

PRE-CONTRACT ASSUMPTIONS IN PRACTICE: A QUALITATIVE STUDY ON THE FLEXIBILITY TO CHANGES IN DBFM CONTRACTS - BLANKENBURGVERBINDING PROJECT CASE STUDY

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PPPs (Public Private Partnerships) are a range of possible relationships between public and private parties. They are realized mostly in contexts of great uncertainty. A challenge in PPPs such as DBFM (O) (Design, Build, Finance, Maintain, Operate) contracts or projects is how to keep the contract progression efficient when there is a high degree of uncertainty. The purpose of this paper is to discuss the potential of changes and requirement of flexibility in a DBFM contract through a case study and to present recommendations for future DBFM contracts. An extensive literature review on the subject of changes and flexibility is provided. Furthermore, this paper describes the results (analysis) of 32 interviews conducted in relation to the case study, the Blankenburgverbinding project. The main findings show that change recognition and flexibility perspectives in pre-contract phase provides the client and stakeholders a better understanding of the challenges facing the organization in realizing its aims and delivering a DBFM project in its complex environment.

Keywords: complex environment, contract changes, DBFM, PPP.

INTRODUCTION

A lack of understanding of the complex environment in which PPP contracts are being created is a significant contributor towards large sunken investments or project failures. Understanding this complex environment of PPP in the pre-contract phase is especially important for decision makers, where the proposed project may become more complex due to changes during the construction and maintenance phases. Therefore, a focus on establishing the right delivery of a project regarding the change expectations, matched to the complexity of the environment of the project, is vital for effective project management.

This research addresses the results of the Blankenburgverbinding (BBV) case study as a part of larger research. It presents the results of the first in a series of case studies regarding Rijkswaterstaat DBFM projects in the planning, realization and exploitation phase. Rijkswaterstaat is the executive agency of the Ministry of Infrastructure and Environment in the Netherlands. The focus of this study is to analyse the practical implementation issues dealing with changes in DBFM contracts (during the realization

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and exploitation or maintenance phase) and identify measures that can be taken in the pre-contract phase to deal with potential changes for certain categories of projects. These measures may reduce conflict and result in a more efficient management (added value) during the construction and maintenance phase of the DBFM(O) contracts.

In PPP contracts, neither its activities nor its environment is stable. What was state-of-the-art yesterday may be out of date tomorrow (De Neufville and Scholtes 2011). PPPs will always be affected by changing circumstances. Sun and Meng, *et al.* (2009), Verweij (2014), Hao *et al.* (2008), Hwang and Low (2011) argue that changes are inevitable in construction projects. Therefore, PPP contracts include change procedures (Rijkswaterstaat 2014; Highways Agency 2010). These procedures provide a reactive way to specify and evaluate project changes when they occur. A DBFM(O) contract is considered a type of PPP or PFI (Private Finance Initiative) contract which facilitates private investment in public infrastructure/assets often over 20 to 30 years. Kwak *et al.* (2009) pointed out that PPPs are not easy to apply to infrastructure projects due to their contractual arrangement complexity and high level of uncertainty that arises from the long concession period. Changes can result from political, economic, social, technological or legal circumstances.

The business of construction projects brings together different types of organizations and stakeholders. These organizations and stakeholders are interrelated by contracts and specifications in order to deliver the service as intended. The relations between the project and its actors (the complex environment) encompass what potential changes may be expected. The contract should provide measures to deal with these “*potential*” changes (scenarios). However, construction projects are influenced by different strategies and procedures from multiple associated actors. As a result, the consideration of change is a very important part of the contract mechanism, especially in DBFM contracts, due to the long-term relationships. It is a common experience that stakeholders in complex projects are the major source of changes (Ward and Chapman 2008). Effective project management involves understanding sources of both uncertainty and complexity to formulate appropriate management strategies (Ward and Chapman 2008; Hertogh and Westerveld 2010).

