

Exploring collaboration success factors for intermediary organizations in public-private partnerships

An analysis of public-private partnerships in the European traffic management sector.

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Abstract

In recent times, public and private organizations have realized that their ability to solve traffic related problems through individual innovations are reaching their limits. Collaboration between public and private organizations is not self-evident, as organizations may need to share sensitive information. To solve this problem, an intermediary organization can be used. How the public, private, and intermediary organizations in this sector can work together to solve these problems is not yet researched. In literature, critical success factors for collaboration in public-private partnerships are researched. Critical success factors encompass internal and external organizational factors that are needed to have a successful partnership. This research aims to identify factors that are important for the inter-organizational side to collaborating in a public-private partnership. Therefore, this research is led by the following research question: “*What factors are important for collaborating with an intermediary organization in a public-private partnership in the traffic management sector?*”

To answer this research question, a qualitative cross-sectional multiple case study on seven pilot projects from the Socrates^{2.0} project was performed. The Socrates^{2.0} project is co-financed by the European Union. Representatives of organizations collaborating in this project, as well as an independent expert were interviewed using a semi-structured interview design.

Analyzing the interviews, it is found that some factors found in theory are more important for collaboration than others. Due to the emphasis on data sharing in the project, *purpose limitation* of the shared data is one of the most important factors for collaboration with an intermediary organization, together with a *detailed and flexible project planning* to incorporate external developments, technological or situational like the Covid-19 pandemic. *Transparency* is important to generate trust between organizations, and the use of *standards* enables collaboration with larger organizations and scalability of services. Additionally, this study identifies advantages for a public or private organization in an intermediary role, how importance of factors can differ over different cooperation models, and that factors regarding data protection are more important for organizations in a certain intermediary role.

This research shows that for the traffic management sector it is valuable to add factors on data driven partnerships, to the theory of critical success factors in public-private partnerships. This research also shows that the sector in which a partnership takes place influences the importance of factors, and suggests further research to identify how the importance of factors will differ in non-subsidized and commercial traffic management public-private partnerships.

Keywords: public-private partnership, traffic management, critical success factors, data driven partnerships, smart mobility

1. Introduction

European cities are increasingly experiencing traffic related problems. Annual costs in the European Union associated with congestion account for almost 100 billion euros (European Commission, 2020). In addition, congestion contributes on a large scale to vehicle emissions (Figliozzi, 2010), with urban mobility accounting for around 40% of European CO₂ emissions (European Commission, 2020). According to Glaeser (2011) vehicle distance traveled increases in proportion with road distance build, so other methods are desirable in order to reduce congestion.

Digitalization in the transportation sector, in the form of smart mobility, can help achieve such a reduction in congestion (Rijksoverheid, 2020). Through active traffic management, recurrent and non-recurrent congestion can be managed, maximizing the capacity of the existing infrastructure (Mirshahi et al., 2007). And with the growth in mobile devices and big data the world is becoming more connected, improving the way public services can be delivered (Dutta & Bilbao-Osorio, 2012). However, research by Leviäkangas (2016) shows that digitalization is mainly driven by commercial aspects, and not necessarily by policies or strategies from the public sector. Interests from commercial organizations are not always in line with those of public authorities, as commercial interests are more concerned with revenue and satisfaction by providing services to end consumers (Socrates2.0, 2018b). Dutta and Bilbao-Osorio (2012) state that a good model to take advantage of increasing connectivity is through public-private partnerships. Through public-private partnerships, public authorities can assure that their interests are fulfilled, while providing private organizations with the possibility to exploit a business case of their own (Klijn & Teisman, 2001).

One public-private partnership project aimed at improving traffic management is the Socrates^{2.0} project. This is a project co-funded by the European Union in which new services are developed to improve traffic management. This is done by collaboration across different European countries between service providers, car manufacturers, Intelligent Transportation System (ITS) companies, and road authorities (Socrates2.0, 2018a). For example, the *Optimizing network traffic flow* project provides individuals with routes that optimize the performance of the overall traffic network instead of their individual optimal route to their destination. This way, the available infrastructure is used more efficiently.

The fulfillment of the traffic management services requires the sharing of data and insights from public, as well as private organizations. In order to limit the individual relations between public and private organizations, the Socrates^{2.0} project proposes different intermediary roles to be fulfilled. An intermediary organization can get a complete overview of the state of the traffic network. With this overview, the service providers can optimize their services towards predefined goals within the cooperation. It is important that the organization that fulfills an intermediary role is trusted with the data from the different partners.

