What are the experiences of private partners with the incentive mechanisms in DBFM contracts and how can these experiences affect the performance of DBFM contracts?

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COLOPHON

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ABSTRACT

Since 1986 onwards, Public-Private Partnerships became more popular for Rijkswaterstaat to use for road infrastructure in the Netherlands (Eversdijk, 2015). A specific form of Public Private Partnership (PPP) became more popular, the Design, Build, Finance and Maintain (DBFM). In this form of contract, "incentive" mechanisms are present that are expected by the public partner to guide the behaviour and acting of the private party (Verweij & van Meerkerk, 2021) to achieve higher contract performance. However, the experience of the private partner with mechanisms is often overlooked in a DBFM contract in Dutch infrastructure planning (Eversdijk, 2015), while literature suggest that this can be a key factor to a successful/unsuccessful PPP contract. Therefore, the main research question in this qualitative research is the following: *"What are the experiences of private partners with incentive mechanisms in DBFM contracts and how can these experiences affect the performance of the DBFM contracts?"* Answering this question can help improving the functioning of DBFM contract in the future in terms of design and application, thus achieving better contract performance in terms of time, cost, quality, and innovation (Koppenjan et al., 2022) due to being able to identify bottlenecks and problems as well as positives in DBFM contracts from a private partners' point of view. A literature review and semi-structured interview are conducted. In the literature, the following incentive mechanisms for DBFM contacts have been identified: Performance-dependent payment, private financing, contract integration and contract flexibility. To measure the contract performance, the following indicators have been used: cost, time, quality, and innovation performance. The experiences of private actors with the mechanisms and subsequently their effects on the contract performance have been investigated. The results indicate that mostly, the experiences can be linked to the expected positive DBFM performance effect. However, multiple negative experiences were found to strongly influence DBFM contract performance negatively and can lead to suboptimal contract performance if not addressed. Therefore, this research shows that the private partners' experiences are important in determining the expected performance of DBFM contracts, and that private partners experiences play a significant role in creating both successful DBFM projects, while at the same time also contributing to possible suboptimal performance results; indicating that there is certainly room for performance improvements trough improvement of the negative private experiences discussed.

1. INTRODUCTION

1.1 BACKGROUND & RELEVANCE

Rijkswaterstaat is a governmental executive agency responsible for maintaining and developing the most major stretches of road in the Netherlands. The role of Rijkswaterstaat in organizing road infrastructure projects has changed significantly: where pre-1970 Rijkswaterstaat was solely responsible for all tasks related to a road infrastructure project, this changed from the seventies onwards. It meant that Rijkswaterstaat more often tried to behave as an administrator and a manager of road infrastructure rather than a builder and creator. This led to the private sector becoming much more involved in both designing, building, financing, and maintaining the road network in the Netherlands due to Rijkswaterstaat opting to divert more responsibilities to the private sector (Ministerie van Infrastructuur en Waterstaat, 2021). Building on this trend of close collaboration between a public and private actor, Public-Private Partnership contracts have been more actively used in road infrastructure projects from 1986 onwards in the Netherlands, and specifically Design, Build, Finance & Maintain (DBFM) contracts in this sector (Eversdijk, 2015) to pursue Rijkswaterstaat's main goal. In PPP contracts, often incentives are identified by the public partner that are expected to guide the behaviour and acting of the private party (Verweij & van Meerkerk, 2021), and thus result in certain beneficial performance results for the public actor. However, in research, often PPPs are mostly discussed from the point of view of the public actor (EPEC, 2015), while studies such as Eversdijk (2015), Välilä (2020) and Van den Hurk & Verweij (2017) stress that in many cases the experiences of the private partner are not discussed/considered as much. The experience of the private partner is often overlooked and can be the key factor in unsuccessful PPP/Design Build Finance Maintain contracts (Eversdijk, 2015). With the experience of the private partner with mechanisms often overlooked in a DBFM contract in Dutch infrastructure planning (Eversdijk, 2015), it is interesting to explore how the private actor experiences certain mechanisms and characteristics of DBFM contracts, and if and how this lack of attention towards the private experience affects the performance of a DBFM contract. A better insight in the experience of the private party can possibly aid in improving the functioning of DBFM contract in the future in terms of design and application, thus achieving better contract performance in terms of time, cost, quality and innovation (Koppenjan et al., 2022) due to being able to identify possible bottlenecks and problems as well as positives in DBFM contracts from a private partners' point of view.

1.2 RESEARCH PROBLEM

The main aim of this research will be to find out which incentives are applied by the public actor (Rijkswaterstaat) and how the private partner experiences these. By doing this, an attempt is made to provide insight in which mechanism are used in such contracts, how they are experienced by the private partner and subsequently if these mechanisms may form obstacles in achieving higher contract performance (Koppenjan et al., 2022). Therefore, the main research question will be the following:

"What are the experiences of private partners with incentive mechanisms in DBFM contracts and how can these experiences affect the performance of the DBFM contracts?"

Consequently, to be able to answer this, the following questions need to be addressed.