There is a growing body of PPP literature concentrating on the pre-contract phases (Levy 2011; Chan and Cheung 2014). Most of this research is focused primarily on identifying the causes and effects of changes and how to cope with them (Sun and Meng 2009; Hwang and Low 2012; Price and Chahal 2007). It is important for decision makers to know and understand how to deal with the various types and sources of changes especially in long term contracts like DBFM. However, research related to DBFM implementation and practitioners’ views of the changes in DBFM contracts is scarce (Lenferink 2013). This paper describes the potential lifecycle changes as identified by the client and stakeholders of the BBV project - a DBFM contract in the Netherlands currently being planned. The purpose of this research and case study is to discuss and compare the client and stakeholders’ perceptions regarding potential changes and the need for flexibility with the literature especially in DBFM contracts, to present recommendations for future DBFM contracts.

LITERATURE REVIEW

Expected changes in literature

The significance of the complex project environment is recognized in literature (Hagan *et al.* 2012). However, there is limited research addressing the changes in a

DBFM contract context. De Neufville (2011) presented uncertainties in engineering design and argued why flexibility in design is needed. Koppinen and Rosqvist (2010) developed a project portfolio selection method to assist infrastructure managers in optimizing the life cycle profiles of their assets through selection of an optimal maintenance and repair portfolios based on the level of both existing and expected uncertainty. Wu *et al.* (2005) proposed a classification based on multiple-case studies using statistical analysis to identify change in a highway project in Taiwan, to clarify the causes of construction changes and to analyse their influence. Their intended aim was to give a reference to clients in forming their project procurement strategy. Sun and Meng (2009) presented the classification of changes in an adopted hierarchical structure. At Level 1 the causes of changes are divided into three broad categories; external, internal and organizational causes. Level 2 explains the determining factors of changes such as environmental, social and political factors and Level 3 describes the root-cause of the changes. A review of the salient literature about expected changes in infrastructure projects provide a number of categories. In the literature several authors categorize changes in different ways. The categorization as used in Table 1 were generally derived from the reviewed literature.

Contract flexibility in literature

Several publications have appeared in recent years documenting the flexibility of contracts on topics such as contract law, finance and relational issues (Domingues *et al.* 2014; Cruz and Marques 2013; Nystén-Haarala *et al.* 2010). De Neufville and Scholtes (2011) have tackled flexibility from a technical point of view for engineering design projects. They provided an overview detailing why flexibility in design is needed to deliver significantly increased value. Domingues *et al.* (2014) examined contractual flexibility in transport infrastructure PPPs and found that flexibility is more likely to contribute to the project's success when implemented in the contract design. According to Nystén-Haarala *et al.* (2010) flexibility is often introduced to life cycle contracts with relational methods, relying on good personal relationships between business partners. They also stated that the contract documents do not often contain mechanisms for dealing with contingencies. Saleh *et al.* (2009) proposed to transform flexibility into a quantifiable engineering attribute and grow the concept to a level of maturity. An interesting approach observed by them that the concept of flexibility is “*vague and difficult to improve*” compared to the notion of quality 20 years ago. Barton (2015) documented two perspectives of flexibility: legal and business. He argues for a multi-national approach to examine flexibility and international legislation and the need for deeper collaboration between those drafting and implementing the contracts. The results are highly enlightening and suggest a greater need for a broader international study on the issue of flexibility in contracts.

In some cases, uncertainties are ignored by decision makers. Therefore, the resulting consequences could be devastating with unpleasant surprises in the long term (Stahl and Cimorelli 2005; Perminova *et al.* 2008). Hertogh and Westerveld (2010) stress the need for adaptive management, which is characterized by monitoring and evaluating results and adjusting actions on the basis of what has been learned. This means that there should be a strong feedback link between monitoring and decisions, which allows for effective learning. The initial arrangements should facilitate this.

In general, relevant literature is mostly concentrated on legal and financial issues of contract flexibility but is scarce in relational issues.

