Achieving Satisfaction When Implementing PPP Transportation Infrastructure Projects: A Qualitative Comparative Analysis of the A15 Highway DBFM Project

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Abstract

This article investigates how managers in public-private partnership (PPP) projects respond to social or physical events during the implementation of their projects, and which of their responses produce satisfactory outcomes. Multi-value Qualitative Comparative Analysis (mvQCA) was used to examine the events that took place during a large Dutch Design, Build, Finance and Maintain (DBFM) transportation infrastructure project. The analysis found that most events were social in nature. Private managers' responses to these events were internally-oriented and resulted in dissatisfactory outcomes. In contrast, externally-oriented managerial responses were associated with satisfactory outcomes. The article concludes that both public and private managers need to invest sufficiently in stakeholder management resources and capabilities when implementing projects. Although the intention of DBFM contracts is to lower the burden on the government, public managers still play an important role as intermediaries between the contractor and the local stakeholders and this role should not be underestimated.

Keywords

Public-Private Partnership, Transportation Infrastructure Project, DBFM, Project Implementation, Project Management, MvQCA

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1. Introduction

Over the last few decades, public-private partnerships (PPPs) have received increasing attention because they are thought to have many benefits (Bovaird, 2004). This is particularly the case with transportation infrastructure development (Kwak et al., 2009). Involving the private sector in infrastructure development is expected to have longer-term benefits, such as "value-for-money" (Grimsey and Lewis, 2004; Kwak et al., 2009), and shorter-term benefits, such as a reduction in cost and time taken to deliver infrastructure services, higher quality service delivery, lower administrative costs, and the transfer of risks to the private sector (Flyvbjerg et al., 2003; Hodge and Greve, 2007; Kwak et al., 2009; Little, 2011). In the Netherlands, Design, Build, Finance and Maintain (DBFM) contracts are often advocated (Commissie Private Financiering van Infrastructuur, 2008; Eversdijk and Korsten, 2009). These contracts resemble the U.K. Private Finance Initiative (PFI) projects (Klijn et al., 2007). A DBFM contract is a specific type of PPP where the private partner is integrally responsible for designing, building, financing and maintaining the infrastructure (Lenferink et al., 2013). However, only few DBFM contracts have been implemented thus far (Klijn, 2009) and research into them is scarce (Lenferink et al., 2013).

Research into PPPs has mainly focused on the extent to which benefits are realized (research into the performance of PPPs) and how such benefits can be increased. Studies on increasing these benefits often examine pre-contract issues (Weihe, 2008), such as tendering, procurement, risk allocation, and the financing of PPPs (Kwak et al., 2009). However, relatively little research has been carried out on the impact of the events that take place during the implementation phase of an infrastructure PPP (i.e. while it is being constructed and delivered (Jones and Noble, 2008)) on project outcomes (Jones and Nobles, 2008; Mistarihi et al., 2013; Weihe, 2008). During the implementation phase, managers are faced with a variety of challenges and delivery difficulties. These challenges and difficulties often come to managers as events, stemming from the project's socio-physical context (Love et al., 2002). How managers in a PPP respond to these events during project implementation is an important part of successful infrastructure development (Love et al., 2002). For instance, an inappropriate response to an event may result in decreased shorter-term benefits such as delivery delays, lower delivery quality (leading to reputational damage or unsatisfied stakeholders), or poor relations between the public and private partners. Research, however, does not clearly specify which managerial approaches are the most beneficial for realizing satisfactory outcomes in PPP projects (Edelenbos and Klijn, 2009). The present study therefore

aims to examine which managerial responses to events produce satisfactory outcomes during project implementation (cf. Verweij and Gerrits, 2014). The research question for the study is: *how do managers in the implementation phase respond to events occurring in the context of PPP transportation infrastructure projects, and which management responses produce satisfactory outcomes?*

This article is structured as follows. Section 2 describes transportation infrastructure project implementation, its implications for the research approach, and the applied research approach of multi-value Qualitative Comparative Analysis (mvQCA). Section 3 sets the empirical scene by introducing the Dutch A15 highway DBFM project, and the data collected about it. The data are analyzed in Section 4 using mvQCA. MvQCA has recently been suggested as a valuable method for evaluating transportation infrastructure projects (Verweij and Gerrits, 2013), though empirical applications are lacking. Sections 5 and 6 comprise the discussion and conclusions respectively.

2. Researching complex PPP transportation infrastructure projects

2.1. Properties of complexity in PPP infrastructure project management

Infrastructure projects are implemented in a socio-physical context where events occur (Gerrits, 2008, 2012; Van Gils et al., 2009). While these events are external to the project's management (Söderholm, 2008), they can influence it, since projects are open systems (Engwall, 2003). Although "during implementation, projects are supposed [to] be as closed as possible and concentrated on execution according to plans" (Söderholm, 2008:83), events occur in the implementation of the project that require managers to respond to them. The events can have a physical basis, such as changing ground or weather conditions, or be rooted in a social issue, such as objecting stakeholders (e.g. Assaf and Al-Hejji, 2006; El-Gohary et al., 2006; Odeh and Battaineh, 2002). This article's focus on events that are experienced by managers in PPP projects during the implementation necessitates a grounded approach to identifying these events since they are experienced by the managers, not by a theory proposed by an evaluator.

Managers respond (i.e. adapt) to events to make them manageable (Van Gils et al., 2009). Literature on the management of PPP projects distinguishes between project management and process management (Edelenbos and Klijn, 2009; Edelenbos and Teisman, 2008). A central difference between them is their openness towards the environment. The first focuses on the internal organization of the project, while the latter emphasizes the project's interaction with the societal environment. The first adheres to the idea of projects as closed systems and the second to projects as "contextually-embedded open systems" (Engwall, 2003:790). Although research shows that managerial activities are crucial for successful PPPs (Klijn et al., 2008), Edelenbos and Klijn state that the literature is "ambivalent about what style is most beneficial for realizing outcome of complex decision-making processes, in particular public-private partnerships. (…). There has not been much

attention paid to this issue, and empirical results are mostly absent" (2009:321). They conducted a survey on this topic and found that the externally-oriented style of management is positively correlated with good outcomes, while the internally-oriented style is not. Although this is a valuable finding, variable-oriented studies such as this do not explain *how* good outcomes are actually produced, in contrast to case-based research (cf. Verweij and Gerrits, 2013; Klijn et al., 2008). Klijn and colleagues speculate that managers actually "choose their managerial strategy according to the logic of the situation" but they acknowledge that "this is a theory that should be addressed through further research that focusses more on individual choices made by managers" (2008:271).

This article responds to this call and examines how managers respond to events in their day-to-day actions (cf. Cicmil et al., 2006; Smits, 2013; Van Marrewijk et al., 2008). Again, a grounded approach applies. The response chosen by a manager and the complex processes leading to it (see Gerrits, 2012 chapter 4) are driven by the manager's interpretation of the event and his assessment of how it is best dealt with. His interpretation, assessment and consequent action(s) may be rationally bounded, but they are his, and they produce real outcomes (cf. Gerrits, 2012). It follows that management responses and outcomes can only be understood by taking the manager's view as the point of departure.