1. *"What are the main incentive mechanisms in DBFM contracts why a public actor (Rijkswaterstaat) uses PPP over a traditional method in road infrastructure?"*
2. *"How are the mechanisms used by Rijkswaterstaat in a DBFM contract experienced by the private partner?"*
3. *"How can the private experiences affect the performance of the DBFM contract?"*

1.3 READING GUIDE

This thesis consists of seven chapters. In the second chapter, the core concepts and literature on which this research is based will be defined. The third chapter will explain and elaborate on the methodology used for the research and the analysis techniques. The fourth chapter contains a presentation of the main results of the interviews conducted with people from private parties that have agreed to share their experiences about DBFM contracts with Rijkswaterstaat. Chapter five will provide an answer to the main research questions based on the findings and literature, while also providing recommendations. Chapter six will discuss the main findings and conclusions, and chapter seven will provide a discussion and reflection on the research process together with future research suggestions

2. THEORETICAL FRAMEWORK

2.1 INCENTIVE MECHANISMS FOR THE PUBLIC ACTOR IN DBFM

To be able to understand the reasons why public actors choose for a PPP, or more specific a DBFM approach, we need to know the already identified incentive mechanisms for the use of DBFM in the literature. In a DBFM contract, the mechanisms aim to provide a higher performance in terms of Value for Money (EPEC, 2015) for the public curator compared to other contract forms such as Design & Construct for example. Next to this, advantages are often expected in terms of cost, time, or quality (Warsen et al., 2018).

2.1.1 PERFORMANCE-DEPENDENT PAYMENT

Verweij & van Meerkerk (2021) identify multiple incentive mechanisms in their article about the performance of DBFM compared to regular contracts. The first mechanism identified is performance-dependent payment. In DBFM, the private partner finances the project. Only if a project is fully constructed, the private partner receives payments from the public partner (Culp, 2011), and additionally project milestones can be implemented for receiving payments. On top of this, when the construction of a project is finished, the private partner can receive payments in the for a period of about 20 to 30 years for the maintenance (Yescombe, 2007). This all means that the private partner only receives payments if the construction and maintenance of the project is deemed satisfactory based on the output specifications and deadlines agreed upon in the DBFM contract. If a private partner does not meet the specified output specifications, the public partner is able to fine the private partner and/or reduce their payments and if case they are unable to meet important agreed upon deadlines, payments can be delayed or they run the risk of being fined (Demirag et al., 2011). By doing this, the private partners income in a project is made very much reliant on payments received from the public partner, with the aim of enhancing the speed of a project through setting strict deadlines and satisfactory outcomes that are a requirement for payment, thus positively influencing the time performance of a project. Next to this, Koppenjan et al. (2022) mention that performance-dependent payment also is expected to affect the quality performance of a project. In a DBFM, when a product is not usable, due to for example maintenance or unforeseen repairs, payments can be either delayed or lowered by the private partner. This subsequently affects the profit of the private partner in a negative manner. Because of this, an incentive is created for the private consortium to invest in high-quality infrastructure that requires less maintenance and repairs in the long-term (Koppenjan et al., 2022). This should then aid in achieving a higher quality performance compared to for example D&C contracts.

2.1.2 PRIVATE FINANCING

The second identified mechanism by Verweij & van Meerkerk (2021) is private financing. In a DBFM contract the private party is responsible for financing the project upfront, after which it tries to retrieve money back over the course of the project (Yescombe, 2007). This financing often is done by obtaining loans from banks or other private equity providers. This then means that risks related to the financing are in hands of the private party in a DBFM (De Palma et al., 2009). These equity providers are often perceived as risk-adverse and will only provide loans on projects that have high quality risk management (Demirag et al., 2011). For the private party this then

means that they are expected to provide better identification, allocation, and mitigation of risks by applying better quality risk management. This then should lead to a reduction of the impact of unforeseen events and circumstances on a project. Combined with the fact that additional work is likely to be financed by the private consortium as well (De Palma et al., 2009), the expected effect of private financing is that there is an increase in cost performance in terms of on-budget delivery, and an increase of time performance through means of better on-time delivery (Koppenjan et al., 2022). However, another expectation related to private financing is that it may hinder the use of innovations due to sparking risk-adverse behaviour, and therefore innovation may only be incremental (Hueskes, 2019).

2.1.3 CONTRACT INTEGRATION

Koppenjan et al. (2022) also mention the integration of the DBFM-contract as a mechanism. DBFM contracts bundle different facets of creating road infrastructure together in just one contract for the private party: they integrate multiple phases that in more traditional approaches are separated. In DBFM, the inclusion of the maintenance component allows for example life-cycle optimizations and economies of scope. The though behind this is that this can lead to extra investment in higher-quality infrastructure to prevent costs occurring in the maintenance phase, increasing the quality performance. But bundling multiple phases together in one contract does also mean for the private party that they can apply and have the freedom to determine their own mix of design, construction and maintenance plans to be able to reduce maintenance costs, thus increasing the cost performance of a project through lifecycle optimization (Koppenjan et al., 2022), as well as increasing time performance through integrated project approaches (Lenferink et al., 2013). Additionally, it means that that there is room for innovation to implement for the private party: lifecycle optimization often demands new and smart solutions. Related to this, because a DBFM only specifies the services expected from the private party but not the inputs, there is freedom to apply innovative solutions to meet the specifications of the contract (Lewis, 2021).

2.1.4 CONTRACT FLEXIBILITY

Demiral et al. (2017) also identifies contract flexibility, not necessarily solely as a mechanism, but as an important contractual content for DBFM that can lead to contract mechanisms that are able to facilitate change. They state that PPPs often are applied in environments that face a lot of uncertainty, such as large infrastructure projects that are realized over larger periods of time; DBFMs are often contracts that have a duration of around 20 to 30 years. Therefore, a challenge in PPPs such as DBFM is to keep the cost and time performance under control when changes occur. A way to do this is by using clever contracting, proactively anticipating potential change in the planning, and providing flexible contract mechanisms that enable responses to mutations (Demiral et al., 2017). If flexibility is implemented in an effective way within a PPP contract by the public actor, the private actor should be able to have the ability to deal effectively with changing circumstances, thus improving time and cost performance of the contract due to the contract being able to deal with changing circumstances in an effective manner.

