Potential of DBFM-Contracts for Railway Development in The Netherlands

Bachelor Thesis

Colophon

Title:	The Potential of DBFM-Contracts for Railway Development in the Netherlands
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Table of Contents

Abstract

This thesis aims to find out what the potential for the use of DBFM-contracts is for railway development in the Netherlands. Since ProRail asks for increased investments in the railway network, private financing may provide a solution. A combination of literature review, documents and semi-structured interviews was used to analyse project characteristics, performance factors and the potential for the use of DBFM in rail. It was found that the use of the contract type is currently not on the table for ProRail due to various obstacles caused by the specific railway infrastructure, and the specific project type needed for the use of DBFM. Currently, the potential for the contract type can be regarded as low. Specific projects of large enough scale and the organizational change of ProRail to a ZBO-status may make the use of DBFM-contracts in railway development in the Netherlands an option in the future.

Chapter 1. Introduction

1.1 Background and relevance

The Dutch Ministry of the Interior and Kingdom Relations together with provinces and municipalities has expressed the ambition to build 961.000 new houses by 2030. Various locations around the Netherlands have and will be designated to accommodate these new housing developments (Rijksoverheid, 2021). With a growing number of inhabitants, the need for mobility will only increase. Therefore, investments in infrastructure are key to make these ambitions successful. Thus, ProRail has advised the new cabinet to increase investments in the railway network of the Netherlands. These investments are mainly for the maintenance of existing tracks, bridges, stations, and other railway infrastructure, and the doubling of existing single-track lines. According to ProRail, these investments are necessary to enable the plans for new housing while strengthening the economy and to improve sustainability (ProRail, 2021).

Rijkswaterstaat, the agency responsible for the execution of highway projects in the Netherlands has used public-private partnership contracts (PPP) for several highway developments during the last 15 years. In DBFM contracts the design, building, financing, and maintenance of the project are the responsibility of the private sector. Koppenjan et al (2020) have concluded that the usage of this type of contract is generally regarded as positive by private and public respondents, the contract type can still be an important and useful asset to Rijkswaterstaat in the future. Lessons can be learned however from the previous DBFM-projects, as the contract type also has weaknesses that must be acknowledged (Koppenjan et al, 2020). The use of DBFM contracts fixes the government expenditure in long-term contracts resulting in more certainty and predictability. In railway development in the Netherlands, the usage of DBFM-contracts is rare. However, the contract type has been used for the HSL-Zuid project. An analysis of the project by Gerrits and Marks (2015), concludes that the choice for PPS for this project together with the goal for the project to be a European frontrunner has resulted in cost overrun, dysfunctional hardware, and unprofitable exploitation (Gerrits & Marks, 2015). The evaluation of the HSL-Zuid project for the Ministry of Infrastructure and Water Management concluded that the choice for a DBFM-contract has not proven to be of overall added value (de Pater et al, 2020).

Within railway development in the Netherlands, other contract types than DBFM are more frequently used. Typically, ProRail uses UAV-GC (D&C) contracts (ProRail, 2020). Private financing in DBFM results in a higher level of financial management (Koppenjan et al, 2022). According to Verweij & van Meerkerk (2020), private financing in DBFM-contracts provides better cost performance and fewer time overruns when compared to D&C contracts. This difference in risk management is referred to as ‘the shadow of the banks’ (Verweij & van Meerkerk,

2020). This effect can also have negative implications such as limitations on flexibility and innovation (Koppenjan et al, 2022). Private financing might offer an alternative to direct government investment in the future. This thesis adds to the literature on DBFM contracts, which is mainly focussed on the current and past projects by Rijkswaterstaat. The thesis adds provides a view on the future of DBFM in the Netherlands.

1.2 Objectives and Research Questions

This research aims to find out if public-private partnerships (PPP's) in the form of DBFM contracts can be beneficial for the development of railways in the Netherlands in the future. What are the reasons for the difference, and can public-private partnerships be helpful to enable railway development? To gain more insight into this, the following research question is used:

How can public-private partnerships in the form of DBFM-contracts be used for railway development in the Netherlands?

The following three sub-questions result from the main research question:

1. What are the projects in highway development in the Netherlands that have used DBFM, what are the characteristics of these projects, was the use of DBFM successful – and why?

2. What are the projects in railway development that have those characteristics and that have not used DBFM - and why not?

3. What is the potential of DBFM in railway planning in the Netherlands

1.3 Structure

This thesis is divided into five different chapters. This first chapter has introduced the background of the topic and the research problem. In chapter two, concepts used in this thesis will be elaborated upon further. The third chapter presents the methodology used in this thesis and the data collection instrument. Chapter four will present the results and analysis of the sub-questions. Chapter five will present the conclusion and discussion of the thesis; this chapter also presents the strengths and weaknesses of the research, and the recommendations for future research.

Chapter 2. Theoretical Framework

2.1 Introduction

This research analyses the infrastructural planning systems which are currently used by Rijkswaterstaat for highway projects and ProRail for railway projects. Rijkswaterstaat has a more extensive history of using public-private partnerships, especially in the form of DBFM (Design, Build, Finance & Maintain) compared to ProRail. In this section, the theories and concepts which will be used for the analysis will be discussed.

2.2 DBFM Contracts

Public-private partnerships are collaborations between governments and public parties such as construction companies and banks. One or multiple contracts are signed between the involved parties, in the case of highway projects these contracts usually have a running time of 20-30 years (Eversdijk & Korsten, 2018). DBFM has been used for several highway projects by Rijkswaterstaat. This contract type involves the design, building, financing, and maintenance of the project, hence the running time of 20-30 years. According to Koppenjan et al (2020), DBFM-contracts are chosen as the preferred type of contract when there is a financial benefit. This is decided by using an instrument called the Public-Private Comparator (PCC). The usage of DBFM-contracts is uncommon in railway development with only the HSL-Zuid being a DBFM-contract (Gerrits & Marks, 2015). Other contract types such as D&C are used by ProRail (ProRail, 2020). These contracts do involve private parties for the design, building, and maintenance of the project; however, private financing is not part of the contract (Verweij & van Meerkerk, 2020).