While a transportation infrastructure project is being implemented, the management often faces multiple and different events. In a DBFM contract, where the private partner bears the responsibility for project implementation, private managers mainly respond to these events, although the public partner may also be involved. Since responses to events can differ, it is possible to find many different examples of 'management responses to events' in a single project. Each example forms a separate case, and each case is configurational (Byrne, 2005), which means that the event and the management response(s) combine to produce an outcome (cf. Van Gils et al., 2009).

The cases may be independent or intertwined with one another. For instance, cases may be linked to each other because of related events (e.g. a single stakeholder objects to different parts of the project for the same reason) or the involvement of the same individual/s. Additionally, these cases are also related because ultimately, they are managed by the same overall contract between a principal and contractor. In sum, a transportation infrastructure project can be understood to consist of strings of cases, which comprise different combinations of similar elements. This implies that cases within a project exhibit both similarities and differences (e.g. Buijs et al., 2009).

2.2. Researching complexity in PPP infrastructure project management with mvQCA

Following the properties explained above, the research approach used for the present study consisted of four steps (Verweij and Gerrits, 2014). The first step is the grounded collection of data. This was done by conducting open, qualitative interviews (e.g. Weiss, 1994): managers were asked what events had occurred, how they

responded to them and what outcomes had resulted. This allowed the researcher to obtain the manager's view of the events, response and outcomes. All the interviews were transcribed. The advantage of using interviews for data collection is that intangible aspects such body language and tone of voice during the interviews can be observed and used as cues for aiding interpretation, e.g. how satisfied an interviewee was with the outcome.

In the second step the interview transcripts were qualitatively coded for events with ATLASti software. ATLASti is a tool for coding qualitative data (Friese, 2013). By coding, the different perspectives of managers are cross-corroborated. This facilitates the synthesis of the different perspectives into case constructions per identified event, although due to the different tasks and responsibilities of the interviewed managers, not all transcripts contained information on each case. Qualitative coding is a process where codes are developed and can be revisited as the researcher interprets the data (cf. Schwartz-Shea and Yanow, 2012). Using software such as ATLASti enables the researcher to structure and record this interpretive process, including the researcher's considerations to code text in a certain way.

The third step is the application of the QCA method. QCA is an umbrella term for several subtypes, including mvQCA (Rihoux and Ragin, 2009; Schneider and Wagemann, 2012). QCA is a case-based comparative method. Being case-based, it allows researchers to emphasize the unique aspects of cases (i.e. their differences), while still allowing the identification of patterns (i.e. similarities) between them by comparing them (Verweij and Gerrits, 2013; Ragin and Amoroso, 2011). QCA is a method that facilitates an iterative process – of constructing cases as configurations of aspects, comparing the cases, interpreting the results and possibly reconstructing the cases – in which (theoretical) ideas and empirical data are in dialogue with (i.e. inform) each other (e.g. Fritzsche, 2013). In QCA, the aspects of cases (here: events, management and satisfactory outcomes) are called 'conditions'. The advantage of mvQCA is that the conditions can have values beyond just 0 or 1, whilst remaining discrete (Vink and Van Vliet, 2009).

The basic logic of QCA consists of four subroutines (cf. Verweij and Gerrits, 2014). The first subroutine is the grounded qualitative construction of cases as configurations, based on the coded interview transcripts, (e.g. Rantala and Hellström, 2001). The cases are then quantitatively coded, and the configurations are placed in a data matrix. In the matrix, the cases are put in the rows and the conditions in the columns. The second subroutine is to reorganize the data into a so-called truth table, which sorts the cases over the logically possible configurations that are present in the data (Schneider and Wagemann, 2012). The truth table is the key tool for the comparative analysis. Each row in the truth table can be read as a statement about whether the configuration represented in the row it is 'true' (or not) for (i.e. associated with) the outcome. The third subroutine involves the pairwise comparison of configurations that have the same outcome but differ in one other condition. This process is called "truth table minimization". The condition in which two configurations differ is said to be logically redundant, because irrespective of the value of that condition, the outcome is produced nevertheless. The research process

from the first to the third subroutine involves shifting the focus from the differences between cases to the similarities between them. The second and third subroutines are performed with software so as to exclude the possibility of human error in the analysis of the truth table (Schneider and Wagemann, 2010). The Tosmana software (Cronqvist, 2011), instead of other QCA software, is used for the present analysis because it can be used for mvQCA. The fourth subroutine is to interpret the patterns that result from the truth table minimization so as to understand the management of the wider context which, in this study, is the A15 highway DBFM project.

Recall that going through these subroutines is an iterative process. For instance, if the truth table contains cases that agree on all the conditions (i.e. are of the same configuration) and contradict on the outcome, this means that there is probably another condition at play that explains the contradiction. Conversely, if there are no contradictory cases in the truth table, the conditions might be further conceptually abstracted or conditions could be excluded from the data matrix so that even more general patterns can be identified. In this iterative process, the coded interview transcripts in ATLASti are regularly revisited.

3. Data collection about the A15 highway DBFM project

In the Netherlands, PPPs mostly occur in the areas of infrastructure and area development projects (Klijn, 2009). Many types of PPPs exist in infrastructure development (e.g. Grimsey and Lewis, 2004; Kwak et al., 2009; Little, 2011). The DBFM contract is one of them. It is a concessional type of that closely resembles the DBFO (Design, Build, Finance and Operate) or DBFMO (Design, Build, Finance, Maintain and Operate) contract (Bult-Spiering and Dewulf, 2006; Grimsey and Lewis, 2004; Yescombe, 2007). DBFM contracts are increasingly being applied in transportation infrastructure, but experiences with and research into DBFM contracts is to date rather scarce (Lenferink et al., 2013).

3.1. The A15 highway project

In December 2010, Rijkswaterstaat (RWS) entered into a DBFM contract, with a total project budget of approx. € 2 billion, with consortium A-Lanes A15 (see also Verweij et al., 2014; Lenferink et al., 2011). RWS is the executive arm of the Dutch Ministry of Infrastructure and the Environment. It is responsible for the for the national transportation network. One of the main reasons for the project is the expansion of the Maasvlakte II port area. This has led to a need for extra transport capacity on the A15 highway corridor between the Maasvlakte II and the Vaanplein traffic junction near the city of Rotterdam. The general purpose of the project is to enhance traffic flow and safety on the corridor. Construction started in April 2011 and the project should be constructed in December 2015. The project includes the design and build of about eighty-five km of additional traffic lanes, a dynamic traffic management system over the thirty-seven km length of the project area, the renovation of approximately thirty-six civil structures and the construction of twelve new ones, the renovation of

two large tunnels, a new Botlekbridge, and the maintenance of the infrastructure system up to 2035. In the Netherlands, infrastructure maintenance is separate from its operation (Lenferink et al., 2013). The operation remains with the relevant RWS road district.