CASE STUDY

The Blankenburgverbinding (BBV) Tunnel Project

The BBV will provide the main highway connection between the highways A15 and A20 in the Netherlands (Figure 1). The distance covered by the project is short - only 5 km of highway - but it is highly complicated with an immersed tunnel crossing the intensely used Nieuwe Waterweg and a 1.5 km land tunnel crossing a very sensitive populated area. The decision to realise this connection, was taken after decades of political discussions and the evaluation of many alternatives for this route. The BBV is one of a series of projects planned for the sustainable future development of the Rotterdam region (Rotterdam Vooruit 2009).

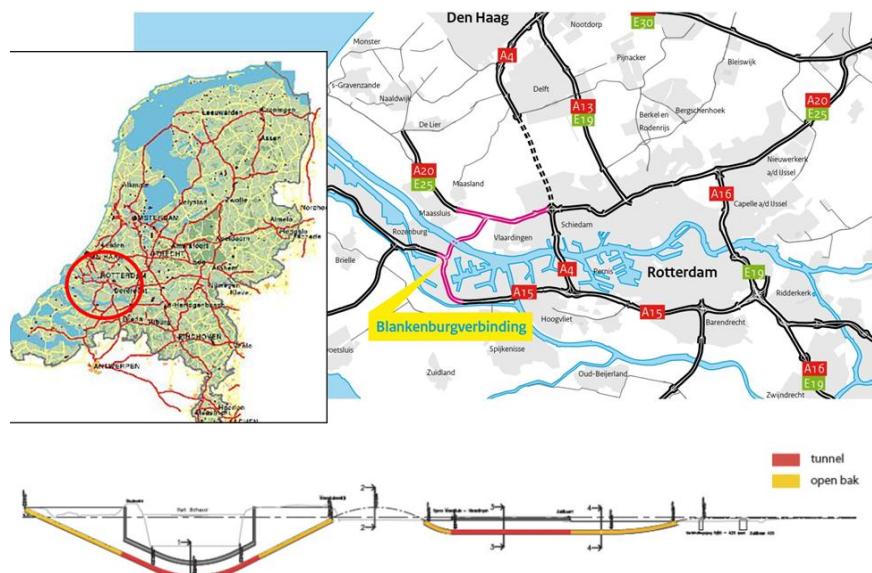


Figure 1: The

planned Blankenburgverbinding (BBV) in the Rotterdam area (see also www.blankenburgverbinding.nl)

The purpose of the BBV is to provide a robust infrastructure connection for the western part of the Rotterdam Harbour complex and supply a traffic solution for the growing river crossing traffic. In 2013, the total contract costs were estimated at approximately €1,000 million. The project will be partly financed by toll. The BBV will be contracted as a DBFM contract. The construction will start in 2017, and the expected opening is in 2022. Besides realization of the project, a maintenance period of 20 years is contracted starting after construction phase.

Due to the complex environment of BBV, including a large number of actors, (major) changes can be expected during the DBFM contract period. The interrelationship of actors and complex nature of the BBV project are shown in Figure 2. The ability to adapt to changes in this complex environment including current and future stakeholders is required. This paper is limited to currently involved actors and focuses purely on a specific set of dominant current actors illustrated in the cloud of Figure 2.

The DBFM Contract Form in the Netherlands

The Dutch DBFM contract model is influenced (extended) from Anglo Saxon contract nature. There is no specific legal structure for Dutch PPP contracts. A standard DBFM(O) contract model for infrastructure was developed by Rijkswaterstaat (Rijkswaterstaat 2014). They have also standardised the tender guidelines for the

procurement proceedings. The competitive dialogue procedure is used to award complex public DBFM(O) contracts.

The Data gathering through interviews

Semi-structured interviews were used for qualitative data collection. The interviews started with a predetermined and phrased set of questions to explore specific issues within the research project (Naoum 2012). However, the questions were more general in their nature; and the sequence of the questions varied per interviewee with new questions evolving during the interviews (Bryman 2012). The interviews concentrated on the following main questions:

1. What kind of changes did you experience in your existing projects?
2. What kind of changes do you expect for the BBV Project?
3. Does the DBFM change procedure cope with the changes?
4. Is a DBFM contract flexible in your opinion?
5. What is your understanding from flexibility in DBFM contracts?