2.1.5 PERFORMANCE OF A DBFM CONTRACT

To be able to understand in which ways the experience of the private actor can affect the performance of the contract, indicators of performance need to be established. Koppenjan et al. (2022) mentions the following four indicators of DBFM performance:

- Cost performance
- Time performance
- Quality performance
- Innovation performance

In Appendix 1 an in-depth explanation of each performance indicator is presented. Through determining these areas of performance of a DBFM, assumptions and conclusions can be made about influences the experiences of the private actor have on the contract performance. In Figure 1 the expected relationships per mechanism can be observed.

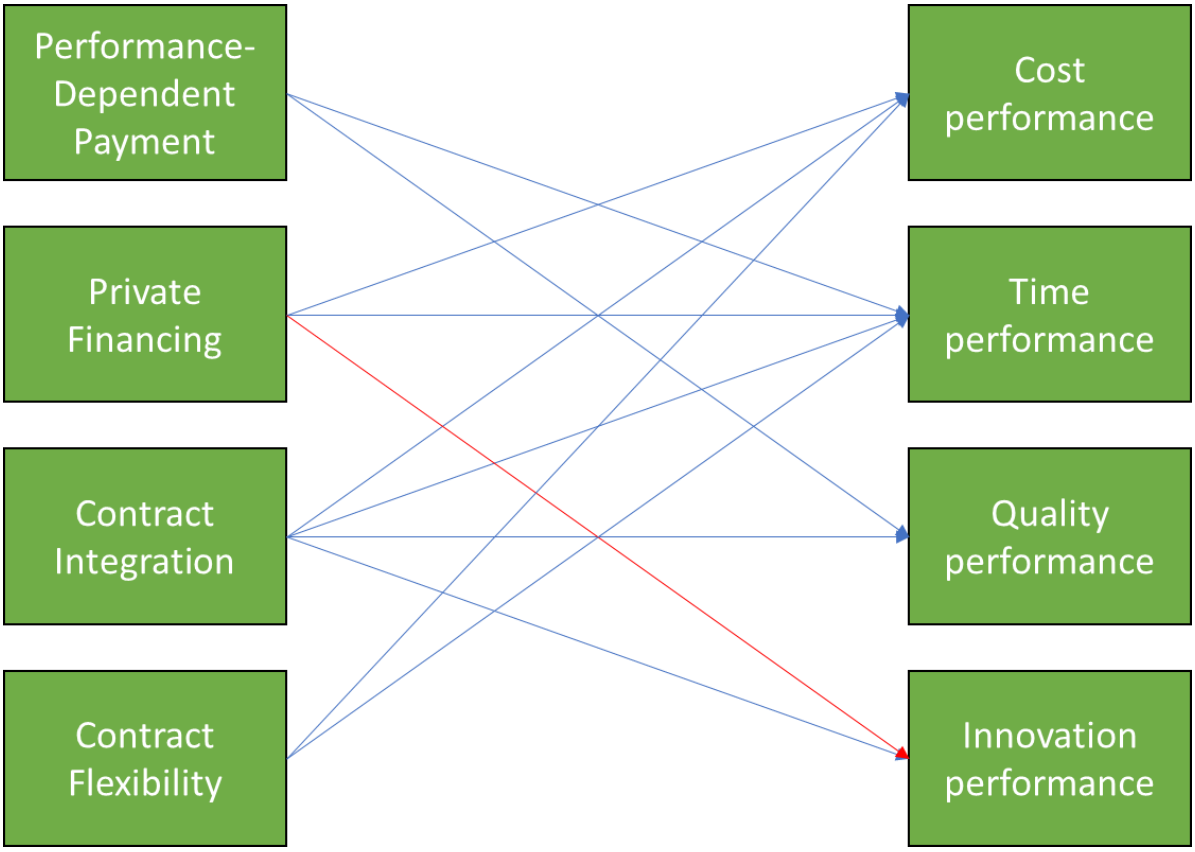

Figure 1 The expected relationship between the identified mechanisms and performance indicators (Koppenjan et al., 2022; edited by Author, 2022).

2.2 CONCEPTUAL MODEL

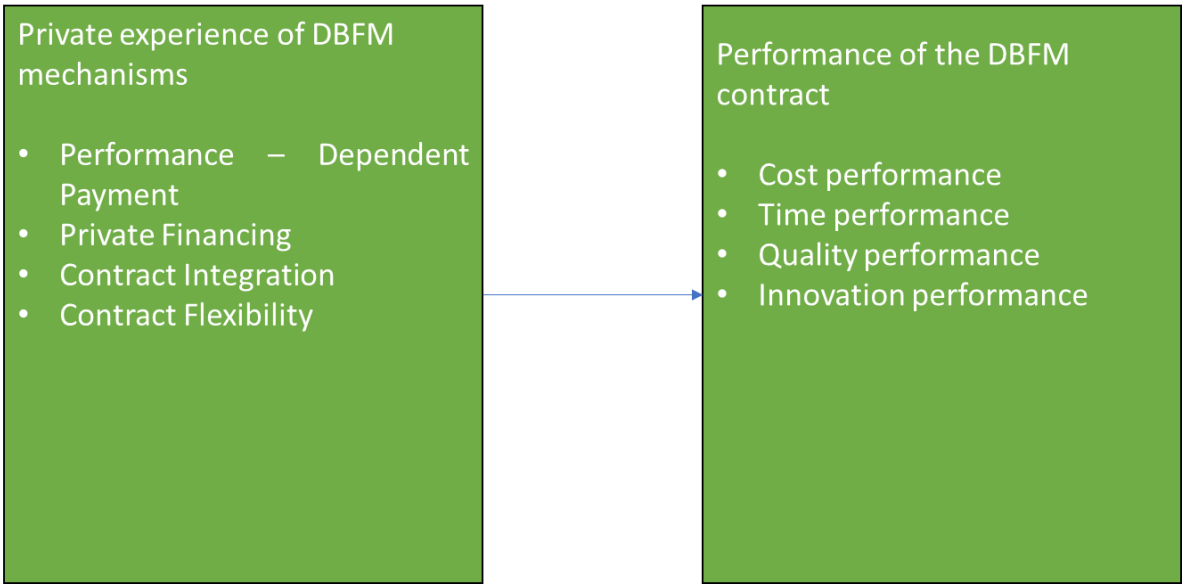

Figure 2 An overview of the relations between the theory discussed in the theoretical framework (Author, 2022).