Leading up to the contract closure, RWS closed an administrative agreement and adherent implementation agreements with fourteen (semi-)public stakeholders: the national Ministry of Infrastructure and the Environment, the regional collaboration Metropolitan Region Rotterdam, the regional Province of South-Holland, the Municipality of Rotterdam, seven other smaller municipalities and boroughs of Rotterdam, the local Waterboard Hollandse Delta, the Port of Rotterdam Authority (HbR), and national railway network manager ProRail. The underlying idea was to have consensus with these actors beforehand so as to smooth the project delivery. RWS incorporated the implementation agreements into the DBFM contract.

In the construction phase of the project, the RWS project organization consisted of a small team headed by five managers, of which the contract manager and stakeholder manager are dominant. The consortium A-Lanes A15 is formed by four companies: three construction firms and a project developer/investor. They are the constituent members of the Special Purpose Vehicle (SPV), which has a DBFM concession contract with RWS. The SPV is a 'virtual organization' responsible for the design, build, finance and maintenance of the infrastructure system for which it receives income (Grimsey and Lewis, 2004; Ng and Loosemore, 2007; Smyth and Edkins, 2007) consisting of two large payments – one at partial availability and one at availability of the infrastructure system – and availability fees during the whole course of the contract up to 2035. The SPV uses contracts secondary to the concession contract (Ng and Loosemore, 2007) to finance the project, i.e. short- and long-term loans from banks, and to design, build and maintain the project, i.e. contracts with two joint-ventures that both consist of the three construction firms. The first of the two joint ventures is the EPC (Engineering, Procurement and Construction) organization that is responsible for designing and managing the project (including the relationships with the stakeholders of the project) in the construction phase. The second joint-venture is responsible for the maintenance of the infrastructure system during and after the construction phase of the project.

3.2. Data collection

A total of twenty interviews were conducted between May 2012 and January 2013: seven interviews were with RWS project managers, thirteen interviews with A-Lanes' directors and project managers. Three managers would not be interviewed. The distribution of interviews reflects the dominant position of A-Lanes in the implementation phase of the project. Additional site visits, document reviews and website inspections were used to further interpret and understand the interview data and results of the analysis.

4. Analysis

This section comprises the third step as explained in Section 2.2. As mentioned before, the analysis was an iterative process, and the fourth section here reports the final results of this process. Section 4.1 discusses the first subroutine: the identification of the events, the responses of the project's managers, and the results of their responses. These configurational cases are reorganized and compared in Section 4.2, which covers the second and third subroutines. At that point, the project's complexity and diversity has been systematically channeled into a few general patterns, which substantiate our understanding of the project's management more broadly. This represents the outcomes of the fourth subroutine, and they are interpreted in Section 4.3.

4.1. Case constructions of responding to events in the A15 highway DBFM project

Table 1 provides an overview of the events that were identified. For instance, in one case, citizens complained about the noise nuisance that was produced when construction took place at night. Many citizens were not made aware of the potential for noise nuisance from construction activities if a north-east wind arose. In another case, Prorail changed the choice it had made in the implementation agreement, and which had been agreed upon by the other parties involved in the project, for a certain type of rail system. A final example from Table 1 is the discovery of an explosives risk zone with WWII bombs.

Table 1: events in the A15 highway project

ID	Brief description
CAB1	The project area is packed with cables and pipelines. RWS is responsible for moving the so-called 'category-1' cables and pipelines – prior to project implementation – and A-Lanes for moving 'category-3' ones. During implementation it appeared that a set of combined category-1 and -3 units near the Aveling secondary road had to be moved after all to be able to widen the A15 highway, which necessarily required coordination with the cable and pipeline owners and stakeholders (such as the Municipality of Rotterdam).
CIT1	Citizens complained about the noise nuisance produced by the nightly construction works (esp. pile driving) near the Botlekbridge. Due to an uncommon, unanticipated northeast wind especially many complaints came from uninformed Spijkenisse citizens.
CIT2	After A-Lanes informed citizens about the pile driving work plan near the Groene Kruisweg provincial road that would produce about 70 dB, the Albrandswaard citizens asked for work methods and plans that would produce less noise nuisance.
CIT3	About 50 citizens complained about the noise nuisance produced by the nightly pile driving near the Verlengde Zuiderparkweg, upon which the Borough of Charlois decided to make the piling works stop by threatening to

	withdraw the necessary permit.
CIT4A	Uninformed Barendrecht citizens complained about the noise nuisance produced by the construction works (i.e. sand transportation and pile driving at night) at the Vaanplein highway junction. Hence, the Municipality of Barendrecht demanded to be timely and correctly informed about A-Lanes' activities.
CIT4B	Since the Municipality of Barendrecht was unsatisfied with the communication by A-Lanes and the quality of the permit applications regarding the Vaanplein construction works – which should include apt information and substantiation about the construction activities – it rejected the applications. Also, citizens still complained about the nuisance.
DOW	A downpour near the Groene Kruisweg Viaduct caused a small flood that washed away intentionally deposited sand where a land abutment would be built.
EXP	In a nearby project commissioned by the Municipality of Rotterdam, an explosives risk zone was discovered through a standard so-called NGE-investigation into unexploded WWII explosives. The results of the investigation contradicted the previous NGE-investigation for the A15 highway project. Consequently, owners of Pipeline Corridor-2 demanded additional NGE-investigations for the A15 highway project.
GRO	The ground conditions near Pipeline Corridor-1 appeared more problematic than expected. During the piling works, the ground moved thereby exerting too much pressure on the cables and pipelines in the corridor.
HBR1	It was agreed upon by RWS and the HbR that the latter would become the owner of the new to be built Oudeland Viaduct by A-Lanes. When A-Lanes finished the design according to the requirements in the contract with RWS, the HbR – backed-up by the Municipality of Rotterdam – demanded changes in it. They did not accept the design. Respondents felt that the HbR "find fault with everything" after the HBR3 case.
HBR2	When A-Lanes announced that it would start with reconstructing the Welplaatweg and Hartelkruis junctions, and simultaneously redirecting the hazardous substances route via the Welplaatweg, the HbR objected that the Welplaatweg could not be both reconstructed and serve as the reroute.
HBR3	Motivated by the contract to make a good pace, A-Lanes constructed a temporary road for transporting hazardous substances without coordinating the design with the HbR as they were required to by contract. Consequently, the HbR objected and did not give its approval for the road.
LEI	LSNed, the organization responsible for managing and maintaining the pipeline corridors, demanded changes in the design of the Pipeline Corridor-1 overarch. This was unexpected as RWS did not close an implementation agreement with LSNed.
MUN1	The Municipality of Rotterdam objected to the designs of Ramp700 (a land abutment for the Botlekbridge) as it would make future access to certain cables and pipelines impossible. The Municipality felt that the design did not

	meet the requirements agreed upon in the implementation agreement.
MUN2	The Municipality of Rotterdam repeatedly did not give its approval for the construction of the Botlekbridge pillars as it was unconvinced that the designed pillars were strong enough to carry the weight of the bridge decks.
PRO	After the contract award Prorail reconsidered its implementation agreements with RWS. Prorail wished another technical rail system on the Botlekbridge than previously agreed upon, because the then foreseen novel system appeared more susceptible to interference than anticipated.
PRV1	The Province of South-Holland objected to the position of a particular cable near the Groene Kruisweg Viaduct as it would make it impossible for the Province to build a road parallel to the Groene Kruisweg in the future.
PRV2	After the deal with the Province was made about the solution of PRV1, a work foreman announced to the A-Lanes stakeholder manager that he would commence the implementation. When the stakeholder manager passed this to the Province, it objected because it first had to check and formally approve the solution, i.e. no permit was issued yet.
RWS1	The RWS Traffic and Water Management directorate (DVS) demanded changes in the design of the Portland traffic changeover as they thought the current design to be not safe enough.
RWS2	The RWS road district objected to the positioning of a site office by A-Lanes under a flyover near the Vaanplein junction for safety reasons, i.e. fire hazard, and wants the site office to be moved.

