and defines transparency in a BVP/PIPS project as: “when an expert creates a simple explanation of the project that all stakeholders can understand, and which increases the motivation of all stakeholders to act in the best interest of delivering the project on time and on budget” (Kashiwagi, 2016b). Experts can, through transparent dominant information, make people understand the current and future situation. Transparency creates knowledge of actions and non-actions by all stakeholders, which increases accountability and makes people responsible for their input in the project. Transactions that do not add value are exposed. Transparency is the risk management mechanism for an expert and replaces MDC (Kashiwagi, 2016b). Based on the assumption that an expert vendor has no technical risk, Kashiwagi (2016b) proposes that the risk allocation is 100% - 0%. If a risk occurs outside the contractor’s sphere of influence, the client is financially responsible. Risk is not moved from the client to the contractor. Instead, the expert contractor creates transparency through metrics in order to minimize the risk.
that he does not control. Measurement creates transparency and makes the expert and others accountable. Kashiwagi (2016b) illustrates that the expert that is asked to do something differently, is able and will hold the asking party accountable for the results, because he is not responsible for another’s actions. Transparency identifies the weak link in the supply chain and should be applied as soon as possible and practiced through continuous simple documentation (Kashiwagi, 2016b). Transparency is enhanced by simplicity. Kashiwagi (2016b) advocates simplicity as a partner of transparency as it makes clients and contractors comprehend what is happening in the environment on an easily understandable level, without many details.

**Trust versus knowing**

Kashiwagi (2016a) defines trust as: “an expectation of another entity with no dominant information and metrics to support it”. The author continues to explain that trust is only necessary in a non-transparent environment and that it increases risk, decision making and reliance upon relationships. Dominant measurements reduce the need for trust to a minimum (Kashiwagi, 2016a). An expert does not need to be trusted, because he can demonstrate his past-performance on similar previous projects with dominant information (Rijt & Santema, 2013). Dominant information and consensus make events directly observable, which minimizes the need for trust. Therefore, BVP/PIPS is not a trust based system, but one that provides transparency through metrics, which help the client to comprehend the project in simple, non-technical terms (Kashiwagi, 2016a).

**Summary of IMT principles**

The implementation of the concept of **IMT**:

1. Exchange of information is dominant and simple, i.e. through metrics.
2. Experts who use metrics can increase transparency and enable immediate understanding and do not leave room for interpretation.
3. Risk allocation is with the party who is best capable of mitigating that risk.

**Resulting principle supported by this outcome:**

1. Minimal decision making.
2. Transparency creates accountability, because it creates knowledge of all the actions and non-actions by all stakeholders.
3. Transparency is the risk management mechanism for an expert and replaces MDC.
4. Knowing instead of trust.
5. Risk allocation with transparency creates accountability.
Appendix C
Phases BVP/PIPS

Phases BVP/PIPS
Duren & Dorée (2008) describe BVP/PIPS as: *PiPS can be described as a predominantly information-based system which makes predictions about expected result based on performance* (Duren & Dorée, 2008). As demonstrated in figure 15, the practical implementation of BVP/PIPS is made up of four phases: Preparation, Selection, Clarification, and Execution. Samson (2015) summarized and described the procedure in detail, based on the Dutch perception of BVP/PIPS as outlined in ‘Prestatieinkoop: met Best Value naar succesvolle projecten’ (Rijt & Santema, 2013).

![Figure 14: Four phases BVP/PIPS (source: Kashiwagi (2016b))](image)