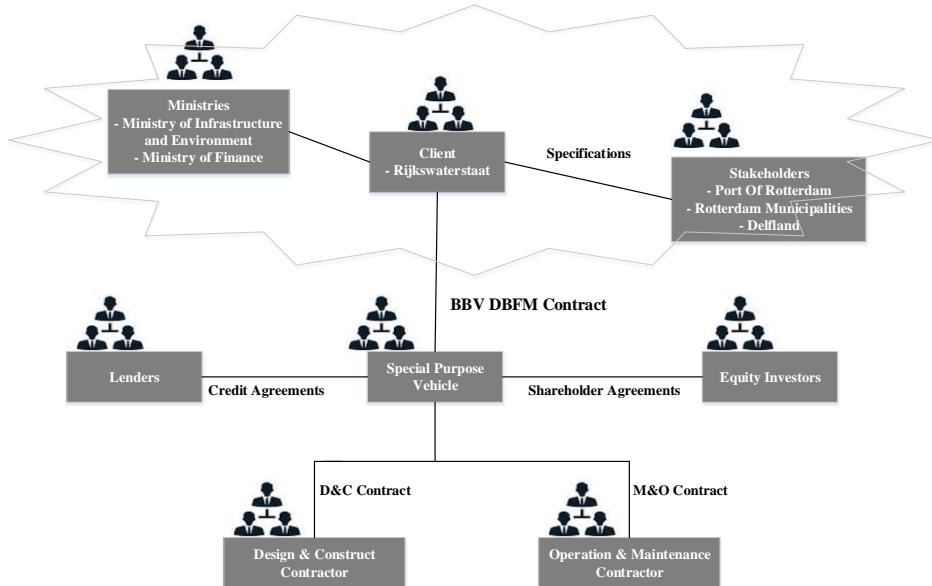


Figure 2: Blankenburgverbinding (BBV) dominant DBFM project actors

The interviews illustrate how practitioners' from different organizations explain and understand the potential changes specifically in relation to the context of the BBV project and particularly the DBFM project. Furthermore, the interviews gave insights into how to cluster and level the changes and increase the understanding of how planners can deal with a complex environment, especially in DBFM contracts. A total of 32 interviews were conducted between April and July 2014. The data gives insight into the different perspectives of the stakeholders. Twenty nine Dutch stakeholders from the Ministry of Infrastructure and Environment, Rijkswaterstaat, Municipality of Rotterdam; Water Board of Delfland and the Port of Rotterdam were interviewed. A further three interviews were conducted in the UK with the Highways Agency for the purpose of comparison. All the participants held senior positions regarding risk, contracts, environment, technical services, assets, projects, law, advisory, and changes. Braun and Clarke's (2006) thematic analysis approach was used to systematically code and analyse the interviews. The codes for the categorization of changes were defined prior to the interviews based on the literature review. Sub codes evolved while analysing the transcripts (see Table 1).

FINDINGS

All of the 32 interviewees characterized the environment in which the BBV project is established as complex. Especially the dynamic environment of the Rotterdam area and the political emphasis on the development of the main port of Rotterdam were mentioned (see Table 1). This corresponds with Aaltonen and Sivonen (2009), who argue that stakeholder conflicts are among the most significant unforeseen risks in projects implemented in challenging environments. Similarly, Hertogh and Westerveld (2010) argue that most dominant form of complexity experienced by practitioners in large infrastructure projects is social. There is a tendency for public participants to ignore potential changes. Ignorance leads to reaction instead of proactivity. The unawareness of uncertainty is consistent with the inflexibility documented in the literature by Stahl and Cimorelli (2005) and Perminova *et al.* (2008) and by the participants in practice.