Each of the cases in Table 1 is constructed in the qualitative analysis as a configuration of conditions (see Section 2). As can be seen in Table 2, each case consists of four conditions. We explain them below.

Table 2: the conditions

Condition	**Abbreviation**	**Numerical codes and meaning**
Nature of the event	EVENT	0 = Physical
		1 = Social
Management A-Lanes	MANA	0 = Internal-oriented
		1 = External-oriented
Management RWS	MANR	0 = Contractor acts autonomously
		1 = Intermediating role
		2 = Cooperation
Satisfaction	SATIS	0 = Dissatisfaction prevails
		1 = Satisfaction prevails

The first condition (EVENT) concerns the nature of the event, which can be either social or physical. Social events originate from stakeholders, i.e. the social context. Physical events originate from the physical (natural) system. This distinction is relevant because it implies different situational logics, which in turn could be followed by different management responses. That is, anticipating or responding to

physical events is second nature to construction firms which specialize in project organization/planning and dealing with physical systems. On the other hand, dealing with social events suggests a more open or external-oriented management response (cf. Edelenbos et al., 2009), with which the construction sector is generally less familiar. In the A15 project, the lower level of familiarity is indicated by *inter alia* respondents saying so, and the relatively fewer means allocated to communication and stakeholder management, which private managers pointed out. The difference between a more internally-oriented response, such as doubling shifts or changing construction modes in an attempt to control planning and the budget, and an externally-oriented management response, such as engaging with stakeholders to achieve or maintain good rapport with them, is captured by the second condition: MANA.

The third condition (MANR) concerns the involvement of RWS' management. It is relevant to include this as respondents indicated that both the principal and the contractor, being relatively inexperienced with DBFM, were still discovering how management tasks and responsibilities are best distributed. A preliminary analysis of the interview transcripts revealed that, in some cases, RWS acted as an intermediary between A-Lanes and local stakeholders in order to safeguard good project outcomes, while in other cases, RWS cooperated with A-Lanes. In yet other cases – 'in the spirit of DBFM' – RWS did not act as a manager. This triple option requires that mvQCA is used over other types of QCA.

The fourth and final condition concerns the outcome (SATIS). Managers have different backgrounds, tasks and responsibilities, leading to differences in how they deal with events and what sorts of outcomes mattered to them. The respondents articulated different types of outcomes, such as local stakeholder satisfaction, being on-time, being within-budget, and product quality. For comparative purposes, however, only one outcome condition is included: the aggregate, multidimensional condition of 'satisfaction' of managers with how the event was dealt with (Verweij and Gerrits, 2014).

Tables 3 and 4 below comprise the qualitative construction of cases as configurations, and the quantitative coding of these constructions in a data matrix, respectively. The meaning of the coded conditions in Table 4 is provided in Table 2. For instance, in the abovementioned Prorail case, which is coded as a social event (EVENT{1}), A-Lanes responded by engaging with Prorail (MANA{1}). Also, RWS intervened by making Prorail financially responsible for the design change that it wished for, thus acting as an intermediary between A-Lanes and Prorail (MANR{1}). Although this case was still ongoing when the interviews were conducted, it was clear that A-Lanes would not have to bear the costs for any design changes, and RWS appreciated the proactive effort by A-Lanes to engage with Prorail (SATIS{1}).

In QCA, the numerical scores (Table 4) of the qualitative descriptions (Table 3) allow the cases to be compared transparently. The coding process, where ideas and data informed each other, involved both tangible and intangible data. The first three conditions are quite tangible as respondents were asked about what empirically happened and how they acted (cf. Verweij, 2012). Describing and scoring the cases on

the outcome condition relied on more intangible cues, such as body language and tone of voice during the interviews, as the respondents were sometimes reticent to explain their position in this respect (see Section 2.2).

Table 3: responding to events

ID	EVENT	MANA	MANR	SATIS
CAB1	Physical	The focus of A-Lanes was on finding a technical solution to the problem that all stakeholders could agree with.	Their respective obligations to move cables and pipelines made RWS decide to combine the actions to be implemented, and to coordinate with stakeholders together.	This case was excluded from the requirements for the large multi-million payment, and a solution satisfactory to stakeholders was found.
CIT1	Social	A-Lanes decided to start actually measuring noise production to validate its model upon which it based its communication policy towards citizens.	As RWS is concerned with being a 'public-oriented network manager', the stakeholder manager started to renegotiate the 50 dB limit at which A-Lanes was required to inform citizens.	The 50 dB limit to inform citizens about construction works near the Botlekbridge was adjusted to 45 dB.
CIT2	Social	A-Lanes reconsidered its work plan which led to an approx. two-thirds reduction of nightly construction works. Additionally, it offered hotel stays to citizens that would be affected still.	There is no indication that RWS was involved in this particular case.	Only 1 or 2 complaints were received, and there were no problems with obtaining the needed permits.
CIT3	Social	The focus of A-Lanes was choosing another method so as to continue construction.	There is no indication that RWS was involved in this particular case.	Construction was delayed for a week, extra costs were incurred, the media got wind of it, and RWS was dissatisfied with the situation.
CIT4A	Social	The focus of A-Lanes remained on achieving quick results and not on	RWS did not facilitate or cooperate at this point (but see	RWS was dissatisfied with the situation, and the Municipality

		high quality stakeholder informing through inter alia producing good permit applications.	CIT4B). It even said to the Barendrecht alderman to just reject the application.	of Barendrecht rejected permit applications.
CIT4B	Social	The focus was still primarily on achieving results within time and budget; information about building activities came too late to be included in a newsletter.	RWS stepped forward, i.e. it gave A-Lanes a reprimand and started checking communication means by A-Lanes.	There was some progress regarding the Vaanplein case, but communication by A-Lanes remained an issue.
DOW	Physical	The focus of A-Lanes was on repairing the physical situation and on improving the collaboration between two sub joint-ventures.	There is no indication that RWS was involved in this particular case.	A hard shoulder had to be resurfaced.
EXP	Physical	The additional investigations were carried out by the Municipality of Rotterdam. A-Lanes had to redo its work preparation and increase working speed.	This was the contractor's risk; RWS was not involved in this case although A-Lanes did seek support.	Costs were incurred for the delay and hitherto RWS seemed unwilling to share (part of) the risks or costs.
GRO	Physical	The construction method was changed. When it turned out that this did not help, piling works were stopped.	There is no indication that RWS was involved in this particular case.	Costs were incurred (but managed by moving the piling works to the other pipeline corridor), and no solution was yet found.
HBR1	Social	RWS was asked for help in this case as A-Lanes felt that it met all the requirements. Additionally, construction plans were reconsidered as delays were anticipated. Also, some efforts were made to better the	RWS stepped forward and mediated between A-Lanes and the HbR. An external consultant was called in and RWS sided with A-Lanes in this case.	The construction was delayed and costs were incurred. Managers expressed tiredness with this issue and A-Lanes was still at odds with the HbR.