*Preparation:*
The client initiates the preparation phase, wherein he should choose a sponsor within the organization. The sponsor’s purpose is to enhance the performance measurements, efficiency, and accountability inside the organization through the methodology of BVP/PIPS (Samson, 2015). The appearance that BVP/PIPS seems to be opposed to human nature, makes the sponsor imperative for achieving these goals (Rijt & Santema, 2013). The Preparation phase is also called the ‘Pre-Qualification’- or ‘Education’ phase, because education and training around three topics takes place during this phase: 1) the best value approach and the BVP/PIPS process, 2) performance metrics and 3) the use of performance metrics to increase competitiveness, value and transparency. The client defines the project and devises a Request for Proposal (RFP). The project is defined in terms of functional scope, which challenges contractors to bear apt and “fit for purpose” solutions (Duren & Dorée, 2008). Therefore, the RFP entails the “what” and leaves the contractor (expert) responsible for the “how” (Samson, 2015). The RFP should not contain minimum norms in order to utilize expertise and decrease the risk of allowing non-performing contractors. Clients provide contractors with knowledge about the maximal budget available for the requested functionalities. The client hereby challenges the contractor to bid maximum value for money and reduce risk for the client. In a BVP/PIPS tender, contractors are challenged to present intelligent and innovative solutions for the realization of the requirements, which spurs contractors to produce solutions that can compete in terms of both quality and costs (Duren & Dorée, 2008). The proposal offered by contractors should contain: performance information, a risk- and opportunities dossier, price, and their key participants.
Selection:
BVP/PIPS generates a system to classify contractors and to select the leading performer based on past performance, present capability, price, risk management and quality of key personnel (Duren & Dorée, 2008). The client gathers and applies dominant information about a contractor’s past performance (Duren & Dorée, 2008) in the form of written documents, a risk dossier, and an opportunity dossier (Samson, 2015) in order to determine the contractors’ capability of achieving the client’s project goals. The risk dossier includes the possible beforehand identified risks and their corresponding mitigation measures. The risk dossier’s goal is to minimize risks through transparency and accountability and not to transfer risks or maximize scope (Samson, 2015). The opportunity dossier includes information concerning potential extra’s that could add value to the project objectives. The client’s assessment team appraises the written documents based on the proposal’s quality, because the price will be known after prioritization. Contractors that have met the knock out criteria will be invited to the interviews, which are the most crucial step during the clarification phase (Samson, 2015). To end this phase, the prioritizing of the selection takes place, wherein the classification of written documents, interviews, and price leads to the expert (Samson, 2015).

Clarification:
The clarification phase is the first phase wherein the project’s technical content is considered. In this phase only the contractor, who achieved the highest rank during the selection phase, continues to clarify and substantiate the proposal with more details for the alignment of both parties in order to form a supply chain (Rijt & Santema, 2013). Opposed to traditional procurement, this structure reduces the cost of tendering for the other offering parties. The contractor indicates KPI’s, identifies risks, clarifies assumptions, delivers a WR format, and plans the project beginning to end. After several meetings attended by all the key participants, wherein the contractor takes the lead and the client can challenge the content of the project plan, the client buys the project plan from the contractor (Samson, 2015). The WR creates transparency throughout the project by means of identification of risk and minimization of risk at the lowest cost (Kashiwagi, 2016b).

Execution:
During execution, the contractor is allowed to manage his performance, based on minimized risks (Duren & Dorée, 2008). In the case that the contractor works according to its risk dossier, mitigates foreseen risks, and a new risk occurs, then the client is financially subject to carry the risk (Samson, 2015). The contractor’s performance is monitored from a distance, by means of WR’s (Duren & Dorée, 2008). The WR serves as the mechanism for the detection and minimization of project deviations. Performance comes with simplicity and transparency (Kashiwagi, 2016b). The purpose of the WR is for the expert to create transparency concerning project deviations with dominant information (Samson, 2015), which the expert measures himself (Kashiwagi, 2016b). This will result in the minimization of activity, management, control, directives, and decision making by the client’s personnel (Kashiwagi, 2016b). After project realization, the client awards the contractor with a post-construction rating, which influences opportunities in forthcoming tenders (Duren & Dorée, 2008).
Appendix D
Supply Chain Management

Development in contract management
The problems in contract management are not new. Fields of literature like supply chain management and Performance based contracting have studied the occurring challenges and have come up with their own solutions. BVP appears to be another solution to similar challenges. This chapter reviews the challenges and their proposed solutions that are defined by scientific literature. This in order to find contract management elements that might support the BVP principles. It does so by first digging into the history of research on problems in SCM, because solutions might be found there. The search through SCM literature leads to different theories addressing similar challenges. Their solutions are analysed and confronted with BVP/PIPS theory in the next chapter in order to assess their applicability for BVP/PIPS projects. Although BVP/PIPS did not directly spring SCM and PBC literature, the view on supply chain optimization and contract management in SCM and PBC has parallels with BVP/PIPS principles and its aim to optimize supply chains. New Institutional Economics (NIE) discusses and is based on similar theories as are covered in SCM and Performance Based Contracting (PBC) literature. Because the theories discussed in SCM, PBC and NIE are linked with optimizing supply chains and contract management, the insights of these theories can directly benefit the implementation of BVP/PIPS in the execution phase. For that reason, these theories are analysed by searching for their challenges and suggested solutions, which will lead the researcher to elements for a contract management model and theoretical principles that potential elements can be validated with.