3. METHODOLOGY

In this research, the aim of this is to explore the experiences of private actors with the identified mechanisms in DBFM and subsequently the possible effects on the performance of the DBFM contract in terms of cost, time, innovative and quality performance. Additionally, a literature review will be conducted to enrich the data.

3.1 ETHICAL CONSIDERATIONS

Ethical considerations will be given plenty of attention. The researcher has no personal connections with any of the parties involved in the research and has the aim to be as objective as possible. Next to this, the researcher is an outsider of this specific domain with no personal interests whatsoever. The respondent's privacy will be maintained by anonymizing the data in terms of names and contact data. No data will be distributed to third parties or published without consent of the participants. To be able to participate, all the respondents must consent up front to participating. At last, there will be no harm done in terms of social stereotypes or discrimination of any form when selecting participants to obtain maximal objectivity.

3.2 DATA COLLECTION

The data will be collected by conducting interviews with managers from private actors, meaning primary data is collected. In the interviews with the managers of the private actor, the aim is to gather an understanding of how they experience and view several mechanisms present within DBFM contracts, and subsequently if and how this affects the performance of the DBFM contract. Additionally, secondary data gathered from Koppenjan et al. (2020) will be used. This report contains interview reports in which both private and public partners have shared their experiences regarding several mechanisms and characteristics of DBFM projects in the Netherlands over the past 15 years. For this research, the main findings, and quotes from twenty-two private actors in Koppenjan et al. (2020) will be used.

3.2.1 LITERATURE REVIEW

First, a literature review has been done in the theoretical framework to clear up the scope and establish the relevant concepts that are at the heart of this research. This makes answering the first sub-question possible and forms the base for the interview guide and coding. This subsequently makes comparing results with literature possible (Clifford et al., 2016). Additionally, a literature review of Koppenjan et al. (2020) will be conducted to aid in answering sub-question 2 and 3.

The relevant literature for this research is selected by using 'Google Scholar' and 'Smartcat.' Literature used is a mix of recent and scientific Dutch and international to be able to provide a detailed insight in the mechanism in DBFM contracts and the experiences of private partners.

3.2.2 SEMI-STRUCTURED INTERVIEWS

Primary data has been gathered by conducting semi-structured interviews with people from private parties involved in DBFM infrastructure projects with Rijkswaterstaat. Since experiences with mechanisms in DBFM contracts is a complex and subjective topic, it is important to be able to grasp the deeper understanding of the experiences themselves and the reasoning behind them. Semi-structured interviews enable opportunities to ask open questions to gather a broader scope of the respondents' experiences, while at the same time providing structure that makes sure comparison between respondents is possible. The interviews are in Dutch to make sure the participants can express themselves more easily. The accompanying interview guide can be found in Appendix 1., and the interviews have been recorded using Vimeo and Dolby On. The data that is gathered from the interviews aids in answering sub-question 2 and 3.

For the interviews, seven participants have been contacted via LinkedIn and e-mail based on their experience with DBFM infrastructure projects involving Rijkswaterstaat. Initially, five of those people agreed to an interview, however, four interviews have been conducted in the end due to unforeseen circumstances. The four interviewees differ slightly in their role within the projects; two have the project director of the EPC (Engineering, Procurement and Construction), one interviewee has the role of project director of the SPC (Special Purpose Company), and one person had a role that combined both SPC and EPC project director, leaning more towards the SPC. However, this means that experiences from people from the MTC are lacking.

Name	***Occupation***	***Project***	***Date***	***Medium***	***Duration***
R1	Project Director EPC	A12	10-5-2022	Interview on location	65 minutes
R2	Project Director SPC/EPC	A1-A6	16-5-2022	Microsoft Teams	58 minutes
R3	Project Director EPC	A1-A27	8-6-2022	Microsoft Teams	50 minutes
R4	Project Director SPC	A9	7-6-2022	Microsoft Teams	63 minutes

Table 1 An overview of the characteristics of the interviewees and the interviews (Author, 2022).

3.3 DATA ANALYSIS

The data will be coded and analysed in 'ATLAS.ti' by using transcripts of the interviews and comparing the findings and linking them to discussed theory: experiences, both positive, neutral, and negative experiences will be linked by code to a mechanism in 'ATLAS.ti.' The coding used in 'ATLAS.ti' will have the following structure: each mechanism has its own label. There will be a separate label for Performance-Dependent Payment, Private Financing, Contract Integration, Contract Flexibility and Other. Within these labels, the following codes will be established: positive experiences, negative experiences, cost performance, time performance, quality

performance and innovation performance. This way, a clear overview of each type of experience can be distinguished for each mechanism. In this research, positive experiences are defined as experiences that were either perceived as beneficial or pleasant by the private actor. Negative experiences are be seen as experiences that were perceived as either disadvantageous or unpleasant. In Appendix 3, the corresponding coding tree can be found. After applying codes to the data, an attempt to find patterns in the data will be done, from which the most relevant findings flow.