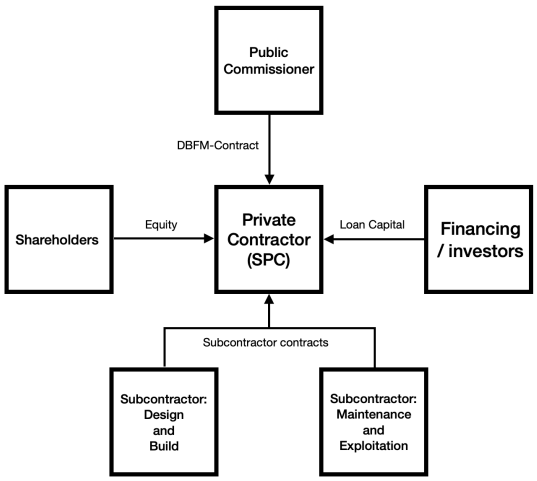

Figure 1: Organisation of DBFM-Contract
(Translated from Hamdan et al, 2014)

According to EPEC (2015), there are several motivations for the use of PPP's. The report explains several ways in which PPP's can improve the preparation, design, and construction of infrastructure projects:

- Improving risk analysis, transfer, and management.
- Optimising the design and construction for better whole-life management.
- Increasing visibility upfront of expected long-term costs.
- Better insurance of on-time on-budget delivery.
- Reducing interface risks by promoting more effective contract integration and project management.
- Harnessing innovation (EPEC, 2015).

2.3 Project characteristics

According to Koppenjan et al (2020) there are characteristics that make an infrastructure project suitable for the use of DBFM-contracts. These characteristics are based on research on DBFM-contracts for highway projects in the Netherlands.

First, the use of a DBFM-contract should offer added value in terms of finance, time, and quality in comparison to traditional contracts (Koppenjan et al, 2020). This is in part determined by the Public-Private Comparator, or PPC. The PPC is used in the tender phase to compare a traditional contract type to the use of DBFM. The PPC is mainly used for financial substantiation and shows if there is an added value by making use of a DBFM-contract (Hamdan et al, 2014). The PPC measures if a DBFM-contract can result in a higher quality within the same budget, or the same quality for a lower budget. Only the financial part is compared in this instrument (Eversdijk & Korsten, 2009).

Secondly, Due to the contract length of DBFM contracts, the requirements in the long term need to be clear beforehand (Koppenjan et al, 2020). Since DBFM-contracts generally have a long duration, during which changes in specifications of requirements to the contractor are difficult, DBFM-contracts should not be used when changes in requirements are likely in the future. Quality standard needs to be highly constant. In the case of unforeseen changes, negotiations take place. The negotiation is elaborated upon in the chapter on changes, in the DBFM-contract. In the case that changes in the requirements are expected beforehand, DBFM is not recommended (Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018).

Third, the project needs to be of a certain scale. In comparison to traditional contracts, DBFM-contracts are higher in complexity. There are several reasons for this: many risks and financing are being attributed to the private parties involved in the contract, and because of this DBFM-contracts need more preparation and negotiations between the public and private parties. Secondly, in DBFM-contracts many parties are involved, each with different interests, adding to the complexity. A third reason is that candidates for the realisation of the project are asked to present a thoroughly worked out plan, to make the financial evaluation of the offer. These factors all increase the complexity of the project and thus the preparation costs are much higher compared to traditional contracts. Therefore, the project needs to be of a certain budget size to compensate for these higher costs (Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018). In the Netherlands, Rijkswaterstaat uses a minimum budget of 60 million euros for the use of DBFM contracts (Koppenjan et al, 2020).

Finally, a sufficiently extensive maintenance component needs to be present in the project. Since the maintenance component is an important part of a DBFM-contract, integrated into the design and building phase, this component needs to be present to create added value from the DBFM-contract. Additionally, DBFM is a good fit for projects where choices in the building phase influence the maintenance costs in the future since this leads to life-cycle optimisation, which has an important effect on cost reduction (Hamdan et al, 2014). If this is not the case, the addition of the maintenance component will make the project too complex, and a traditional contract type is more suitable (Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018).

Several factors can influence the outcome of the use of DBFM-contracts positively. First, the project needs to be thoroughly prepared. Since contractors and financiers are responsible for a high portion of the risks involved in the project, thorough preparation is an important factor in minimising these risks. It is equally important to make clear in the contract how these risks are managed. A high amount of risk in the project may result in contractors or financiers being unwilling to join the project. Secondly, the public party must possess sufficient knowledge and experience regarding the use of DBFM-contracts. Professionalism leads to more trust with financiers and contractors, which can eventually result in cost reductions. The capacity of financial, legal, and technical advisors, or in-house knowledge is critical to the success of the project. Third, the use of DBFM-contracts asks for a different attitude from the public party than in traditional contract types. The public party must be willing to give freedom to the private parties regarding the design, building and maintenance phases of the project. Finally, the private party must also possess expertise in the use of the contract type. The role of the government is that of formulating output specifications. The

private party is responsible for more components than usual (Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018).

2.4 Performance of DBFM-projects

In Koppenjan et al (2020), nine different performance indicators are discussed to define the success of DBFM-projects at Rijkswaterstaat. These factors are time, finances, quality, innovation, availability, risks, flexibility, collaboration, and the role of Banks. The performance indicators are defined as follows:

Factors	**Questions**
Time	Did DBFM lead to on-time delivery?
Finances	Did DBFM lead to on-budget delivery? Did contractors realise an acceptable return?
Quality	Did DBFM lead to more process- and product quality? Did the life-cycle approach come out well?
Innovation	Did DBFM lead to more, or fewer innovations and optimisations?
Availability	Did the availability instrument lead to a better project approach from contractors, and high availability?
Risks	Did DBFM lead to a higher or lower number of risks involved?
Flexibility	Was there enough flexibility present to make changes during the contract?
Collaboration	Did DBFM lead to better collaboration between public and private parties?
Role of banks	What is the role of the banks in DBFM? To what extent did that role contribute to better risk management?

Figure 2:
Translated and adapted from Koppenjan et al (2020).

According to Koppenjan (2022), DBFM-contracts have a better or equal performance compared to Design & Construct contracts. It was concluded that DBFM-contracts had a better cost and time performance and resulted in fewer additional costs. The study could not confirm better performance in terms of quality, collaboration, and innovation. Private financing was even found to harm innovation. It was concluded that overall, the performance of DBFM-contracts was not worse than that of Design and Construct contracts (Koppenjan et al, 2022).