Supply Chain Management
In order to understand the theories in PBC and find potential contract management elements, its origin and development will be summarized first. This starts in the field of SCM. SCM theory grew along with practical developments in different industries. The theory describes the increasing focus on services and how to steer manufacturers to deliver the desired performance. In order to support these goals, SCM literature describes multiple theories, such as the agency theory, which is well established in SCM (Selviaridis, 2015), and discusses several contract schemes such as PBC. Understanding these developments in literature gives the researcher a view of how experts in the field thought and think about optimizing supply chains and provide a theoretical foundation on which to build a solution to the research problem. The next subsection describes the traditional view on supply chains, how it evolved over time and gave rise to PBC.

Origin and Development of Supply Chain Management
SCM research originated from the classical inventory theory, which Clark and Scarf (1960) developed into the ‘multi-echelon inventory theory’ when applied in multi-echelon organizations like the military in order to not only count local stock, but also stock downstream the system and logistically manage the material flows of goods, services and funds. Business specialists wanted to implement these theories in institutions. Therefore they added the context of situations wherein multiple decision makers who are linked within or across firms participate. Tsay et al. (1999) defines a supply chain as: two or more parties linked together by flows of goods, information, and funds. Two parties
can be seen as two consecutive nodes in a supply chain. One of these parties is an upstream party, which is usually referred to as the manufacturer. He provides a product to a downstream party, which is commonly referred to as the retailer and serves the market demand. SCM investigates how to optimize these situations (Tsay, et al., 1999). The theories discussed in SCM are relevant to this research and its problem statement concerning the utilization of expertise in the execution phase, as it includes the previously described contexts and situations in SCM. The optimization of supply chains is a focal point to BVP/PIPS as it supports the purpose of BVP/PIPS, which is to increase value for money. In order to utilize SCM theory further, the following sections will describe the developments in SCM.

**Classic transaction based approach to supply chains**

Porter (1980) designed the Value Chain Model, which relates to the classic, transaction based approach to supply chains, and describes an organization as consisting of primary (operational) functions such as incoming logistics, production and sales, and secondary (over head) functions such as procurement, ICT and R&D. In the traditional, transaction based approach to supply chains; contracts are written to define the negotiated relations in a supply chain. Transactions are the underlying line of thought, with Transaction Cost Economics (TCE) as its theoretical framework (Santema, 2011). TCE focuses on keeping transaction and production costs as low as possible provided a required quality level (Duren & Dorée, 2008). BVP/PIPS also aims at keeping transaction costs as low as possible by utilizing expertise. This should reduce the need for unnecessary transactions. TCE will be considered to deliver potential contract management elements and might be used to underpin the value of BVP/PIPS contract management elements.

Van Ark et al. (2008) and Giannakis (2011) describe the importance of process excellence and performance of manufacturing. However, the authors also state that despite the growing importance of services in world economies, services are lagging behind in those aspects. This realization initiated a shift in SCM.

**Evolving to a service based approach to supply chains**

Vargo and Lusch (2004, 2008) observed the continuing transition from goods oriented- to a service oriented approach in business and research. The manufacturing dominant orientation in SCM did not completely relate to service industries (Kathawala & Abdou, 2003). This led to the conceptualization of Service Supply Chains (SSC) (Sampson & Spring, 2012b). These conceptualizations emphasize the interconnected relations between customers, service providers and their sub-contractors (Maull, et al., 2012; Giannakis, 2011). SSC regularly encompass bi-directional input flows since customers provide service production inputs as well (Lillrank et al., 2001; Sampson & Froele, 2006). Customers can assume diverse roles as service co-producers, for instance: customers supply process components and labour, aid design and deliver services, and monitor service quality (Sampson & Spring, 2012a). Elramm et al., (2004) state the necessity to distinctly formulate and manage the inputs that customers, service providers, and subcontractors add in order to attain performance. Contracting serves as a mechanism to coordinate those inputs through incentive alignment and risk sharing across multiple parties (Cohen & Kunreuther, 2007). In detail, the way supply chain participants are influenced to deliver is achieved through performance specification and measurement, incentives, and revenue models (Lillrank & Sa´rkka´, 2011). Contract type and associated incentives steer participants’ behaviour when it comes to meeting their responsibilities and delivering requested performance (Ren & Zhou, 2008). Roels et al. (2010) states that particular contract types such as fixed price, cost-plus, and PBC can be applied for effective supply chain coordination. PBC demonstrated particular usefulness for aligning incentives and distributing risks across the service supply chain (e.g. Datta & Roy, 2013; Randall, et al., 2010; Kim, et al., 2007).