4. RESULTS

In this section, the main findings from four semi-structured interviews and the literature review will be presented. The chapter follows the structure of the theoretical framework in the sense that it starts with presenting all the present/used mechanisms and the related relevant experiences of private actors related to each of them. With each relevant experience found, the possible implications for the DBFM contract are discussed in terms of cost, time, quality, and innovation performance as described in Koppenjan et al. (2022). The most important and/or interesting findings will be elaborated further.

Results	Positive experiences	Negative experiences
Performance-Dependent Payment	*Certainty of payment > Increase in time performance.* *Increase in planning certainty > Increase in time performance.* *Keeping pressure on the project team > Increase in time performance.* *Working with the technical advisors/public partner at a distance > Increase in time and cost performance.*	*Height of the fines > Decreased time and cost performance.* *Lack of "positive" incentive > Decreased time performance.* *Pressure on the schedule > Decreased time, cost, quality, and innovation performance.*
Private Financing	*Strong incentive for on-time delivery and higher quality due to financial pressure > Increase in time performance.*	*Negative effects on the quality due to pressure on the schedule created by private financing > Decreased cost and quality performance.* *Negative effect on innovation > Decreased innovation performance.* *Cultural differences between banks and their technical advisors, and Dutch infrastructure > Decreased time and cost performance.*
Contract Integration	*A change of mindset towards delivering higher quality > Increase in quality performance.*	*Mindset changes in private organizations to deliver higher quality is difficult > Decreased time, cost, and quality performance.*

	Generating long term income opportunity > Increase in quality performance. *Room to decide when and where to invest in certain phases of the project leading to optimalizations > Increase in cost and time performance.*	
Contract Flexibility	*Room for product optimalisations in both the construction and maintenance period > Increase in cost and quality performance.*	*Too much space for project mutations in DBFM > Decreased cost, time, and quality performance.*
Other	*Collaboration between both EPC, SPC, MTC and Rijkswaterstaat and the stakeholder environment is important: when done right, it can have great positive influence of the performance of a DBFM contract > Increase in cost, time and quality and innovation performance.*	*Risk transfer is a particularly important negative aspect of many DBFM's, since often too many risks are with the party that cannot manage them the best > Decreased cost, time, quality, and innovation performance.*

Table 2 Overview of the main findings (Author, 2022).

4.1 PERFORMANCE-DEPENDENT PAYMENT

4.1.1 POSITIVE EXPERIENCES

Increase in planning certainty

An important positive experience shared among several respondents was that performance-dependent payment enlarges the certainty of the planning (R1; R2; R3, 2022). Due to setting milestones within the DBFM contract, deadlines are made clear and provide certainty in time when it comes to creating schedules. This then subsequently increased the certainty in the planning. Both R1 and R3 perceived performance-dependant payment as an incentive to provide on-time delivery, thus an incentive to increase the time performance.

Working with the technical advisors and the public partner at a distance

Another pattern of positive experience was related to the cooperation with the technical advisors to determine the progress of an object or the project to be able to receive payments. Both R1, R2 and R3 indicated that the technical advisors from the banks that determine the progress related to the milestones are knowledgeable and have the expertise to build large infrastructure projects. This led to little discussion about the progress in relation to getting payments (R2, 2022) and in terms of the order size matching the progress (R1, 2022). Being mostly dependent on the technical advisors and the bank means that Rijkswaterstaat, the client, is kept at a distance when it comes to determining progress and receiving payment, meaning the private partner is not *"bothered by Rijkswaterstaat"* (R2, 2022) and they only have to deal with the banks and their technical advisor most of the time. This experience can lead to higher time and cost performance: there is less discussion, thus time, needed to determine the level of progress and determining if milestones are deemed as satisfied, while also possibly reducing additional costs that are made when discussion takes place.

4.1.2 NEGATIVE EXPERIENCES

Height of the fines are disproportional

One of the most mentioned negative experiences was related to the height of the fines within a DBFM contract. More than once, respondents indicated that the fines could become disproportionally large in a noticeably brief period. Both R1, R2, R3 and R4 indicated a negative experience with the height of the fines. R3 stated that *"A relatively small project can have fines that correspond with a project of eight hundred million euros. That is really out of proportion."* (R3, 2022). Combined with the fact that profit margins are low for the private partner, this means that the private partner must put in an enormous amount of effort to avoid being fined at all costs, since being fined can lead to their profit rapidly diminishing (R2, 2022). This subsequently creates a lot of pressure to get everything done perfectly in one try, leading to an increasing chance of reducing the cost and time performance due to inevitable mistakes occurring under pressure and uncertain circumstances.

Lack of "positive" incentive

Another shared negative experience was that in a DBFM, the public partner really steers towards a fine regime to create pressure for on-time delivery (R2; R3, 2022). However, this means that, combined with the height of fines, the penalty system of DBFM was experienced as a rather "negative system" to enhance time performance. R2 (2022) for example mentioned that Rijkswaterstaat is often a bit too focussed on creating pressure trough fining, while both R2 and R3 (2022) and some private actors in Koppenjan et al (2020) indicated that a more "positive system" would be much preferrable, where you work with "rewards" you can redeem if you achieve a milestone. The current system creates a negative feeling about delivering on-time, reducing motivation for increased time performance.

Rigid and tight schedule leads to pressure

Even though there is a real incentive to deliver on-time, the rigidity of the schedule and the focus on shortening the construction period in DBFM leads to excessive pressure within private organizations (Koppenjan et al, 2020; R2; R3, 2022). The pressure related to the schedule can lead to people getting stressed out and creates opportunity for mistakes, enlarging the chance of lower time, cost, quality, and innovation performance.