Project characteristics:	Performance in terms of:	Sources:
Added value	Finance Time Quality Innovation Availability	Hamdan et al, 2017 Koppenjan et al, 2020 Eversdijk & Korsten, 2009
Visibility on long-term requirements	Constant quality standards Flexibility Risks Role of banks	Koppenjan et al, 2020 Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018
Project scale	Budget size Complexity Collaboration	Koppenjan et al, 2020 Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018
Extent of maintenance component	Life-cycle optimisation	Hamdan et al, 2017 Vlaams Kenniscentrum Publiek-Private Samenwerking, 2018

Figure 3: Project characteristics and performance (Author, 2022)

2.5 Conceptual Model

In this conceptual model, the concepts used in this study, and how they interrelate are visualised. Certain project characteristics influence the performance of a DBFM-contract.

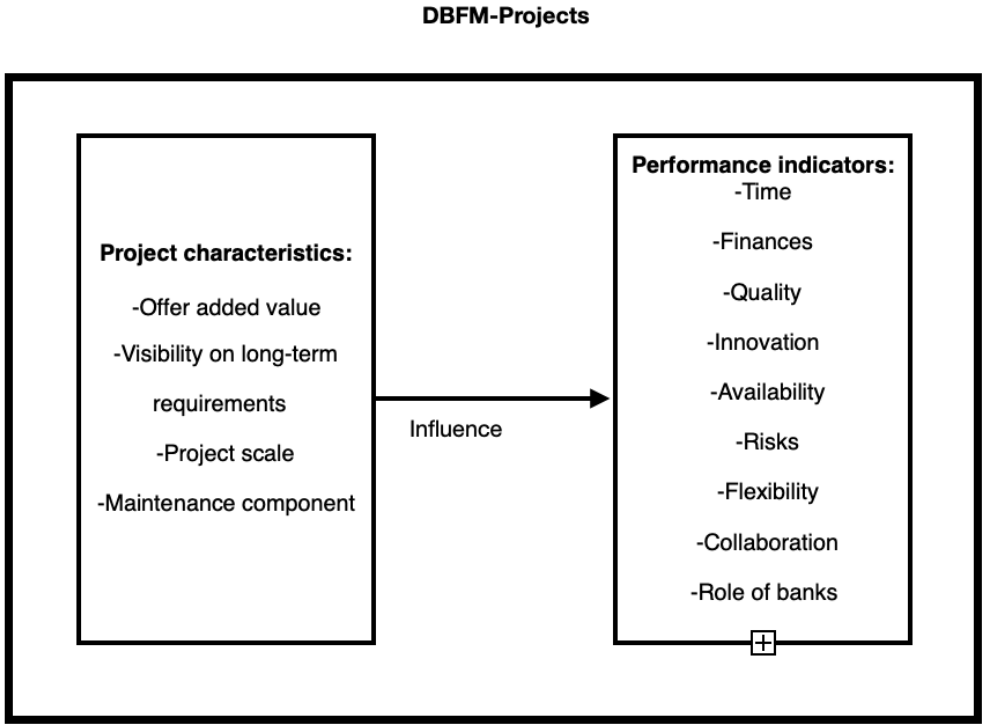

Figure 4: Conceptual Model (Author, 2022)

Chapter 3. Methodology

3.1 Research Strategy

To answer the research question and sub-questions a qualitative research approach is used. A mixed-methods approach is used by analysing documents, namely MIRT project books for specific highway development projects by Rijkswaterstaat, literature review and semi-structured interviews. A combined approach will be used to collect data in this research as the differently formulated sub-questions ask for different types of data collection.

3.2 Documents

The characteristics of highway projects that used DBFM-contracts at rijkswaterstaat were analysed using MIRT project books from the years 2011-2021. These project books provide additional information on the characteristics of the projects in terms of the task, solution, execution, political aspects, planning, costs, and budget. The documents were used to create an overview of DBFM-projects in highway development in terms of changes in the budget over the years.

3.3 Semi-structured interviews

Semi-structured interviews are used for the primary data collection. Interviews with experts in contract types in the railway sector are useful since data on the contract types used, and the considerations behind this are scarce. Semi-structured interviews make it possible to ask open-ended questions regarding contract types, while still providing structure using an interview guide (appendix 1) (Clifford et al, 2016). Semi-structured interviews were held with four respondents, all experts at ProRail. The experts were approached via LinkedIn and Email. Respondents were also found by being referred to managers at ProRail with more knowledge on the specific topic, namely contract types, and DBFM. To gain useful information on this topic, the respondents at ProRail must have experience and knowledge of contract types that are being used, and the reasoning behind these choices. Eventually, four experts on the topic at ProRail were found willing to take part in an interview.

Figure 5 shows an overview of the four respondents. Semi-structured interviews of 35-55 minutes were held concerning the contract types used by ProRail, and the reasoning behind the decisions. The interviews gave space for the respondents to express their experiences about projects and contract types. At the same time, an interview guide was used to have an overview of the questions and structure.

Respondent	Organization	Function	Date	Medium	Duration
R1	ProRail	Tender manager	12-05-22	Phone call	41 minutes
R2	ProRail	Contractmanager/ Bouwmanager	13-05-22	Microsoft Teams	38 minutes
R3	ProRail	Projectmanager	09-06-22	Microsoft Teams	40 minutes
R4	ProRail	Inkoopstrateeg/ Procurement	10-06-22	Microsoft Teams	55 minutes

Figure 5: Respondents (Author, 2022)

3.4 Analysis

The audio of the interviews was recorded using QuickTime player on Mac OS. The interview audio was subsequently transcribed using Amberscript. ATLAS.ti was used for the coding of the interviews. A combination of inductive and deductive coding was used for the analysis. Deductive codes (theory driven) were developed and used for sub-question 1. Inductive codes (data driven) were developed during the coding process of the interview transcripts and used to answer sub-questions 2 and 3. Inductive coding was used to identify key themes in the raw interview data, causing fewer constraints than structured methodologies. This makes it possible to summarize and develop theory about the underlying experiences and structure. (Thomas, 2003). The coding schemes can be found in appendices 3 and 4.

3.5 Literature Review

Literature used in this thesis has been found using Google Scholar and Smartcat. Additionally, documents on contract types and policy have been found using google. The literature is in both English and Dutch, as the specific cases in the Netherlands.