**Challenges SSC:**

1. Influence supply chain participants to deliver.
Solutions SSC:

1. Contract design (aligns incentives and allocates risks).

The above mentioned solutions for SSC problems are based on underlying theories which are implemented in PBC. In order to examine the usefulness of those solutions one has to understand the conditions under which these solutions work and how they should be implemented. Therefore, the next sections will dive deeper into the application PBC and the underlying theories that support the methods.

BVP/PIPS also considers the situation that accompanies the interconnected relations between customers, service providers and their sub-contractors as described by Maull, et al., (2012) and Giannakis (2011). BVP/PIPS also acknowledges the by Elramm et al., (2004) stated necessity to distinctly formulate and manage the inputs that customers, service providers, and subcontractors add in order to attain performance. As described in the previous chapter, BVP/PIPS uses other principles and methods to steer supply chain participants behaviour. However, given the similar challenges that occur in BVP and SSC, and because Roels et al. (2010) claim PBC can be used to effectively coordinate supply chains, it is useful to further investigate the literature about PBC and its underlying theories in order to find contract management elements that serve the utilization of expertise.

Performance Based Contracting

This paragraph describes the theoretical background and application of PBC according to literature. This will provide potential solutions in the form of contract management elements that support contract management with the utilization of expertise. Firstly, elements will be considered by analyzing PBC’s origin, basic concepts and application. Then, the underlying theories will be analyzed in search for contract management elements.

PBC concepts and application

The elementary application of performance contracts can be found in the 1960s with the appearance of total-package defense contracts (Marcus, 1964), wherein the contractor takes responsibility for completely supporting the defense equipment by services founded on a single fixed-price contract (Anderson, 1969). Especially the last decades have been subject to the continuous transitions from a goods orientation to a service orientation in business and literature (Vargo & Lusch, 2004, 2008). Lay et al. (2009) define the concept of PBC as changes in ownership, maintenance responsibility, and payment. Selviaridis (2014) summarized how payment mechanisms can be used to maximize PBC benefits by explaining that performance contracts enable clients to pay exclusively when a contractor has delivered outcomes, instead of simply activities and tasks (Ng & Yip, 2009). These outcomes are specified service performances, which are linked to payment, which in turn transfers risk to the contractor (Kim, et al., 2007; Doerr, et al., 2005) (PBC’s are outcome based contracts). Altamirano (2010) describes that in contractual terms this approach translates into a tendency to transfer more risks to private contractors and a new focus on how different project risks are divided among parties based on their competences. Risks are to be assigned to the party most capable of carrying it (Altamirano, 2010). Contractor effort can be incentivized by linking financial penalties and/or bonuses to the specified service performance measures (Hooper, 2008). The application of such performance-based incentive systems assumes elaborate methods in order to measure and report service performance indicators (Datta & Roy, 2011). Selviaridis (2014) summarizes that the development of performance-based payment systems determines the effectiveness of incentive alignment (Kim, et al., 2007) by deciding the mix and intensity of bonuses and penalties and how these are tied to minimum and maximum performance standards (Sols, et al., 2007).
Summary PBC
The main focus in PBC and SCM lies on influencing supply chain participants effort. This is done through contract design wherein incentives are aligned with desired behaviour, and the allocation of risks. The next section will further examine the theories behind these approaches in order to find potential contract management elements.

Challenge PBC:
1. Influence contractor effort.