		relationship between A-Lanes and the HbR.		
HBR2	Social	A-Lanes involved eight stakeholders, including the HbR, in a deliberation process to determine the best solution for the rerouting problem.	There is no indication that RWS was involved in this particular case.	A solution was found that satisfied all stakeholders, save the Municipality of Spijkenisse, i.e.: rerouting via the Hartelkruis.
HBR3	Social	The actions of A-Lanes were focused on just getting this case over with; the focus was certainly not on building a better relationship with the HbR.	RWS was on the same footing as the HbR and told A-Lanes that the road could not be commissioned until A-Lanes would substantiate the design and get approval from the HbR.	This case was the first to set the scene for the difficult relationship between A-Lanes and the HbR that tormented A-Lanes constantly.
LEI	Social	As no implementation agreement was available, LSNed had neither interest nor contractual responsibility to cooperate. Management was aimed at getting LSNed to cooperate.	After a request for assistance by A-Lanes, RWS wrote an implementation agreement.	Costs were incurred, but the implementation agreement made it possible that LSNed recovered some costs from RWS.
MUN1	Social	The focus of A-Lanes was on quickly finding a technical solution to the problem, but it failed to align its interpretation of the requirements with those of the Municipality.	RWS intervened as it was unclear whether A-Lanes was to blame for the situation or whether the contract contained a contradiction. RWS tried to make A-Lanes and the Municipality better cooperate with one another.	Delays had occurred and it was yet unclear when construction could start. Moreover, the relationship between A-Lanes and the Municipality was damaged. Also RWS was unsatisfied with A-Lanes' performance in this case.
MUN2	Social	The focus of A-Lanes was on finding a	There is no clear indication that RWS	The construction on the Botlekbridge

		technical solution to the problem that the Municipality could agree with. Simultaneously, the final design for the bridge was not awaited and ordering steel for the bridge continued to limit delays; and the construction planning was revised.	was involved in this particular case, although A-Lanes started informing RWS about the slow acting by the Municipality.	pillars was delayed with several months, and costs were incurred in the ordering process for the Botlekbridge.
PRO	Social	Initially, according to the RWS contract manager, A-Lanes responded to Prorail by starting a process to explore the possibilities to satisfy the wishes of Prorail.	RWS intervened by making Prorail responsible for all the costs that a design change would cause. This case first had to be resolved between RWS and Prorail before involving A-Lanes, although A-Lanes acted as a 'consultant' to RWS.	RWS appreciated the proactive effort of A-Lanes. The case was still ongoing, but it was clear that A-Lanes was not responsible for solving this issue and thus possible costs involved.
PRV1	Social	A-Lanes' stakeholder manager made a deal with the Province to extend the cable.	There is no indication that RWS was involved in this particular case.	The Province agreed with the solution.
PRV2	Social	The A-Lanes stakeholder manager engaged in a negotiation process with the Province.	There is no indication that RWS was involved in this particular case.	A deal was made that satisfied all actors: the foreman could start his work, and in return A-Lanes would asphalt some bicycle path unrelated to the A15 highway project.
RWS1	Social	The preference of DVS corresponded to a previous design that was abandoned as it scored low on traffic flow. A-Lanes clarified that reverting to the	There is no clear indication that the RWS project organization was involved in this particular case.	In the end, the commissioning of the new traffic lanes was delayed, and a claim by A-Lanes towards RWS to compensate for costs was

		previous design would increase costs, leading to a new reconciliation processes with stakeholders. The solution was to make some small changes in the design.		rejected.
RWS2	Social	A-Lanes initially reacted dismissively but offered a new solution to the road district.	RWS discussed the issue with A-Lanes during a meeting and advised the contractor how to deal with it.	Costs were incurred for moving the site office.

Table 4: data matrix

Case-ID	EVENT	MANA	MANR	SATIS
CAB1	0	0	2	1
CIT1	1	1	1	1
CIT2	1	1	0	1
CIT3	1	0	0	0
CIT4A	1	0	0	0
CIT4B	1	0	1	0
DOW	0	0	0	0
EXP	0	0	0	0
GRO	0	0	0	0
HBR1	1	0	1	0
HBR2	1	1	0	1
HBR3	1	0	1	0
LEI	1	1	1	1
MUN1	1	0	1	0
MUN2	1	0	0	0
PRO	1	1	1	1
PRV1	1	1	0	1
PRV2	1	1	0	1
RWS1	1	0	0	0
RWS2	1	0	1	0

4.2. Comparing cases with mvQCA and results

After constructing the data matrix (Table 4), the next step in a qualitative comparative analysis is to reorganize the data into a truth table (Table 5). Our truth table has twelve logically possible configurations (2^2 x 3^1): two conditions have two possible values and one condition has three possible values (see Table 2). Only the six

empirically present configurations are shown in Table 5. The table shows that there are three configurations associated with satisfactory outcomes and three with unsatisfactory outcomes.

Table 5: truth table

EVENT	MANA	MANR	SATIS	Cases
0	0	2	1	CAB1
1	1	1	1	CIT1, LEI, PRO
1	1	0	1	CIT2, PRV2, HBR2, PRV1
0	0	0	0	DOW, GRO, EXP
1	0	0	0	CIT3, CIT4A, MUN2, RWS1
1	0	1	0	CIT4B, RWS2, HBR1, HBR3, MUN1

The next step is to minimize the truth table, i.e. to compare configurations that agree on the outcome and differ in but one condition. For instance, if we take the fourth and fifth rows of Table 5, configurations EVENT{0}*MANA{0}*MANR{0} and EVENT{1}*MANA{0}*MANR{0} can be minimized into the more generalized MANA{0}*MANR{0}. That is, logically speaking, whether EVENT is {1} or {0}, the outcome SATIS{0} is produced nevertheless. Note that the second and third rows in Table 5 cannot be minimized because the configuration EVENT{1}*MANA{1}*MANR{2} is not present in the data. This also applies to the fifth and sixth rows because the configuration EVENT{1}*MANA{0}*MANR{2} is absent. The results of the comparison are depicted in Table 6.