3.6 Ethics

Interviews with experts at ProRail are used for this research, the respondents must be aware of their rights to stay anonymous. To make these rights clear a confidentiality agreement (Appendix 1) was made and sent to the respondents via email before the interviews. The respondents are informed about the research, the way the data (recording, transcript, etc) is analysed and stored. The respondents have the option to receive the transcript of the interview, making it possible to change mistakes before finalising the research. The interview data is only used with the permission of the respondents for the purpose stated in the confidentiality agreement (Clifford et al, 2016)

3.7 Data Collection Instrument

	Literature review	Documents	Semi-structured interviews
Concepts	Project characteristics Performance factors	Project characteristics - Highway development (Rijkswaterstaat)	Project characteristics - railway development (ProRail)
Sub-Questions	1, 2, 3	1	2 & 3

Figure 6: Data collection instrument (Author, 2022)

Chapter 4. Results and Analysis

4.1 Introduction

In this chapter, the results of the research using literature and semi-structured interviews will be presented. The first section focuses on the projects in highway development in the Netherlands. Which projects can be designated as successful and why? The characteristics of these projects will be elaborated upon. Following this, the results of semi-structured interviews with experts at ProRail will be presented. The characteristics of railway development at ProRail. The reasoning behind the choice of contract type and the reasons for not using the DBFM contract type will be discussed here. Finally, the potential for the use of DBFM-contracts in railway planning is discussed

4.2 Highway Development

Not all Rijkswaterstaat highway development projects were executed using DBFM-contracts, figure 7 shows the projects where the contract type was used. The projects were deemed by Rijkswaterstaat to be suited to the use of DBFM, this was recommended due to a positive outcome of the PPC. The performance of DBFM-projects in comparison to traditional contract types is measured by using nine performance indicators: time, finances, availability, quality, innovation, flexibility, risks, collaboration, and the role of banks (Koppenjan et al, 2020).

Project name	Financial close	Year of availability	Contract duration	Consortium	CAPEX (mln.)
N31 Wäldwei	2003	2007	15 years	BAM, Ballast Nedam, Dura Vermeer	<100
A59 Den Bosch-Oss/Rosmalen-Geffen	2003	2006	15 years	BAM, Boskalis, Fluor	100-250
Tweede Coentunnel	2008	2013	25 years	Arcadis, Dura Vermeer, Besix, TBI	>500
A12 Lunetten-Veenendaal (LuVe)	2010	2012	20 years	BAM	250-500
A15 Maasvlakte-Vaanplein (MaVa)	2010	2015	20 years	Ballast Nedam, John Laing, Strabag, Strukton	>500
SAA: A1/A6	2012/2013	2017	25 years	VolkerWessels, Boskalis, Hochtief, DIF	>500
N33 Assen-Zuidbroek	2012	2014	20 years	BAM	100-250
A12 VEG	2014	2016	16 years	Heijmans A12	<100

SAA: A9 Gaasperdammerweg	2014	2018	20 years	Ballast Nedam, Fluor, Heijmans, 3i	>500
SAA: A6 Almere	2016	2020	20 years	Dura Vermeer, Besix, RebelValley, John Laing	100-250
A27/A1	2016	2018	25 years	Heijmans, 3i Infrastructure, Fluor	100-250
N18: Varsseveld-Enschede	2016	2018	25 years	VolkerInfra, DIF	100-250
A24: Blankenburg Verbinding	2017/2018	Planned 2024	20 years	Ballast Nedam, Macquarie, DEME	500
A16 Rotterdam	2018	Planned 2024	20 years	Besix, Dura Vermeer, Van Oord, John Laing, Rebel, TBI	>500
SAA: A9 Badhoevedorp-Holendrecht	2019	Planned 2026	14 years	FCC, Siemens, Macquarie, Count&Cooper	>500
ViA15	2020	Planned: 2024	20 years	Dura Vermeer, Besix, Hochtief, John Laing	>500

Figure 7: Rijkswaterstaat DBFM-Contracts Highway Development
(Edited from Koppenjan et al, 2020)

Characteristics in highway development

The following table presents road infrastructure projects by Rijkswaterstaat which were/are being executed using DBFM-contracts. The data from the table was derived from MIRT project books from the years 2011-2021. The MIRT project books elaborate upon the projects in terms of the problem, solution, planning, execution, and financing. The PPC is mentioned as the main reason for deciding on choosing for DBFM-contracts in the MIRT reports from 2011-2022 (Ministerie van Infrastructuur & Milieu, 2011-2021). The PPC measures if the use of a DBFM-contract is likely to create added value in terms of cost performance. This can be seen as the main reason for choosing DBFM-contracts in comparison to the traditional contract types (Koppenjan et al, 2020). It can be seen from both the tables that DBFM-contracts are mainly used for large projects in terms of costs (budgets vary between €166 million for the A12 Ede-Grijsoord project and €5849 million for A1/A6/A9 Schiphol-Amsterdam-Almere project (which is sub-divided into 5 smaller sub-projects). For all projects, the budget has been adjusted and increased over time. All projects eventually came out more expensive than initially budgeted. Many projects are still under construction or starting the maintenance phase. The performance of the projects in these phases is still relatively unclear.

Project	MIRT year	Problem	Solution	Planning	Finance	Execution
A15 MaVa	2011	Traffic growth in Port of Rotterdam Region	-Increase in lanes -New bridge	-Decision on route: 2010 -Start 2011 -Delivery: 2015	Budget: €1428 million	-DBFM-contract -Added value expected from PPC
	2012				Budget: €1185 million	
	2013				Budget: €1983 million	
	2015				Budget: €2053 million	
N33 Assen-Zuidbroek	2016			Delivery A29 Vaanplein-Barendrecht: 2014	Budget: €2058 million	
	2011	Traffic safety	-Doubling lanes -New traffic junction	-Decision on route: 2011 -Start: 2012 -Delivery: 2014	Budget: €186 million	-DBFM-contract -Added value expected from PPC
	2012			-Decision on route: 2012 -Start: 2013 -Delivery: 2015	Budget: €190 million	
	2013				Budget: €212 million	
	2015			Delivery: 2014	Budget: €354 million	
Tweede Coentunnel	2011	Congestion due to bottleneck effect of tunnel	-Increase in lanes -New tunnel	-Decision on route: 2007-2008 -Start: 2009 -Delivery: 2012	Budget: €2173 million	-DBFM-contract
	2012			-Decision on route: 2007 -Start: 2009 -Delivery: 2014	Budget: €2016 million	
A27/A1 Utrecht-Eemnes	2013			-Delivery: 2013		
	2012	Traffic growth	-Increase in lanes	-Decision on route: 2012 -Start: 2013 -Delivery: 2015	Budget: €252 million	-DBFM-contract -Added value expected from PPC
	2013			-Decision on route: 2013 -Start: 2016 -Delivery: 2018		
	2015			-Decision on route: 2014 -Start: 2016 -Delivery: 2018-2020	Budget: €264 million	