Solution PBC:
1. Contract design (aligns incentives and allocates risks).
Appendix E
Building contract models

Contractual context
The execution phase of construction projects is partially characterized by the contract that shapes the legislative boundaries of contract management. This section examines the practical contractual boundaries that influence the application of contract management elements. First, different models are analysed according to literature in order to determine which contractual/legislative context (that a contract management model should comply with) is relevant for BVP/PIPS projects. This is an essential step, because certain contract management methods accompanying certain contract forms may have a constraining influence on the extent to which Best Value principles can be applied in practice (e.g. direction and supervision, which is legally done under §3 (1) of the UAC 2012 through the installation of a clerk of works (also called the client’s agent)). The contracts models that fit the BVP/PIPS procedure are analysed for boundaries through literature and conversations with experts. Second, the boundaries placed by the UAV-IC are described.

Building contract models
There are different building models of contract which can shape the context of contract management:

- The traditional model;
- The design team model;
- The alliance model;
- The public-private partnership;
- The integrated model.

The integrated model is the only model fit for BVP/PIPS projects. The essence of these models and their relevance to BVP/PIPS projects are briefly discussed below.

Traditional model
The traditional model, governed by the UAC 2012 (1989), is characterized by the classic triangle (Chau-Duivis, et al., 2013a) (see fig 16). The client is at the top of the triangle and he initiates the project by first commissioning a design from the architect and consultant engineer through a contract under The New Rules (DNR) 2011 (Chau-Duivis, et al., 2013c). After completion of the design, the client hires a contractor, who is given the design and realizes it. The client carries responsibility for the design. Flaws in the design that delay the contract are compensated by the client (Chau-Duivis, et al., 2013a).
Traditional model: not fit for BVP

The traditional model is not fit for BVP/PIPS projects, because it is not tendered and contractually structured according to BVP/PIPS procedure. The traditional model allows more possibilities for opportunistic behaviour and does not allow the principle of utilization of expertise of BVP/PIPS to be implemented, because the high level of specification in the tender phase does not allow the contractor to demonstrate and apply his expertise. The method of supervision that the traditional model describes according to UAC 2012 does not support the principles of BVP/PIPS. Instead, this approach corresponds with the by Kashiwagi (2016b) described phenomenon of MDC.

Design team model

Van den Berg & Assers (2007) define a design team as “a temporary partnership on an equal footing between representatives of the roles in the building process of initiation, design and execution, where the participants in a coordinated manner perform the tasks arising from their particular roles and on top of this, where possible, assist their fellow participants to perform their tasks by giving advice”. Chau-Duivis et al. (2013b) describe the characteristic of the design team model as that the contractor is involved in the design, which brings the advantage of him contributing his knowledge of execution in an early stage, which can be considered in the design. Although the contractor participates in the design stage with the possibility of being awarded the contract for the works, whether he will get it is dependent of the price he asks. The design team completes the design stage; the construction phase is considered separate from the design stage and is governed by its own conditions. It may be a different contractor who carries out the works. Chau-Duivis et al. (2013b) explain that it is possible for the client to participate in the design stage. However, in the construction phase he is the traditional client with all the liabilities that this includes.

Design team model: not fit for BVP

The fact that the contractor is involved early in the design in order to utilize his expertise enables the BVP/PIPS model of procurement to be compared to the design team model. However, the design team model is not fit for BVP/PIPS projects, because there is a separation between design and execution. This means that the contract ends after the design phase and that the contractor who designs is not sure if he will execute the project. This does not fit the BVP/PIPS procedure wherein
the contractor designs and the key participants are interviewed as one of the criteria during the selection phase. Also, the role of the client in the design team is one of leadership (Chau-Duivis, et al., 2013b), which does not comply with the BVP/PIPS method, wherein the contractor is in the lead. The fact that the construction phase is governed by its own conditions does not fit BVP/PIPS method since the BVP/PIPS is based on a contract that includes design and execution.

**Alliances/Partnering**

The alliance model differs from the previous models in the fact that the client is more involved in design and execution. An alliance is a partnership of client and contractor wherein they treat each other as equals. This is done through setting up a business in which they are both stakeholders and which they manage together (Chau-Duivis, et al., 2013a).

**Alliances/Partnering: not fit for BVP**

Alliances/partnering is not fit for BVP/PIPS projects because the contractor is not in the lead in this model. The model is based on cooperation and is an integration of two businesses without any hierarchy between them. Kashiwagi (2016b) states that the value of experts is minimized in a partnering environment.