Table 6: first results of the truth table minimization

SATIS	Configuration	Cases	*N*
{1}	EVENT{0}*MANA{0}*MANR{2}	CAB1	1
	EVENT{1}*MANA{1}*MANR{1}	CIT1, LEI, PRO	3
	EVENT{1}*MANA{1}*MANR{0}	CIT2, PRV2, HBR2, PRV1	4
{0}	EVENT{1}*MANA{0}*MANR{1}	CIT4B, RWS2, HBR1, HBR3, MUN1	5
	MANA{0}*MANR{0}	DOW, GRO, EXP + CIT3, CIT4A, MUN2, RWS1	7

In order to arrive at more general patterns for both SATIS{0} and SATIS{1}, the condition MANR was abstracted in the next iteration from a multi-value condition into a binary condition (see Section 2.2). Consequently, the number of logically possible configurations changed from twelve (2^2 x 3^1) to eight (2^3). This means that the empirical coverage of the logically possible configurations increased from 6 out of 12 to 6 out of 8, meaning that more pairs of configurations would agree on the outcome and differ in but one other condition. The advantage is that the results of the minimization are more general (i.e. less minimal configurations which are comprised of less conditions), making interpretation easier. The results of the new iteration in the comparison are depicted in Table 7. It could be argued, on the downside, that this implies a conceptual abstraction into 'RWS is either present {1} or absent {0} as a

manager', and the way in which RWS is involved (the previous MANR{1} and MANR{2}) is irrelevant. However, because CAB1 (the only case with MANR{2}) individually constitutes a configuration (see Table 6), this abstraction can easily be accounted for in the next section.

Table 7: final results of the truth table minimization

SATIS	Configuration	Cases	*N*
{1}	EVENT{0}*MANA{0}*MANR{1}	CAB1	1
	EVENT{1}*MANA{1}	CIT1, LEI, PRO + CIT2, PRV2, HBR2, PRV1	7
{0}	EVENT{1}*MANA{0}	CIT3, CIT4A, MUN2, RWS1 + CIT4B, RWS2, HBR1, HBR3, MUN1	9
	MANA{0}*MANR{0}	DOW, GRO, EXP + CIT3, CIT4A, MUN2, RWS1	7

4.3. Explanation of the results

As shown in Table 7, there are two minimized configurations associated with higher satisfaction. The first configuration is represented by case CAB1. It is an odd one out as it is covered by just one case. RWS and A-Lanes responded to the physical event by cooperating to find a solution. They had separate financial responsibilities for dealing with different types of cables and pipelines (see Table 1), but because these were physically intertwined, it made sense to work together. The second configuration was covered by seven cases and stated that an external-oriented response by A-Lanes to social events was associated with a high level of satisfaction. In some of these cases, RWS acted as an intermediary between A-Lanes and local stakeholders, while in other cases, A-Lanes managed to respond satisfactorily without any intervention by RWS.

Two minimized configurations are associated with unsatisfactory outcomes. In nine cases, most of which involved meeting deadlines and getting things built in line with the project plan, encouraged by the structure of the DBFM contract, A-Lanes' managers responded to social events with internally-oriented policies. This meant that the interests of local stakeholders, such as citizens (CIT3, CIT4A, CIT4B), municipalities (MUN1, MUN2) and other (semi-)public actors (RWS1, RWS2, HBR1, HBR3), were not catered for. As shown in Table 3, this resulted in stressful relationships with those stakeholders, delays, and/or costs. For instance, in case CIT4A, RWS was dissatisfied with the response of A-Lanes' managers to citizens' complaints, and the relevant municipality rejected permit applications by A-Lanes. The other minimized SATIS{0} configuration is represented by seven cases and indicates that, irrespective of the nature of the event, A-Lanes' managers acted autonomously and responded with internally-oriented actions. Some of these cases were about social events and are also covered by the previous configuration. The other three are physical events (DOW, GRO, EXP). RWS was absent due to the fact that the events were the contractor's risk. Respondents indicated that costs were

incurred as a consequence. Whether the SATIS{0} cases will impact the longer-term benefits remains to be seen.

The majority of the cases (sixteen out of twenty) involve events that had a social basis (see Table 5). A closer look at the coded interview transcripts revealed that some of those cases were related to one another. This applies to two clusters of cases, shown in Table 8. The first concerns the CIT cases. Citizens complained about the nuisance of construction work (CIT3, CIT4A) which led to the Municipality of Barendrecht eventually rejecting their permit applications (CIT4B). The initial autonomous internally-oriented responses by A-Lanes did not result in better outcomes, as can be seen in Table 8. In cases that occurred later, RWS became an intermediary in the process by checking (CIT4B) and renegotiating (CIT1) A-Lanes' stakeholder communication policy and channels. In the most recent case (CIT2), A-Lanes' managers responded with an externally-oriented action, and RWS did not become involved. Higher satisfaction was associated with these latter cases. The pattern here is that more satisfactory outcomes were achieved when RWS temporarily intervened but stepped back later, after which A-Lanes used external-oriented management autonomously. In terms of Table 8, the CIT cases are related clockwise through time.

Table 8: responding to social events

	Contractor acts autonomously	Principal intermediates	
Internal-oriented management	CIT3, CIT4A	CIT4B, HBR1, HBR3	Lower satisfaction
External-oriented management	CIT2, HBR2	CIT1	Higher satisfaction

The second cluster of cases concerns the HBR cases. A pattern similar to the CIT cases occurred here. The HBR3 case occurred not only because of A-Lanes' desire to make headway, but also because of its failure to improve the relationship with the HbR (see Tables 1 and 3). The relationship deteriorated to the point that A-Lanes managers felt that the HbR "found fault with everything", impeding the construction process (HBR1, see Table 1). At some point, contra the rationale of the DBFM contract according to which the principal is minimally involved, RWS stepped forward to manage the relationship between A-Lanes and the HbR. In the most recent HBR2 case, satisfactory outcomes were produced and RWS was not involved: A-Lanes autonomously organized a deliberative process with stakeholders to find a solution to an objection of the HbR, which resulted in a solution that satisfied all stakeholders (see Tables 1 and 3).

This pattern explicates what several respondents underlined: although construction companies may not by nature be attuned to societal complexity, they are learning how to best respond to deliberate attempts by stakeholders to influence the project. Ample involvement in this by the principal was considered important, especially according to private managers.

5. Discussion

5.1. Discussion of the results

The main purpose of this article was to investigate how managers respond to events in the implementation of PPP transportation infrastructure projects, and which management responses produced satisfactory outcomes. The results show that most cases (sixteen out of twenty) involved social events. In nine of these sixteen cases, the contractor responded with internally-oriented management; in the other seven cases, it responded with externally-oriented management. The results indicate that, for the A15 highway DBFM project, social events that are responded to by managers with externally-oriented actions are associated with satisfactory outcomes, while internally-oriented management responses are associated with unsatisfactory outcomes. This confirms the research findings of Edelenbos and Klijn (2009). The analysis also highlights the importance of the principal's involvement in the implementation phase of the DBFM project.