	2016 2017			-Start: 2017 -Delivery: 2018-2020	Budget: €261 million	
	2018 2019				Budget: €349 million Budget: €354 million	
A13/A16/A20 Rotterdam	2012	-Capacity problems -Environmental problems	-New highway	Not yet determined	Budget: Not yet determined	-DBFM-contract -Added value expected from PPC
	2013			Decision on route: 2014	Budget: €945 million	
A12 Ede-Grijsoord	2012 2013	-Congestion	-Increase in lanes	-Decision on route: 2011 -Start: 2014 -Delivery: 2015	Budget: €107 million	-DBFM-contract -Added value expected from PPC
	2015			Start: 2015 Delivery: 2017	Budget: €120 million	
	2016			-Start: 2015 -Delivery: 2016	Budget: €166 million	
N18 Varsseveld-Enschede	2012	-Traffic safety -Liveability in villages	-New maximum speed -New route	-Decision on route: 2012 -Start: 2014 -Delivery: 2016	Budget: € 179 million	-DBFM-contract -Added value expected from PPC
	2013			-Decision on route: 2012 -Start: 2015 -Delivery: 2018		
	2015 2016 2017			-Decision on route: 2013 -Start: 2016 -Delivery: 2019-2021	 Budget: € 337 million	DBFM-contract for part of route
				-Delivery: 2018	Budget: € 446 million	
A12/A15 Arnhem/Nijmegen	2013	-Traffic growth -Congestion	-Connection A12 and A15 improved -New highway section	-Decision on route: 2014 -Start: 2015 -Delivery: 2018	Budget: €804 million	-DBFM-contract -Added value expected from PPC
	2015 2016			-Decision on route: 2015 -Start: 2016 -Delivery: 2019-2021	Budget: €840 million	

	2017			-Decision on route: 2017 -Start: 2019 -Delivery: 2021-2023	Budget: €827 million	-DBFM-contract
	2018				Budget: €835 million	
	2019			-Start: 2020 -Delivery: 2022-2024	Budget: €843 million	
	2020 2021				Budget: €869 million Budget: €1035 million	
A1/A6/A9 Schiphol-Amsterdam-Almere	2015	-Insufficient accessibility	-Increase in road infrastructure capacity -Tunnel A9	-Decision on route: 2011 -Start: 2012 -Delivery: 2024-2026	Budget: €4667 million	DBFM-contract for subproject A10/A1
	2016			Delivery A9 Amstelveen: 2024-2026 4/5 subprojects: earlier	Budget: €5066 million	DBFM-contract for subproject A1-A6
	2017				Budget: €5101 million	
	2018				Budget: €5325 million	
	2019				Budget: €5395 million	
	2020 2021				Budget: €5482 million Budget: €5849 million	
A24 Blankenburgverbinding	2017	-Congestion	-New highway connection -Lane doubling -Tunnel	-Decision on route: 2016 -Start: 2017 -Delivery: 2022-2024	Budget: €1090 million	DBFM-contract
	2018				Budget: €1102 million	
	2020				Budget: €1800 million	
	2021			Delivery tunnels: 2024	Budget: €1909 million	
A16 Rotterdam	2020	-Insufficient accessibility -Environmental problems	-New highway	-Decision on route: 2016 -Start: 2019 -Delivery: 2022-2024	Budget: €1498 million	DBFM-contract

	2021				Budget: €1521 million	

Figure 8: MIRT reports 2011-2022 (MIRT, 2011-2021)

Success of DBFM projects in highway development

DBFM-projects by Rijkswaterstaat perform better in comparison to traditional contracts in terms of on-time delivery. The financial performance of the contracts is slightly worse. For financiers the performance of DBFM-contracts is positive since the security on a return on investment is high. The quality of the projects also scores higher because the life-cycle component of DBFM-contracts creates added value. Innovation scores higher in DBFM-contracts in terms of process innovations, product innovations are less likely. Flexibility in DBFM-contracts is deemed to be low because of the long duration of the contracts. Risks in DBFM-contracts are higher in comparison to traditional contracts because more risks are attributed to the public parties involved. Collaboration is an important factor leading to success. Finally, private investments lead to a strong incentive for contractors to improve cost performance and on-time delivery (Koppenjan et al, 2020).

4.3 Railway Development

4.3.1 General information

Projects and budget

The project Groningen Spoorzone with a total budget of €300m, was split into different contracts of approximately €100m. For this project D&C contracts are used. The contractor is entirely responsible for the design in this project. (R-3, 2022). Respondent 4 mentions that the use of DBFM was discussed for the Hanzelijn and Spoorzone Delft. For both projects, a D&C contract was eventually used. The Hanzelijn, a newly built railway connection from Lelystad to Zwolle was potentially suitable for a DBFM-contract. However, ProRail did not see the financial benefit of the use of DBFM. The Ministry of Infrastructure and water management was in favour of the use of DBFM, however. The project was eventually finished for less than the budgeted €1 billion. (R-4, 2022). The only railway project in the Netherlands where a DBFM contract was used is the HSL-Zuid. This high-speed line can be seen as a separate rail line from the rest of the network, which is why DBFM was deemed suitable for the project (R-4, 2022). "*The DBFM-contract ends there where it becomes exciting, where the HSL-Zuid connects to the rest of the network. This is where ProRail comes in". (*R-3, 2022).

Contract types

Various railway development projects in the Netherlands were mentioned by respondents. These projects did not use a DBFM-contracts since other contract types were deemed more suitable for the task. ProRail mainly makes use of D&C contracts, called UAV-GC contracts. Other contract types used are the two-phase contract variant on the standard UAV-GC contracts, alliances, and PGO (Process Controlled Maintenance, Prestatie Gericht Onderhoudscontract in Dutch) contracts for the maintenance of existing infrastructure (R-1; R-2; R-3; R-4, 2022). The norm is to use D&C (UAV-GC) contracts, with smaller contracts called D&C light for smaller infrastructure such as tunnels (R-3, 2022). According to R-1 (2022), the engineering component of the contract can differ in size, dependent on the scope of the project. The use of the two-phase contract is becoming more common, in this contract type, there is more collaboration between ProRail, the contractor and the engineering firm before the realisation phase (R-2, 2022).

4.3.2 Key differences

According to respondents, there are various key differences in railway development in comparison to highway development. These differences make DBFM-contracts for railway development less suitable.