4.2 PRIVATE FINANCING

4.2.1 POSITIVE EXPERIENCES

Strong incentive for on-time delivery and higher quality due to financial pressure

The F component of DBFM does show a tendency to provide a strong incentive for on-time delivery and at the same time a higher quality product compared to other contract forms (Koppenjan et al., 2020; R1; R2; R3; R4, 2022). Due to the fact that the private partners are quite dependent on payments from equity providers for a project in a DBFM and that these equity providers are often very risk-adverse (Koppenjan et al, 2020), there is a real incentive to deliver both on-time and deliver quality products among private actors to prevent financial troubles and subsequently discussions about the quality of the product delivered that can lead to withholding or delaying payments by equity providers.

4.2.2 NEGATIVE EXPERIENCES

Negative effect on innovation

An experience shared both by R3 and several private respondents in Koppenjan et al. (2020) is that the F component does not really help in implementing and developing innovations. Often, banks and other equity providers are such risk adverse and want so much certainty that a project will be successful, that innovations can

be hard to develop and implement (Koppenjan et al., 2020; R2; R3, 2022) and are often of incremental nature (Koppenjan et al, 2020). R3 understates this: "*Innovation is fine, but not with us. We want a robust risk profile, and everything that is new sounds scary, thus not possible. The financers are so risk adverse, they want to avoid all risks"* (R3, 2022). Therefore, private financing can reduce the innovation performance of the contract.

4.3 CONTRACT INTEGRATION

4.3.1 POSITIVE EXPERIENCES

A change of mindset towards delivering higher quality

One of the most important experiences shared among all the respondents was that DBFM sparks a change of mindset towards investing in higher quality (R1; R2; R3; R4, 2022). Due to the bundling of the multiple phases of a project, investing in solutions that offer less maintenance and a general higher quality pay off for private partners (R2, 2022). This incentive for higher quality performance shows itself by investing in solutions like better quality asphalt, higher quality metals and more expensive designs (R1; R2; R3; R4, 2022) and increases the quality performance of the contract.

4.3.2 NEGATIVE EXPERIENCES

Mindset change to deliver higher quality is difficult

Even though only one respondent mentioned this, it may be a significant finding, nonetheless. R2 (2022) indicated that changing the culture within larger private companies from delivering short term product towards high-quality products and maintaining them is still hard: *"Previously, a 6-6.5 was enough. With DBFM, an 8.5 is still not enough. But I have to deal with arsenal of personnel that still leans towards a 6.5, or a 5.5"* (R2, 2022). If this also reigns true for other private companies in the infrastructure business, this may be a compelling cause of a decrease in both cost, time, and quality performance.

4.4 CONTRACT FLEXIBILITY

4.4.1 POSITIVE EXPERIENCES

Room for product optimalisations in both the construction and maintenance period

A positive experience related to contract flexibility and partly the integration of the DBFM contract, is that there was often room to accommodate optimalisations in terms of product design in the construction and maintenance period (R1; R2; R4, 2022). This meant that often a higher quality standard could be reached trough optimizing designs and products, and subsequently also higher cost performance through saving money in the long-term.

4.4.2 NEGATIVE EXPERIENCES

Too much space for project mutations in DBFM

However, one of the most mentioned negatives among private respondents was that DBFM contracts often allow for a lot of project mutations, caused by either the public partner (Rijkswaterstaat), the private consortium or external stakeholders such as municipalities (Koppenjan et al., 2020; R1; R2; R3; R4, 2022). Disturbances caused by mutations in large infrastructure project are enormous in both cost and time for private actors and can have profound consequences. R2 underlines this: *"The disturbance of a thousand deviations in such a work is phenomenal, phenomenal"* (R2, 2022). Therefore, the high amount of flexibility in terms of mutations can lead

to a serious decrease in both time and cost performance, and even quality performance due to mutations in the design of a project.

4.5 COLLABORATION

Not necessarily defined as one of the incentive mechanisms in this research but mentioned by all interviewees (R1; R2; R3; R4, 2022) and in Koppenjan et al. (2020) as one of the most important influencers of DBFM contract performance is collaboration. With collaboration is meant both the cooperation between SPC, EPC and MTC, but also their cooperation with Rijkswaterstaat and the stakeholder environment. In this research, collaboration has not been considered as an incentive mechanism, but both Koppenjan et al. (2020) and all four interviewees mention reasons for a strong link between collaboration and the the cost, time and quality and innovation performance of a DBFM contract.

4.6 RISK TRANSFER

An important negative influence on the performance in terms of cost, time, quality, and innovation that was again mentioned by all respondents (R1; R2; R3; R4, 2022) and in Koppenjan et al. (2020), was the general risk transfer within DBFM contracts. Risk transfer is not defined as a separate mechanism in this research, since it has strong overlap with private financing, performance-dependent payment, and contract integration. However, there were some interesting findings about the risk transfer in DBFM. In a DBFM, in the first place all risks are transferred to the private party, with the idea that the responsibilities are with those who can manage them the best (Culp, 2011). However, several respondents in Koppenjan et al. and R1, R2 and R3 indicated that this does not hold true and private partners for example often must manage risks that either are not necessarily theirs (R2, 2022) or risks that the public partner can manage better (Koppenjan et al, 2020; R1; R3, 2022). When such a situation occurs where the private party must manage risks that they cannot manage the best, performance in terms of cost, time, quality, and innovation may become suboptimal.

5 CONCLUSIONS

This research shows that the private experiences with each incentive mechanisms in DBFM contracts is not something where there is just one unequivocal answer, and that each mechanism creates its own unique set of experiences, both negative and positive. At the same time, it provides insight in which mechanisms are important to pay attention to when considering contract performance in terms of cost, time, quality, and innovation from a private point of view, and considers whether the mechanisms achieve the performance effects that are expected by public partners.