**Public-private partnership**

Public-private partnership (PPP) is a broad concept. PPP’s are not based on the traditional roles of government and the private sector (Chau-Duivis, et al., 2013a). One of the things it covers is the contract with the designing and executing part. Chau-Duivis et al. (2013a) describe PPP as an umbrella term, which in a planning context translates to a legally structured partnership between a government agency and private-sector organizations for a spatial development and its operation.

**Public-private partnership: not fit for BVP**

PPP’s between the government and companies are shaped by integrated contract forms (Rijksoverheid, 2017a), mostly through DBFM and DBFMO (Rijksoverheid, 2017c). A consortium of different contractors with different specialties will be formed who together will fulfill the contract and take care of the maintenance and possibly operations phases. The government does not deal with other parties than this consortium (Rijksoverheid, 2017b). At this moment it is not common to apply BVP/PIPS on these types of contracts. The uniqueness of the construction of this type of contracts asks that the application of BVP/PIPS hereon should be researched separately. Additionally, Kashiwagi (2016b) states that the value of using experts is minimized in a partnering environment. Therefore, this thesis will focus on the most common contract wherein the research problem occurs.

**Integrated model**

The integrated model demonstrated in figure 5 chapter 7 is governed by the UAC-IC 2005. These have standard provisions for the combination of design and execution work, or of design, execution work and long-term maintenance. (Chau-Duivis, et al., 2013d). An integrated contract places design and execution (and possibly management and operation) in the hands of a single party in relation to the client (Chau-Duivis, et al., 2013d). The term integrated contracts covers a variety of contract types, among others: Design & Construct (D&C); turnkey; Design, Build, Finance, Maintain and Operate (DBFMO) and different variations on these. All the integrated contracts share one principle, which is that in comparison with other models, the client takes the back seat and plays a far smaller role (Chau-Duivis, et al., 2013d). This situation also implies that the client attracts less liability and the contractor much more. It is possible for the contractor to be a building contractor that procures the other functions contributing to his own. He could also be an architect or consultant engineer. In the case that a designer is brought in, it is sensible to form the design contract subject to The New Rules 2011. Chau-Duivis et al. (2013b) state that in the case of the need for an external building contractor it is imaginable to apply the UAC-IC 2005 to this relationship.
**Integrated model: fit for BVP**

The integrated model under UAC-IC 2005 leaves the most room for BVP/PIPS principles and methods to be implemented. The integration of design and execution fits the setup that BVP/PIPS suggests in the sense that the contractor carries responsibility for the design. Also the principle point of UAC-IC 2005; the client taking the back seat and playing a smaller role, complies with the BVP/PIPS principle utilization of expertise. There are also contract forms under UAC-IC that will not be examined in this thesis, as they are currently not being procured and executed through BVP/PIPS in practice. These are the Design, Build, Finance, Maintain (and Operate) (DBFM(O)) contracts. These contracts are formed under special conditions on their own terms. The involvement of banks that finance the project shapes the contract and positions of the involved stakeholders in such a unique manner that these contracts are currently not procured through BVP/PIPS (Lee, 2017).

**Conclusions contractual context**

The legal context of contracts that shape the boundaries for BVP/PIPS projects are the integrated contract models under UAC-IC 2005. Among these integrated contracts this research will focus on the Design & Construct (D&C), Engineering & Construct (E&C) and Performance contracts, because these are the contract forms that are most commonly procured and executed under BVP/PIPS. A solution that serves these models is therefore most relevant.

<table>
<thead>
<tr>
<th>Building contract model</th>
<th>Fit for BVP/PIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional model</td>
<td>No</td>
</tr>
<tr>
<td>Design team model</td>
<td>No</td>
</tr>
<tr>
<td>PPP</td>
<td>No</td>
</tr>
<tr>
<td>Alliance/Partnering</td>
<td>No</td>
</tr>
<tr>
<td>Integrated model</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Table 7: Relevant building contract models*
Appendix F
Contract management methods

Contract management methods
Preliminary research in policy documents and informal interviews provides knowledge about contract management methods that exist in practice. These methods are examined in the following sections. Each method’s possible contribution to BVP/PIPS principles will be briefly discussed.

- What are contract management methods?
- How did these develop into their current state?
- How are these methods implemented?
- Where are the challenges in applying these methods?
- How do contract management methods and contracts relate to each other?