Number of contractors

ProRail uses a so-called acknowledgement regulation (Erkenningsregeling in Dutch). This regulation consists of certain requirements needed for a contractor or engineering firm to be allowed to work on railway infrastructure in the Netherlands (R-1, 2022). This regulation guarantees ProRail that a certain level of knowledge and expertise is being contracted. The downside of this is that there is only a small party of engineering firms and contractors that is allowed and able to work on the railway infrastructure (R-2; R-3; R-4, 2022). Whereas the choice for Rijkswaterstaat in especially engineering firms is larger (R-3, 2022). R-4 adds that contractors from outside the Netherlands are potentially being overlooked. This would however only be a possibility for large projects. Dutch contractors are also more experienced with the type of maintenance contracts used in the Netherlands, making new entries challenging (R-4, 2022).

Integrated system and Maintenance

Respondents describe the railway system as an integrated system, where everything is connected. Especially train safety systems run over a larger part of the system than only a certain renovation or train station project (R-1; R-3; R-4, 2022). "*The use of DBFM would result in a patchwork of different projects, and different responsibilities. All these parts would still need to be able to communicate to each other.*" (R-3, 2022). R-1 mentioned that this results in a higher complexity in the railway network compared to highways, since maintenance work causing a disconnection to the rest of the network has a large impact on travellers and the rest of the network. In railways there are significantly fewer options for diversion (R-1, 2022). Because of this complex system, ProRail uses one maintenance contract per region, separated from the project contracts (R-3, 2022). Since maintenance and operation are separate entities within ProRail, the integration of maintenance as a component of DBFM does not fit within the philosophy (R-2, 2022). Respondent 4 adds to this that the materials used in railway infrastructure have a longer lifespan than materials used in highway infrastructure: "*When we replace rails, switches, and ballast, these are replaced for about 60 years. Road heating and asphalt will have to be replaced every 6 years. It's an entirely different dynamic.*"

Collaboration

Respondent 1 mentions the need for collaboration to be an important goal for ProRail. "*There is more need for contract types that have a positive effect on collaboration, than for DBFM.*" Respondent 2 adds to this that ProRail is dependent on the availability of its contractors. Increased risks in contracts may result in contractors being unwilling to work for ProRail (R-2, 2022). This urge for improved collaboration can be especially seen in the emergence of the two-phase and alliance contracts. Respondent 3 mentions: "*I believe that in a two-phase contract, or an alliance, you are being forced to create a better collaboration between public and private parties.*" An important aspect within these contracts is the elimination of risks in the early stages of the contract. The contracts are smaller, and the risk profile is more balanced (R-3, 2022). Respondent 4 argues that Rijkswaterstaat and ProRail are trying to be more competent commissioners, since market parties may not always be competent enough yet for the use of D&C or DBFM-contracts, in comparison to international contractors. According to respondent 4, good collaboration starts with recognition of the fact that public and private parties do not share a common interest: "*If both parties acknowledge that, there is a better understanding of why the contracts are this extensive.*" (R-4, 2022).

Innovation

Innovation within railway development is deemed to be more difficult than in highway development. Respondent 1 argues that innovations in parts of the railway network are difficult since the network would still need to be able to communicate with the rest. Innovations are thus mainly applied over the entirety of the network, such as with improved rail safety systems (ERTMS) (R-1, 2022). This also applies to innovations regarding sustainability such as the use of new and cleaner materials. With innovations, risks are high. For this reason, new train safety systems are implemented over the entire network at once, after extensive testing (R-3, 2022).

4.4 Potential for DBFM-contracts

The potential of the use of DBFM-contracts for railway development in the Netherlands is generally conceived as low by the respondents. These arguments are discussed here.

4.4.1 Arguments against future DBFM-use

Integrated system and complexity

The closed, integrated system of the railway network, with separate organizations for operations and maintenance, makes DBFM contracts unsuitable since these existing contracts would need to be terminated (R-3, 2022). The interrelated network in terms of train safety systems running over a longer part of the network than the projects themselves make the use of an integrated DBFM-contract less suitable as well. The systems need to communicate with each other, it is impossible to disconnect a part from the network (R-1, 2022).

Risk management

Smaller contracts with a more balanced risk profile are deemed more suitable to the task. *"We need more collaboration and a more balanced risk profile than we currently have, other types of contracts are more suitable for this. Mainly alliances and the two-phase contracts."* (R-3, 2022).

Contractors

ProRail uses different contracts for maintenance and operations because of the characteristics of railway development. Respondent 4 mentions that the experience of contractors with DBFM in railway development is low, making the use of these contracts difficult to start with (R-4, 2022). "*Contractors from Spain, Scandinavia and especially France are much more experienced with DBFM-contracts, think of VINCI running entire airports in southern Europe. Dutch contractors are not at that level yet."*

Flexibility

Flexibility is important for railway development. Respondent 4 mentions the problems caused by the rigid HSL-Zuid DBFM-contract as an example: *"Until this day we experience problems with the contract used in that time. It is very difficult to look 20-30 years into the future. It is important that changes can be made during the contract duration."* (R-4, 2022).

Manageability

Respondent 1 argues that the manageability of contracts will decrease with the use of a DBFM-contract. *"Handing over an entire project to a private party,*

*combined with the higher complexity will decrease the manageability of the project for ProRail. For this reason, we divide a large project into smaller projects and contracts, improving the overall manageability." (*R-4, 2022).

Culture and politics

Respondent 3 calls the culture at ProRail one of the reasons that DBFM is less suitable. Since passenger operations, infrastructure and maintenance were all part of NS only 30 years ago, there is a philosophy of being highly involved in the projects. This may change in the future but a change in philosophy is needed in that case (R-3, 2022). *"The use of DBFM and private financing is not forbidden, however, political will has a high influence on if this is being considered. This is currently not the case in my experience."* (R-4, 2022).

According to Verhees (2013), ProRail prefers alliance contracts to DBFM(O). Additionally, it is mentioned that ProRail looks to have chosen for the alliance contracts due to experiences with the Betuweroute. Alliance contracts were also used for railway developments in Arnhem and Amsterdam/Almere (SAAL). ProRail finds that the concession model is less suitable for railway infrastructure due to various reasons:

-Conditioning of the infrastructure due to limited number of materials, sizes, shapes, and coordination with rolling stock.

-The network character of railways.

-The need for integrated maintenance in the main network, because of uniform products and systems.

-The focus on sharing risks (alliance) instead of spread risks (concession) (Verhees, 2013).

4.4.2 Arguments for future DBFM-use

Financing

According to respondent 4 private financing could be a useful asset to railway development. *"In the case that the project and contract are relatively stable, with low risks, private financing would create some sort of calmness in your financing."* (R-4, 2022). *"It often occurs that you think: why don't we loan €100 million? Or why don't we let private investment in? In that case we could do this project in one go." (*R-4, 2022). This is however currently not common and would need to be arranged together with the ministry (R-4, 2022).