In the literature, the main incentive mechanisms because a public actor (Rijkswaterstaat) chooses PPP over a more traditional contract type have been identified for this research as performance-dependent payment, private financing, contract integration and contract flexibility. These mechanisms are expected to push and guide the private partner to perform certain actions that lead to better performance in terms of time, cost, quality, or innovation.

In general, the private experience with the mechanisms within a DBFM contract varies greatly. Each mechanism has shown that it has both its positive and negative experiences. When it comes to contract performance, several findings are in line with the expected performance effects in the literature (EPEC, 2015; Koppenjan et al., 2022), but some were not.

The results have shown that in general, performance-dependent payment can be linked to an increase of cost performance, which is in line with Koppenjan et al. (2022). However, the pressure on the schedule, lack of “positive” incentive and the height of the fines can decrease time, cost, quality, and innovation performance if

not addressed properly. A direct link between performance-dependent payment and quality performance increase could not be established in this research.

When it comes to private financing, it can be related to a strong incentive for on-time delivery, thus better time performance. However, the results have shown that the F component brings a lot of negative experiences for private partners that seriously decrease contract performance. Private financing restricts innovation for the private partner, and at the same time provides an excessive pressure on the schedule, leading to decreased performance in terms of cost and quality performance.

Contract integration in general has shown to have a positive effect on DBFM contract performance. The bundling of multiple phases in one contract offers a great incentive for higher quality performance, and at the same time allows for optimalizations in both investments and designs that can lead to increased cost and time performance. However, there is a possibility that there is still a different mindset present in private companies that does not match the idea of long-term high-quality solutions that are suitable for DBFM.

Contract flexibility was in general experienced negatively due to the great amount of room a DBFM offers for mutations, leading to significant decreases of cost, time, and quality performance. However, the flexibility also offered space for product optimalisations in both the construction and maintenance period, thus an increase in cost and quality performance.

On top of the discussed mechanisms, collaboration and risk transfer in general seem to be particularly crucial factors in determining the experience of the private actor and subsequently the contract performance. To determine the exact performance effects, they have and how to increase this, further research is advised.

To conclude, this research shows that the private partners' experiences are important in determining the expected performance of DBFM contracts, and that private partners experiences play an important role in creating both successful DBFM projects, while at the same time also contributing to possible suboptimal performance results; indicating that there is certainly room for performance improvements trough improvement of the negative private experiences. Therefore, in a DBFM in Dutch infrastructure, Rijkswaterstaat cannot simply assume optimal contract performance without considering the private actors' experiences, and addressing issues related to the private experience can be a valuable tool to boost DBFM contract performance.

6 DISCUSSION AND REFLECTION

6.1 DISCUSSION

This research contributes to scientific literature about the effect the private actors' experiences have on DBFM contract performance, by finding out what the private experiences with several mechanisms in a DBFM contract are, what the overall experience among private parties is and how this subsequently can affect predetermined performance indicators by Koppenjan et al. (2022). In several cases, the experiences with incentive mechanisms leads to expected performance increases. However, this research adds to the literature by indicating that not every mechanism always may lead to an expected performance outcome due to the a negative private experience, and therefore stresses the importance of the often overlooked private experience (Eversdijk, 2015; Välilä, 2020; Van den Hurk & Verweij, 2017), since the results show that several negative private experiences can lead to suboptimal performance of a DBFM contract if not addressed.

6.2 REFLECTION AND RECOMMENDATIONS FOR FUTURE RESEARCH

At last, a reflection on the limitations of the research is done and recommendations for future research are made.

A limitation of the research is that no people from the MTC were interviewed, but only from the EPC and SPC. Adding people from the MTC to the respondents can have made the interviews more representative. This could have affected the data in the sense that people in distinct functions can have differing opinions on mechanisms. Another limitation is that not all results could be worked out extensively due to the word-count limit of this research. Choices had to be made and therefore only the most relevant and interesting findings in the eyes of the researcher have been further elaborated on. This can introduce some personal bias, leading to a loss of other relevant results. What went well in this research is that the theoretical framework provided a strong basis to guide the research. Also, the literature review of Koppenjan et al. (2020) turned out to be a rich source of data, on top of the already rich interviews.

Future research could investigate whether mindsets of private parties negatively affect the quality performance of DBFM contracts as indicated by R2 (2022), since R2 was the only respondent to mention this. Additional qualitative research could be done to investigate how important the risk transfer and collaboration are in terms of contract performance, since they were mentioned as important influencers of contract performance, and additional quantitative research could be done to investigate how large the effects of the private actors' experiences on the performance indicators are.

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APPENDIX

APPENDIX 1 TABLE PERFORMANCE INDICATOR DESCRIPTIONS

Cost	**Time**	**Quality**	**Innovation**
Additional work costs, which can be understood as the sum of costs that arise due to changes in the contract after the contract was signed. The more additional work costs, the lower the cost performance.	Realized achievement of the recommissioning milestone, which can be understood as the period between the day of contract awarding and finishing construction activities. A shorter period than planned means a higher time performance, a longer period means lower time performance.	Quantitative performance perception, which can be understood as whether the results in the project can count on support from involved organizations, whether the developed solutions deal with the problems that are present, if the developed infrastructure and its assets are sustainable and durable, and if the goals of the project as specified in the contract haven been met. The lower/higher a project scores on each of these points, the lower/higher the quality performance.	Quantitative performance perception, which can be understood as whether innovative solutions have been developed, recent technologies have been developed or used, time and money is invested in researching and developing recent technology and constructions. If this is the case, the innovation performance is higher, if not, the innovation performance is lower.
Quantitative performance perception, which can be understood as the costs of the project staying within set bandwidth and norms, and that the benefits of the project are overall greater than the costs.	Quantitative performance perception, which can be understood as whether the availability of the project has been realized within the predetermined agreed period.	Qualitative performance, perception, which can be understood as what the perception about the level of product and process quality was. The lower/higher the quality of the product and processes, the lower/higher the quality performance.	Qualitative performance perception, which can be understood as the number of innovations a DBFM project has compared to other contract types. If the number of innovations is perceived higher, the innovation performance is higher, while when the amount of innovation is perceived as less, the innovation performance is lower.
Qualitative performance perception, which can be understood as whether a project has been realized on budget and if the project an acceptable return has on investment for the private partner. If not, the lower the cost performance.			