Direction and control
Direction and control is a method that is practiced in the traditional contract model under UAC 2012 (van Krujsbergen, 2017). The execution in the traditional model is managed through daily supervision by the employer’s agent, acting on behalf of the client² (Chau-Duivis, et al., 2013c). Under UAC 2012 this happens through the presence of an agent called ‘the clerk of works’. The role of the client’s agent is often fulfilled by the designers, who are granted the power of representation for this purpose. Chau-Duivis, et al. (2013c) summarizes the duties of the clerk of works as the following:

- Representation of the client (UAC 2012 §3 (4));
- Coordination of all activities;
- The supervision of the works and compliance with the contract (UAC 2012 §3 (6));
- The conduction of works and/or checking the correspondence and records, including the weekly reports of progress of the works (UAC 2012 §27);
- The indication of points at which the contractor is entitled to payment of all or part of the contract sum and to check and/or draw up the payment documents for the works (UAC 2012 §40);
- Drawing up and/or check and correct working drawings and other documents produced for the execution of the works.

Relevance to BVP/PIPS
Direction and control is not a BVP/PIPS supporting practice. The practices that are applied under this method stand in direct contrast with the BVP/PIPS principle utilization of expertise and can be seen as MDC behaviour as described by Kashiwagi (2016b).

Collaboration
Another identified method in practice will be named collaboration. Some contract managers prefer to attend meetings of contractors without that being prescribed in the contract as test moments. Rather these moments are chosen by the contract manager. This can for instance be once a week during standard progress meetings of the contractor. Contract managers who do this can keep a feel

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² Supervision by the client is not legally required according to §3 (1)) under the UAC 2012. If the client does not appoint a clerk of works, the duties assigned by the UAC 2012 to the clerk of works must be performed by the contractor (see §3 (8)).
with the project and would like to be able to contribute their knowledge or help in finding a solution (Hasselt, 2017).

Relevance to BVP/PIPS
Collaboration is not advised according to BVP/PIPS, because it introduces risk and unnecessary transactions. BVP/PIPS suggest that the vendor expert should come up with solutions and create win-win situations for the supply chain participants. Kashiwagi (2016b) states that partnering depends on relationships and not performance and risk mitigation. Kashiwagi (2016b) explains the negative sides of partnering as a transaction that takes time, cost, does not have any positive impact on performance and that it is only perceived to work as long as it meets everyone’s objectives. In case of cost or time disagreement, partnering will soon disintegrate. The author also explains that it is reactive and not proactive action and that the perceived risk that it minimized could have been minimized through simple BVP/PIPS techniques. The author continues to elaborate that the allowance of partnering that is required can be seen as an indication of the lack of alignment, pre planning, selecting and hiring the best value expert, and an increased amount of management, direction, and control required on a project.
Interview protocol

Theory Question 1 (TQ1):
Practical information project:

1.1 Does the client hire a consultant to audit or manage the contract?
1.2 What is the role of the auditor/contract manager?
1.3 How often are there meetings between client and contractor or auditor and contractor?
1.4 Which contract management methods are used?
1.5 How are these contract management methods applied?
1.6 Did the contractor’s team change after the clarification phase?
1.7 What is different in this project considering your role as contract manager?

Theory question 2 (TQ2):
Why does BVP/PIPS work in the execution phase?

2.1 Can you give an example of a situation in this project wherein it went very good?
   2.1.1 What happened in that situation?
   2.1.2 How was the communication between OG and ON in this case?
   2.1.3 What did you do then?
   2.1.4 What did you expect to happen?
   2.1.5 What happened?
   2.1.6 How do you look back on that action?
   2.1.7 What would you do differently in the future?
2.2 How did the contractor react to that?
2.3 What enabled that situation to happen?
2.4 What makes this special for this project?

2nd level: Did trust/team formation/monitoring/goal alignment play a role in this scenario?

Theory question 3 (TQ3):
Why does BVP/PIPS not work in the execution phase?

3.1 Can you give an example of a situation in this project which went not so good?
3.2 What happened in that situation?
   3.2.1 How was the communication between OG and ON in this case?
   3.2.2 What did you do then?
   3.2.3 What did you expect to happen?
   3.2.4 What happened?
   3.2.5 How do you look back on that action?
   3.2.6 What would you do differently in the future?
3.3 How did the contractor react to that?
3.4 What enabled that situation to happen?
3.5 What makes this special for this project?

2nd level: Did trust/team formation/monitoring/goal alignment play a role in this scenario?