What then do these results tell us about the role of management in the implementation phase of the DBFM project? First, the prevalence of social events over physical events resonates with the argument of Aaltonen and Sivonen that "stakeholder related conflicts and incidents are among the most significant unforeseen risks in projects implemented in challenging environments" (2009:131). Second, the analysis shows that in the implementation, the primary focus of the contractor is on project activities so as to meet deadlines (cf. Edelenbos and Teisman, 2008) since exceeding those results in missing periodic payments by RWS, which negatively impacts the financial status of the project. Third, however, the contractor is dependent on the project's stakeholders for making progress in the implementation of the project. According to the concession contract, the contractor first needs to get the design requirements from the stakeholders, such as the municipalities and the HbR, after which it can design and plan the project's construction, which in turn has to be coordinated with the stakeholders. Only then can it start constructing the various elements of the project. These stakeholders have their own interests and their internal processes are organized at their own pace. This means that, to a large extent, the contractor is dependent on the capacitance and willingness of the stakeholders. This dependency requires externally-oriented management. However, the same contract also encourages the contractor to deliver high-quality transportation infrastructure in a cost-efficient and rapid way. These are the main reasons for governments to use public-private partnerships, and to achieve this, the contractor is put at an arm's length from its principal so that he can deploy its skills as a project manager. During the implementation of the project, both management orientations are important, but the A15 highway DBFM project seems to have had more of an internal orientation (cf. Edelenbos and Teisman, 2008). It seems that the contractor had not yet fully developed the management skills to deal with social events satisfactorily. Fourth, the study showed that RWS' involvement as an intermediary in the relationship between the contractor and the project's stakeholders was important

for achieving more satisfactory outcomes. This means that the DBFM contract is not, in the words of some of the private managers, a "Bahamas contract" were the principal is totally unburdened.

The present study responded to the call in the literature to have more insights into what happens in the implementation phase of PPP projects (Jones and Nobles, 2008; Mistarihi et al., 2013; Weihe, 2008), and DBFM projects in particular (Klijn, 2009; Lenferink et al., 2013), although, of course, the findings of the study cannot be generalized to other DBFM projects. Our analysis suggests that, during the implementation phase, contractors are inclined to focus on project activities, instead of engaging with stakeholders, and that the DBFM contract encourages this particular orientation. However, these are as of yet suggestions that need to be corroborated with more comparative research.

5.2. Reflection on the method

This study also contributes to the literature on the evaluation of infrastructure projects. While QCA has recently been suggested as a valuable method for this field, actual applications of it still lack (cf. Verweij and Gerrits, 2014). The mvQCA analysis conducted here indicates several pros and cons of this approach. The main advantage is that QCA is a systematic comparative approach that allows a simultaneous focus on the differences and similarities between cases, thus striking a balance between paying attention to the unique aspects of cases and the identification of patterns. One implication of the configurational nature of QCA is, however, that different conclusions may be arrived at if a single case is added. Indeed, the three managers of the A15 highway DBFM project that would not be interviewed could have pointed at additional cases of events. If those cases represented (an) additional configuration(s), the minimization of the truth table would produce different results. However, for the present study this effect is probably not too problematic since the interviews showed that the rate of increase of the number of events introduced by the respondents was declining. Also, with the exception of one configuration, the coverage (by cases) of the minimized configurations is quite strong. Another issue is that mvQCA requires that conditions are simplified into a few possible values. However, this may not be appropriate for more granular activities. For example, the activities of managers in responding to events are more complex than the distinction between being internally- or externally-oriented. To deal with this, future applications of QCA could adopt the fuzzy-set Qualitative Comparative Analysis (fsQCA) subtype. The advantage of fsQCA is that more fine-grained scales, rather than just 0 or 1 can be used (Ragin, 2008), although these scales may be more difficult to develop in grounded approaches. Finally, only a limited number of conditions can be included in a QCA: because the number of logically possible configurations increases exponentially with the number of conditions, the possibilities for pairwise comparing cases decrease. This could be solved by adding more cases although there are practical limits to the number of cases that (a) researcher(s) can manage to study.

6. Conclusion

The analysis and discussion are by no means intended to criticize the management of A-Lanes. For one thing, other important aspects such as the decision processes involved in the management responses could provide more insights into the thinking behind the choice to respond to events in an internally-oriented fashion. Also, the intention is not to judge the final performance and longer-term outcomes of the project: the interviews are a snapshot, and at the time of the interviews, the project was still being implemented. These aspects need to be addressed in future research. The implication of the present study is that, whereas policymakers, at least in the Netherlands, tend to (over)emphasize the potential benefit of DBFM to unburden government, construction companies may have not yet fully mastered the ability to manage relationships with local stakeholders that comes with this type of PPP. In procuring future DBFM projects, public managers may do well to recognize the stakeholder management capabilities of construction companies, as well as their own roles as intermediaries between stakeholders and the contractor in the process of implementing a DBFM project.

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References

Aaltonen, K., Sivonen, R., 2009. Response strategies to stakeholder pressures in global projects. *International Journal of Project Management* 27, 131-141.

Assaf, S.A., Al-Hejji, S., 2006. Causes of delay in large construction projects. *International Journal of Project Management* 24, 349-357.

Bovaird, T., 2004. Public-private partnerships: From contested concepts to prevalent practice. *International Review of Administrative Sciences* 70, 199-215.

Buijs, M.J., Eshuis, J., Byrne, D.S., 2009. Approaches to researching complexity in public management, in: Teisman, G.R., Van Buuren, M.W., Gerrits, L.M. (Eds.), *Managing complex governance systems: Dynamics, self-organization and coevolution in public investments*. Routledge, New York, pp. 37-55.

Bult-Spiering, M., Dewulf, G., 2006, *Strategic issues in public-private partnerships: An international perspective*. Blackwell Publishing: Oxford.

Byrne, D.S., 2005. Complexity, configurations and cases. *Theory, Culture & Society* 22, 95-111.

Cicmil, S., Williams, T., Thomas, J., Hodgson, D., 2006. Rethinking project management: Researching the actuality of projects. *International Journal of Project Management* 24, 675-686.

Commissie Private Financiering van Infrastructuur, 2008. *Op de goede weg en het juiste spoor: Advies van de commissie private financiering van infrastructuur*. Commissie Private Financiering van Infrastructuur, Den Haag.

Cronqvist, L., 2011. *Tosmana: Tool for small-n analysis 1.3.2.0*. University of Trier, Trier.

Cronqvist, L., Berg-Schlosser, D., 2009. Multi-value QCA (mvQCA), in: Rihoux, B., Ragin, C.C. (Eds.), *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques*. Sage, London, pp. 69-86.

Edelenbos, J., Klijn, E.H., 2009. Project versus process management in public-private partnership: Relation between management style and outcomes. *International Public Management Journal* 12, 310-331.

Edelenbos, J., Klijn, E.H., Kort, M.B., 2009. Managing complex process systems: Surviving at the edge of chaos, in: Teisman, G.R., Van Buuren, M.W., Gerrits, L.M. (Eds.), *Managing complex governance systems: Dynamics, self-organization and coevolution in public investments*. Routledge, New York, pp. 172-192.

Edelenbos, J., Teisman, G.R., 2008. Public-private partnerships on the edge of project and process management: Insights from Dutch practice: The Sijtwende spatial development project. *Environment and Planning C: Government and Policy* 26, 614-626.

El-Gohary, N.M., Osman, H., El-Diraby, T.E. (2006). Stakeholder management for public private partnerships. *International Journal of Project Management* 24, 595-604.