Several aspects of public-private partnerships have been researched before. Klijn and Teisman, (2003) have identified institutional and strategic barriers for public-private partnerships in the Netherlands. Teicher et al., (2006) have performed a case study on Australian public-private partnerships. They found that although partnerships can achieve increased efficiency for the fulfillment of services, they have not been able to establish trust between the collaborating organizations. Research has also focused on identifying added value of independent intermediary organizations during collaborations in different fields. Stevens et al. (2015) have researched how such an intermediary can help medical research, and Moschovou et al. (2019) researched how

an independent intermediary could enable an efficient cooperation around data sharing and collection for freight transport.

Next to these studies, multiple researchers have tried to identify factors contributing to the success of public-private partnership projects. This has provided the concept of Critical Success Factors (CSFs) in public-private partnership projects. Among others, Jacobson and Ok (2008) and Abdul-Aziz and Kassim (2011) identified CSFs for public-private partnerships in infrastructure development. Also, Zou et al. (2014) have provided CSFs for relationship management in public-private partnership projects. For example, one CSF is *appropriate risk allocation and sharing*, ensuring that both public and private organizations can see that potential benefits outweigh the costs associated with participating (Mladenovic et al., 2013). Included in these CSFs, there are factors concerning collaboration with other organizations. Other factors are external circumstances that influence the success of a partnership. An example of this is *political stability* (Osei-Kyei & Chan, 2015). Next to these studies, the European Commission has made propositions specifically for successful data-driven partnerships (European Commission, 2018).

While the added value of an independent intermediary organization has been recognized, research until now has identified success factors for public-private partnerships that apply to collaboration between public and private partners without an intermediary organization. As a result, it is not yet known whether these success factors apply to a public-private partnership with an intermediary organization. It is also unclear how the success factors and propositions on data-driven partnerships are relevant for a partnership in the traffic management sector. This research identifies what factors are important, or less important, for collaboration through the following research question:

What are important success factors for collaboration with an intermediary organization in a public-private partnership in the traffic management sector?

For this research, a definition for collaboration by O’leary, Choi, & Gerard (2012, p.70) is used: *“the process of facilitating and operating in multiorganizational arrangements to solve problems that cannot be solved or easily solved by single organizations”*. This research adds to the existing literature by identifying what factors are important or less important for collaboration in public-private partnerships in the traffic management sector. Specifically, this research will identify important factors for collaboration in which an intermediary organization is present.

This research is conducted as part of an internship with MAP traffic management (from here onwards referred to as MAPtm). MAPtm is a company operating as an intermediary organization in the Socrates^{2.0} project. The practical relevance of this research is to help them in understanding how an actor fulfilling an intermediary role can successfully fulfill this role within public-private partnership projects regarding traffic management.

This research continues with section 2, which provides context of the Socrates^{2.0} project, and describes the theoretical concepts that are used for this research. Section 3 contains the research method, describing how the research is performed. The results of the research are described in section 4. This is followed by the conclusion of the research in section 5. Section 6 and 7 provide the recommendations and discussion respectively

2. Context description and theoretical framework

In this section, first a short context description of the Socrates^{2.0} project is provided in section 2.1. This is then followed by a description of relevant theories that can be used to answer the research question. In section 2.2 public-private partnerships are explained. Section 2.3 explains factors that are important for data driven partnerships, while section 2.4 discusses theory on critical success factors for public-private partnerships. Lastly, a conceptual overview is created in section 2.4 that forms the basis for this research.

2.1 The Socrates^{2.0} project

The Socrates^{2.0} project started from the recognition of organizations in the mobility sector that improvements for traffic management are getting increasingly difficult to achieve by a single actor (Socrates2.0, 2018b). The public organizations optimize their actions with data from mostly roadside infrastructure that is installed, while private organizations are generating data from in-car technologies to provide their users with the fastest routes to their destination. By cooperation between public and private organizations, these data information streams can be combined. This will allow for routing advice coming from either a private or a public organization to complement each other. Without cooperation, public and private organizations could potentially be suggesting contradicting routes via the roadside infrastructure or in-car navigation services to the road users. In the Socrates^{2.0} project, multiple pilot sites throughout Europe, such as Amsterdam, Munich, Copenhagen, and Antwerp are chosen for different traffic management services to be tested. In all these projects public and private organizations work together (Socrates2.0, 2018b).