Efficiency

Respondent 4 argues that giving more responsibility to market parties leads to a higher efficiency compared to a high responsibility for ProRail: "*These market parties are more competent in that department.*" A certain level of private involvement can have a positive effect in terms of costs (R-4, 2022).

Project type

The type of project in terms of budget and scale is an important aspect for the use of DBFM, projects of the right scale and budget are however rare in railway development (R-2, 2022). Respondent 4 gives the example of a straight replacement of a certain track (e.g., Amersfoort-Groningen), in the case that the entire route is being replaced without major changes, DBFM would theoretically be possible, including maintenance. "*This would be uncluttered, and it would be relatively easy to make concrete agreements.*" (R-4, 2022). However, these projects are rare, since such replacements are carried out in smaller steps. The Hanzelijn was a project where DBFM would have been possible, however not added value in terms of finance was expected. DBFM would also be a possibility for the Lelylijn. However, the future of this plan is unsure (R-4, 2022).

ZBO-status ProRail

According to respondent 1, the change in status of ProRail to a ZBO (Zelfstandig Bestuurs Orgaan, Dutch), creates a direct link to the Ministry of Infrastructure and Water Management, making the Finance component of DBFM more interesting to ProRail (R-1, 2022). Respondent 4 agrees with this and adds: "*Direct ministerial responsibility over ProRail may result in higher political pressure on certain railway development projects, making DBFM a possibility.*" Respondent 3 argues that the change would not have a significant effect on the daily operations at ProRail (R-3, 2022).

The potential for the use DBFM-contracts is generally seen as low. The change in status to ZBO for ProRail and political willingness may cause this to change in the future. However, factors such as risk management, the integrated system, high complexity and the lack of experience and culture for the use of the contract type make its implementation, and the use of private financing unlikely

Chapter 5. Conclusion and discussion

5.1 Conclusions

Public-private partnerships, in the form of DBFM-contracts are currently rare in railway development in the Netherlands. The HSL-Zuid was the only railway project where DBFM was used. This newly built high-speed railway line can be seen as an entirely new addition to the Dutch railway network. The line is different from the rest of the network as a separate train safety system specified for higher speeds is installed on the line. These factors made a DBFM-contract more suitable. Future use of DBFM in railway development has a low potential, according to the respondents of the interviews in this thesis. Since there are no real missing links in the Dutch railway network, large new lines are not planned soon. The much-discussed Lelylijn could potentially be such a missing link. The development of a new line of this scale would result in a project where a DBFM-contract could potentially be used. The lack of such projects in railway development in the Netherlands make the future use of DBFM in railway planning unlikely, other types of contracts are deemed more suitable for the current needs. A change may occur after the reorganization of ProRail into a ZBO, the effect of this on the use of DBFM is still unsure. The respondents have mixed opinions on this case. The research has shown differences between the characteristics of railway planning and highway planning, which explain the types of contracts used.

5.2 Recommendations

DBFM may be a useful tool to speed up railway development through private financing. Projects suitable for the project type are however rare making the future of DBFM in railway planning doubtful. Other types of contracts are deemed more suitable for various reasons. Financing is not a part of these contracts. More research and discussion about the potential of private financing for railway development may be helpful to see the chances of private financing, and to overcome the current obstacles.

5.3 Discussion

This thesis adds to the literature on DBFM-contracts. It builds on the existing theory while making the theory on the contract type and its requirements and suitability to railway development more specific. Verhees (2013) explains the preferences of ProRail regarding contract types. The conclusions here are still the same nine years later. Negative experiences from the past in combination of the different characteristics of railway infrastructure make the use of DBFM unlikely. A change in political willingness and culture would need to happen before private financing has potential in railway development.

5.4 Reflection

Looking back on this research process, it was a process of ups and downs. The topic and research questions resulted in broader research than expected, which made the research process challenging at times. Finding (suitable) respondents for the interviews was challenging as well. After being referred to managers with the right knowledge and experience, four respondents were willing to participate. The interviews were very positive and interesting. The openness and honestness of the respondents were much appreciated, as this resulted in interesting, in-depth answers to the questions, and overall pleasant conversations on the topic.

This thesis provided a look into the potential of DBFM-contracts for the railway development sector in the Netherlands. The result of this is a global view of the sector, going less in-depth into specific projects. Future research on DBFM in railway development may need to focus on the project level more extensively. During this research, the process of finding suitable data on railway projects in the Netherlands was challenging. Data and reports on the project level are rare and/or difficult to gain access to. Future research on the project level may benefit from WOB-requests (Wet Openbaarheid van Bestuur). This however is still challenging as ProRail itself is not covered by this law currently, this will change in the future, creating chances for more in-depth research on the topic.

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Appendix 1 - Interview Guide

Introductie

-Voorstellen en omschrijving van onderzoek

-Uitleg over rechten van respondent met betrekking tot anonimiteit etc.

-Toestemming voor opname vragen en opname starten

-Kunt u mij iets vertellen over uw achtergrond en werkzaamheden bij ProRail?

-Bij welke projecten bent u betrokken geweest.

-Toelichting op projecten

-Welke andere partijen waren betrokken bij dit project?

-Welke contractvorm werd gebruikt bij dit project?

Voordelen DBFM-contracten

-Verbetering van risicoanalyse

-Optimaliseren van ontwerp en bouw fase - beter management van totale project inclusief onderhoud

-Verbetering van zicht op toekomstige kosten (lange termijn)

-Verbetering van opleveringsduur

-Innovatie

-Kosten spreiding over langere termijn

-Zijn deze genoemde voordelen van meerwaarde voor spoorwegontwikkeling bij ProRail?

-Vergelijking tussen gebruikte contractvorm en DBFM?

-Hoe komen deze punten terug in de gebruikte contractvorm?

-Doorvragen naar belangrijke aspecten bij keuze contractvorm

Karakteristieken van projecten die geschikt zijn voor een DBFM-contract

-Keuzes in de bouw fase hebben een effect op de onderhoudsfase

-Het is mogelijk om de eisen voor de lange termijn vast te stellen

-Project formaat in budget - minimal 60m bij rijkswaterstaat als ondergrens

-Per aspect - voldoet (genoemde project) aan deze karakteristieken volgens u?

-Hoe verschillen deze karakteristieken volgens u binnen spoorwegontwikkeling

-En waarom?