Engwall, M., 2003. No project is an island: Linking projects to history and context. *Research Policy* 32, 789-808.

Eversdijk, A.W.W., Korsten, A.F.A., 2009. Concessionele publiek-private samenwerkingsrelaties: Feiten en ficties bij op DBFM gebaseerde infrastructurele projecten. *Bestuurswetenschappen* 63, 25-44.

Flyvbjerg, B., Bruzelius, N., Rothengatter, W., 2003. *Megaprojects and risk: An anatomy of ambition*. Cambridge University Press, Cambridge.

Friese, S., 2013. *ATLAS.ti 7: User guide and reference*. Scientific Software Development GmbH, Berlin.

Fritzsche, E., 2013. Making hermeneutics explicit: How QCA supports an insightful dialogue between theory and cases. *International Journal of Social Research Methodology*, DOI 10.1080/13645579.2013.779778.

Gerrits, L.M., 2012. *Punching clouds: An introduction to the complexity of public decision-making*. Emergent Publications, Litchfield Park.

Gerrits, L.M., 2008. *The gentle art of coevolution: A complexity theory perspective on decision making over estuaries in Germany, Belgium and the Netherlands*. Erasmus University Rotterdam, Rotterdam.

Grimsey, D., Lewis, M.K., 2004. *Public private partnerships: The worldwide revolution in infrastructure provision and project finance*. Edward Elgar: Cheltenham.

Hodge, G.A., Greve, C., 2009. PPPs: The passage of time permits a sober reflection. *Economic Affairs* 29, 33-39.

Hodge, G.A., Greve, C., 2007. Public-private partnerships: An international performance review. *Public Administration Review* 67, 545-558.

Jones, R., Noble, G., 2008. Managing the implementation of public-private partnerships. *Public Money & Management* 28, 109-114.

Klijn, E.H., 2009. Public-private partnerships in the Netherlands: Policy, projects and lessons. *Economic Affairs* 29, 26-32.

Klijn, E.H., Edelenbos, J., Hughes, M., 2007. Public-private partnership: A two-headed reform. A comparison of PPP in England and the Netherlands, in: Pollitt, C., Van Thiel, S., Homburg, V.M.F. (Eds.), *New public management in Europe: Adaptation and alternatives*. Palgrave MacMillian, Basingstoke, pp. 71-89.

Klijn, E.H., Edelenbos, J., Kort, M.B., Van Twist, M.J.W., 2008. Facing management choices: An analysis of managerial choices in 18 complex environmental Public Private Partnership projects. *International Review of Administrative Sciences* 74, 251-278.

Kwak, Y.H., Chih, Y.Y., Ibbs, C.W., 2009. Towards a comprehensive understanding of public private partnerships for infrastructure development. *California Management Review* 51, 51-78.

Lenferink, S., Tillema, T., Arts, J., 2013. Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in Dutch infrastructure projects. *International Journal of Project Management* 31, 615-627.

Little, R.G., 2011. The emerging role of public-private partnerships in megaproject delivery. *Public Works Management & Policy* 16, 240-249.

Love, P.E.D., Holt, G.D., Shen, L.Y., Li, H., Irani, Z., 2002. Using systems dynamics to better understand change and rework in construction project management systems. *International Journal of Project Management* 20, 425-436.

Mistarihi, A., Hutchings, K., Shacklock, A., 2013. Differing opinions do not spoil friendship: Managing public-private partnership (PPP) infrastructure projects in Jordan. *Public Administration and Development* 33, 371-388.

Ng, A., Loosemore, M., 2007. Risk allocation in the private provision of public infrastructure. *International Journal of Project Management* 25, 66-76.

Odeh, A.M., Battaineh, H.T., 2002. Causes of construction delay: Traditional contracts. *International Journal of Project Management* 20, 67-73.

Ragin, C.C., Amoroso, L.M., 2011. *Constructing social research: The unity and diversity of method*, Second ed. Sage, London.

Ragin, C.C., 2008. *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago Press: Chicago.

Rantala, K., Hellström, E., 2001. Qualitative comparative analysis and a hermeneutic approach to interview data. *International Journal of Social Research Methodology* 4, 87-100.

Rihoux, B., Ragin, C.C., 2009. *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques*. Sage, London.

Schneider, C.Q., Wagemann, C., 2012. *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge University Press, Cambridge.

Schneider, C.Q., Wagemann, C., 2010. Standards of good practice in qualitative comparative analysis (QCA) and fuzzy sets. *Comparative Sociology* 9, 397-418.

Schwartz-Shea, P., Yanow, D., 2012. *Interpretive research design: Concepts and process*. Routledge, New York.

Smits, K.C.M., 2013. *Cross culture work: Practices of collaboration in the Panama Canal expansion program*. Next Generation Infrastructures, Delft.

Smyth, H., Edkins, A., 2007. Relationship management in the management of PFI/PPP projects in the UK. *International Journal of Project Management* 25, 232-240.

Söderholm, A., 2008. Project management of unexpected events. *International Journal of Project Management* 26, 80-86.

Van Gils, M.K.A., Gerrits, L.M., Teisman, G.R., 2009. Non-linear dynamics in port systems: Change events at work, in: Teisman, G.R., Van Buuren, M.W., Gerrits, L.M. (Eds.), *Managing complex governance systems: Dynamics, self-organization and coevolution in public investments*. Routledge, New York, pp. 76-96.

Van Marrewijk, A., Clegg, S.R., Pitsis, T.S., Veenswijk, M., 2008. Managing public-private megaprojects: Paradoxes, complexity, and project design. *International Journal of Project Management* 26, 591-600.

Verweij, S., 2012. Management as system synchronization: The case of the Dutch A2 passageway Maastricht project. *Emergence: Complexity & Organization* 14, 17-37.

Verweij, S., Gerrits, L.M., 2013. Understanding and researching complexity with qualitative comparative analysis: Evaluating transportation infrastructure projects. *Evaluation* 19, 40-55.

Verweij, S., Gerrits, L.M., 2014. How satisfaction is achieved in the implementation phase of large transportation infrastructure projects: A qualitative comparative analysis into the A2 tunnel project. *Public Works Management & Policy*. DOI 10.1177/1087724X13518743.

Verweij, S., Van Meerkerk, I.F., Koppenjan, J.F.M., Geerlings, H., 2014. Institutional interventions in complex urban systems: Coping with boundary issues in urban planning projects. *Emergence: Complexity & Organization* 16, 7-23.

Vink, M.P., Van Vliet, O., 2009. Not quite crisp, not yet fuzzy? Assessing the potentials and pitfalls of multi-value QCA. *Field Methods* 21, 265-289.

Weihe, G., 2008. Public-private partnerships and public-private value trade-offs. *Public Money & Management* 28, 153-158.

Weiss, R.K., 1994. *Learning from strangers: The art and method of qualitative interview studies*. The Free Press, New York.

Yescombe, E.R., 2007. *Public-private partnerships: Principles of policy and finance*. Butterworth-Heinemann, Burlington.