On the whole, all the interviewees suggested expected changes to the BBV project. However, the focus of expected changes was mostly in the realization phase of the project. The participants' understanding of DBFM contracts centred mostly on that of a D&B contracts with additional maintenance. Short term requirements rather than the life-cycle and facilities management of the asset is where the major concerns are expressed. Most participants did not realize the effect of changes in DBFM under the incorporated life-cycle mechanism. In the interviews, 68% of the changes related to the Design and Build phase and 32% towards the Design, Build and Maintenance phases.

It was generally agreed that understanding the potential changes can help both public and private project managers to deal with them in the construction and the maintenance phase. In Table 1* the change categorization as derived from the literature is related to the findings of the interviews in the BBV case. The categorization can be used as a basis for further detailed investigation into uncertainty. The findings should be viewed as a generic template that will be further expanded.

Stakeholders and client understanding of flexibility changes from person to person. Flexibility in DBFM projects is assessed from two different perspectives. When one says a contract is flexible, the statement conveys mostly legal understanding that the contract clauses can easily deal with the changes. However, this understanding does not deal with the complex environment of PPPs. The interviewees' who approached flexibility from a business-managerial perspective stated that each stakeholder has a role to play and some will be more dominant than others. For example, contractors are obliged to pay their loans in time to lenders. Having contractual flexibility does not imply that the complex environment of tight relations between actors will make the project more rigid. They stated that uncertainties can be dealt with in any type of contract but because of the actor relations, cost and time issues in DBFM type of contracts call for flexibility. The majority of interviewees (74%) stated that DBFM contracts are flexible regarding their change procedures. However they also indicated that this can result in significant schedule and cost issues. Additionally, the minority (16%) believed changes are difficult to impose on DBFM contracts. Furthermore, the remaining (10%) was not sure due to their unfamiliarity with the DBFM contract.

The interviewed contract managers viewed flexibility as an essential ingredient for success of DBFM projects because they are long term investments in a complex environment. Client's procurement procedures with their service providers need to be more flexible in the dialogue phase regarding potential changes. Stakeholders said that

flexibility and contract efficiency can be provided with good communication between the actors. Those who approach contracts from more relational perspective argued that “*we should sit on the same table with client and service provider over the contract period to build up good relations and express the needs.*” This is in line with Haarala’s (2010) findings as flexibility introduced to contracts with relational methods relies on good personal relationship between the actors. Saleh *et al.* (2009) stated that flexibility, despite its popularity, is not yet an academically mature concept and the interviews show this is also the case in practice. The different perspectives correspond with Barton (2015), who reported flexible contracting in two different and seemingly opposed perspectives which are legal and business oriented.

Table 1: Change categorization

Changes in construction projects Literature	Feature	Expected changes in a DBFM project Case Study
Influential surrounding projects	Changes in project environment	Accidents in other tunnels (5/32) Hit by ships (2/32) Residential changes (Immigration) (5/32) New exits for residential areas (10/32) Surrounding highways (10/32) Surrounding railways (5/32) Surrounding cables and pipelines (4/32) New dykes (5/32) Port facilities (5/32)
Global Crisis	Financial Changes	Toll prices, Toll cuts (13/32)
Lack of public financing		
Bank accounting systems		
Fluctuations in annual budgets		
Specifications and law	Changes of Legislation	New national tunnel standards (12/32)
Noise and vibration restrictions		EU standards (12/32)
New proposals for reducing green gas emissions		
Governments make new laws	Change in politics	Change in decisions (10/32)
Tax paying issues		
The movement towards the service based system	Organizational changes	Rijkswaterstaat organizational changes(10/32)
Boundary conditions		Risk sharing (12/32)
Collaboration of parties		
Risk sharing		
Level of competition		
Contractor selection		
Responsibilities		
Efficiency and effectiveness	Changes of requirements	Environmental requirements (11/32)
Environmental requirements		Quality levels (10/32)
Performance measures		
Safety requirements		
Mobility requirements		
Quality levels		
Global warming	Climate changes	Water conditions (5/32)
Sea level		Weather conditions (3/32)
Water conditions		
Use of new materials	Technological changes	Technology (8/32)
Car technology		
	Traffic system	Traffic management system (7/32) Traffic density (3/32) Speed limits (3/32)
	Technical Changes	Tunnel installations (3/32)