-Kan een project qua budget ook te groot zijn voor het gebruik van een DBFM-contract?

-Hoe is de connectie tussen bouw fase en onderhoudsfase bij genoemde project vastgelegd?

-Kunt u nog een voorbeeld noemen van karakteristieken van een project die het geschikt maken voor gebruik van een DBFM-contract binnen spoorwegontwikkeling?

Vergelijking spoorwegontwikkeling - snelwegen

-Wat zijn volgens u belangrijke verschillen tussen deze twee?

-Mbt: -Infrastructuur

-Projectmanagement

-Organisatorisch (Rijkswaterstaat vs ProRail)

-Wat maakt de (genoemde contractvorm) volgens u beter passend bij het project dan een DBFM-contract?

-Wat maakt een DBFM-contract niet geschikt voor dit project?

HSL-Zuid

-Weet u waarom de HSL-Zuid wel geschikt geacht werd voor het gebruik van een DBFM-contract?

-Wat is de rol van ProRail binnen de HSL-Zuid?

-In welke mate is de HSL-Zuid vergelijkbaar als project met andere projecten binnen spoorwegontwikkeling bij ProRail?

Toekomst DBFM en ProRail

-Is het mogelijk dat DBFM-contracten toegepast worden bij ProRail in de toekomst?

-Waarom wel/niet?

-Wat voor soort projecten zouden geschikt zijn voor DBFM in de toekomst?

-Zijn er andere minder voorkomende contractvormen die meer geschikt zijn in de toekomst? (Benoem twee-fasen contract)

-Wordt de DBFM-contractvorm als serieuze optie gezien bij het kiezen van een contractvorm?

-Wat zijn hier de redenen voor?

-In welke mate maakt de rol van ProRail als beursgenoteerde vennootschap DBFM minder geschikt?

-Kan de verandering van ProRail naar een ZBO in de toekomst hier effect op hebben?

Afsluiting

-Heeft u nog iets extra toe te voegen?

-Heeft u nog vragen?

-Ontvangst van transcript/eindversie gewenst?

-Dank voor tijd en deelname

Appendix 2 - Interview Consent Form

Overeenkomst van deelname
Onderzoeksproject: Bachelor Scriptie Spatial Planning & Design M.H. Sluiman
Titel: Potential of DBFM-contracts in railway development in the Netherlands

Het doel van dit onderzoek is om in kaart te brengen wat de potentie van publiek-private samenwerkingen in de vorm van DBFM-contracten is voor spoorwegontwikkeling in Nederland.

Geachte heer/mevrouw,

Dank voor uw medewerking aan mijn onderzoek naar de potentie van het gebruik van DBFM-contracten voor spoorwegontwikkeling in Nederland.

Het interview zal dan wel telefonisch dan wel online plaatsvinden en ongeveer 30-45 minuten in beslag nemen, afhankelijk van of u een onderwerp extra zou willen toelichten. U kunt het interview ten alle tijden stopzetten of aangeven een vraag niet te willen beantwoorden. Indien gewenst is het mogelijk om anoniem te blijven. Het interview zal worden opgenomen en op een later moment worden getranscribeerd. Wanneer gewenst, is het mogelijk om het transcript achteraf met u te delen zodat u het kunt controleren en waar nodig aanpassen. De gegevens en het transcript van dit interview zullen vertrouwelijk worden behandeld en de audio opname zal na afloop van het onderzoek verwijderd worden. De scriptie zal worden opgenomen in het archief van de Rijksuniversiteit Groningen, het transcript zal hier niet in opgenomen worden.

Met het ondertekenen van deze overeenkomst verklaar ik dat:

- Ik deze overeenkomst heb gelezen en begrijp waar het onderzoek over gaat.
- Ik begrijp dat deelname aan dit onderzoek vrijwillig is en ik begrijp dat ik het recht heb mij terug te trekken uit dit onderzoek tot het moment dat het onderzoek is afgerond.
- Ik begrijp dat ik niet verplicht ben om individuele vragen te beantwoorden.
- Ik begrijp dat mijn deelname aan dit onderzoek vertrouwelijk is. Zonder mijn toestemming mag geen materiaal dat mij kan identificeren gebruikt worden in de rapportage.
- Ik begrijp dat de data van dit interview kan worden gebruikt in artikelen, hoofdstukken van boeken, gepubliceerd en ongepubliceerd werk en in presentaties.
- Ik begrijp dat alle gedeelde informatie vertrouwelijk zal worden bewaard, op een beveiligde computer of bestand.

Voor verdere vragen kunt u contact opnemen met:

Marten Sluiman (student)
m.h.sluiman@student.rug.nl

En

dr. Stefan Verweij (begeleider)
s.verweij@rug.nl

Graag de volgende punten JA of NEE invullen

Ik ga akkoord met de audio opname van dit interview JA / NEE

Ik wens anoniem te blijven JA / NEE

Wanneer ja
Mijn naam mag gebruikt worden in het onderzoek JA / NEE
OF
Een eigen gekozen pseudoniem wordt gebruikt in het onderzoek JA / NEE

"Ik ga akkoord met de deelname aan dit interview en erken ontvangst van deze overeenkomst"

Naam onderzoeker: M.H. Sluiman Datum: 11-05-2022

Naam deelnemer:

Datum:

Email adres:
(In het geval dat u het transcript van het interview wil ontvangen.)

Appendix 3 - Inductive Coding

Concept	Code group	Code
Characteristics of railway development	General information	Projects Contract type Budget Project size
	Key differences	Small number of contractors System Maintenance Collaboration Innovation
Potential for DBFM in railway planning	Arguments for future DBFM-use	Financing Efficiency Project type ZBO-status
	Arguments against future DBFM-use	Complexity Culture Integrated system Risk management Politics Contractors Flexibility Manageability

Appendix 4 - Deductive Coding

Characteristics	Added value	Finances	On budget delivery
			Return for contractors
		Time	On time delivery
		Quality	Process- and product quality
			Outcome life-cycle approach
		Innovation	Level of innovation
		Availability	Project approach of contractors
			Level of availability
	Visibility long term requirements	Constant standards	Level of change
		Flexibility	Level of flexibility
			Room for adaptation/change
		Risks	Amount of risk
		Role of banks	Contribution to risk management
			Type of role
	Project scale	Budget size	CAPEX/Budget
		Complexity	Level of complexity
		Collaboration	Level of collaboration
	Maintenance component	Life cycle optimisation	Outcome of life-cycle approach