Table 3 Overview table of performance indicators (Koppenjan et al., 2022; edited by Author, 2022).

APPENDIX 2 INTERVIEW GUIDE

Thank you for participating in this interview. In this interview, questions will be asked regarding the topic of mechanisms within DBFM contracts and the experience of the private actor that goes along with it and its effects on the performance of the contract. This interview will not be recorded without consent. The recording will be deleted after the transcription.

Feel free to contact me if you have any questions at e.b.telkamp@student.rug.nl.

- Introduce myself.
- Ask if there is consented to record the interview.
- Tell the participant their rights.

Mechanisms

Performance-dependent payment

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

Private financing

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

Shadow of banks

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

Integration of the contract

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

Risk Distribution

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

Contract flexibility

Was this mechanism present?

How was it applied in this contract?

What were the positives concerning this mechanism?

What were the negatives concerning this mechanism?

What were other experiences with this mechanism?

How did it affect the contract performance?

General questions

In general, what were other positive experiences related to the DBFM contract?

In general, what were negative experiences related to the DBFM contract?

Do you think that there was positive a symbiotic relationship present in the discussed DBFM contract between public and private?

Are there any other remarks or ideas you want to share regarding the topic?

Thank you for participating.

APPENDIX 3 CODING TREE

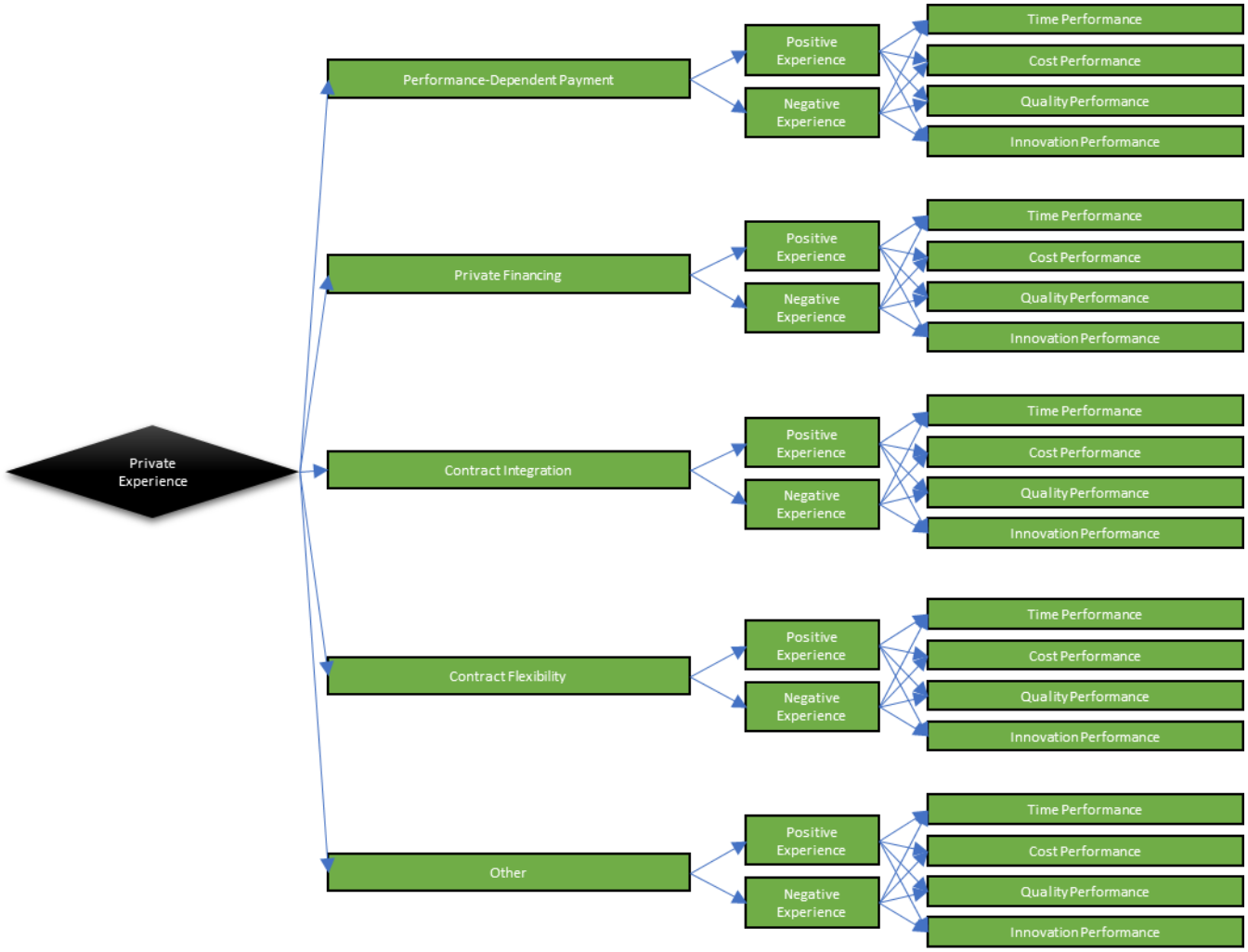

Figure 3 The used coding tree for analysing the data (Author, 2022)