* Number of times issue was mentioned in the interviews compared to total numbers of interviews

Private participants were not interviewed yet in this case study. Participants (client and stakeholders) stated that contractors bear no responsibility for these kinds of changes, therefore their response is mostly reactive instead of proactive. Introducing changes and flexibility approach in pre-contract and the tendering phases (like the competitive dialogue) may force private parties into a proactive attitude. This was also suggested by the client and stakeholders as a better example of a solution through the dialoguing and pricing of options.

DISCUSSION AND CONCLUSIONS

The initial investigation of the BBV leads to the following conclusions which support the need for a flexible approach to the PPP contract. Firstly, top managers and specialists involved in the BBV-project are unanimous in their expectation that many changes will occur during DBFM project lifetime. The expected changes are mostly related to changing politics and the dynamic environment (stakeholders). However, there is a tendency, especially by public clients, to ignore expected changes and rely on the flexibility of the contract.

Secondly, the BBV case study corresponds with the change categorization as found in literature. However, changes are by the large focussed on the short-term realization phase. The majority of interviewees consider the DBFM contract as a D&B contract with additional maintenance. In general, actors do not realize that changes can occur during the whole life-cycle mechanism with significant consequences, high contract disturbance and cost implications when changes occur. Reactive management to the maintenance phase may result in further financial burden on the PPP actors or client.

The interviews stated that both the client and stakeholders should identify proactive measures necessary to deal with expected changes. Reaction leads to inefficiency and disturbance of the project progression. Better to act proactively on possible changes.

Furthermore, there was a wide range of views from the interviewees regarding flexibility which reflects the current level of flexibility in academic and practical contexts. The understanding of flexibility is changing regarding technical, legal, financial and actor relationship perspectives. This increases the complexity. Future research will gather a better understanding of flexibility from each disciplines viewpoint.

Within quantitative and qualitative studies we take into account stakeholders perceptions on expected changes and flexibility for complex DBFM projects. This data will be used in the competitive dialogue tendering of the BBV DBFM project. The findings give insights and support the alignment of the client and Special Purpose Vehicle (SPV) and their capability to meet the degree of changes during the implementation and maintenance phases of the contract. Additionally, this helps DBFM actors to understand their current delivery environment and then create the one they need. Furthermore, this will help to allocate project risks to the parties best able to manage them. For each party, risk allocation is interesting which is consistent with changes and has sufficient flexibility to deal with them. Classified changes from stakeholders' perspectives can be a useful starting point for the development of a risk framework. Specifically, these expected changes can be directly related to the availability of fees in the DBFM contract which stands within the schedule of the contract. From the SPV side, being prepared to make these changes will reduce future difficulties repaying loans to the banks.

This study demonstrates the need for a common language and understanding of popular words used in DBFM contracts to tackle the complexity. The derivation of a definition of flexibility as well as guide to flexibility is an area within DBFM projects that needs further attention. The concept of flexibility is observed as vague in DBFM projects.

FURTHER RESEARCH

The novel aspect of this study compared to the reviewed literature is that expected changes with great effect under DBFM are related to possible counter measures in the pre-contract phase. Future data will be gathered through more case study research to judge whether the overall complexity is low, medium and high, because different changes can carry more weight in DBFM projects than others. Further case studies will also look at the perception of flexibility in different stages of a project. The exploration phase of A12 Dutch Highway DBFM contract will be examined as a next step. It will be interesting and useful to explore the flexibility approach regarding the relations between the actors in the exploration phase of DBFM projects to better inform the approach towards the BBV DBFM contract and compare the results with the findings identified in the planning phase of the BBV project.

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