The Socrates^{2.0} project is a public-private partnership project subsidized by the European Union. The participating organizations can get 50% of their investments reimbursed from the European Union. Goals are set that need to be met in order for organizations to get this reimbursement. What these services look like, and how they are provided is agreed upon on a level between all cooperating organizations. This is done in the so-called “Grant Agreement”, which describes what this partnership should look like. For example, it describes how all organizations should handle shared data and information for a project. Between the organizations that are operationalizing a project at a pilot site, these agreements can be altered to suit the specific project better.

To provide a framework for cooperating in these pilots, the participating organizations have designed fitting cooperation models together. These cooperation models differ in their basis on the use of intermediary organizations during the collaboration. In the pilots that are part of this research, two different cooperation models are used that require (an) intermediary organization(s). These are the *Coordinated approach* and the *Shared view* cooperation model.

In the coordinated approach cooperation model, four intermediary roles are designed that can be executed. Dependent on the pilot, it is decided which intermediary roles are required. The different intermediary roles are the *Strategy table*, *Network monitor*, *Network manager*, and the *Assessor*. The *Strategy table*, is designed to establish and monitor strategic cooperation between the partners involved. The *Network monitor*, to collect data from the public and private data providers to determine the current and predicted state of the traffic network. The *Network manager* is in place to define the problem statement and place service requests to the service providers. Lastly, the *Assessor* collects, validates, and reports the impact of services provided by public and private service providers (Socrates2.0, 2018b).

The shared view cooperation model uses one intermediary role, the *Network monitor*. In these pilots, the data providers share their data with the intermediary organization which determines the

current state of the traffic network. The service providers can use this information for their services voluntarily, without a Network manager placing service requests to the service providers. An overview of the cooperation models and the intermediary roles that can be used is provided in Table 1 below.

Table 1: Overview of the cooperation models and corresponding intermediary roles that can be used (based on Socrates^{2.0}, 2018b).

Intermediary roles	Cooperation model:	Shared view	Coordinated Approach
Network monitor: Collects data from the data providers to determine the current and predicted state of the traffic network		x	x
Strategy table: Establishes and monitors strategic cooperation between the partners involved			x
Network manager: Defines the problem statement and places service requests to the service providers			x
Assessor: Collects, validates, and reports the impact of services provided by public and private service providers			x

2.2 Public-private partnerships

A public-private partnership is a form of public policy that increasingly is being adopted by governmental organizations (Teicher et al., 2006; Osei-Kyei & Chan, 2015). The public-private partnership is derived from a hybrid between two policy types that were already used: production and provision of services by the government or by the market (Klijn & Teisman, 2001). Both of these arrangements, however, have certain disadvantages. Government production and provision of services has led to rising costs. And due to economic crises, governments have placed much more emphasis on controlling their budgets. Private production and provision of services on the other hand, has proven to not always satisfy social needs (Klijn & Teisman, 2001). Thus, by combining the two, governments aim to create value from expertise present in the private sector, while lowering risk and costs for projects that satisfy social needs (Osei-Kyei & Chan, 2015).

Another common aspect of public-private partnerships is that the cooperation lasts for a longer time period (Hodge & Greve, 2007). A public-private partnership, therefore, can be defined as *"cooperation between public and private actors with a durable character in which actors develop mutual products and/or services and in which risk, costs, and benefits are shared"* (Klijn & Teisman, 2003, p.137). Compared to private production and provision of services, which can be seen as increasing privatization from government tasks to private organizations, Klijn and Teisman (2001) provide a few key differences with a partnership, of which an overview is provided in Table 2.

The first key difference for a successful project between a partnership and contracting out arrangement for collaboration is regarding the problem definition. Private and public organizations will have to engage in joint decision making, instead of a principal-agent relationship. This provides the first dimension for this research that is important for collaboration: *Joint decision making*. The second key difference can be found in the keys to success for the collaboration. Where in a contracting-out arrangement a public authority defines the problem, and what solution it wants, in a partnership the private organizations have their own goals and an idea for the best solution of the problem to be solved. Together, the public and private organizations create goals, and decide on objectives for the individual organizations to achieve. This provides the second dimension for this research that is important for collaboration: *Goals and objectives*. The third key difference can be found in the keys to a good relationship. As a partnership will last over a longer time period the working relationship needs more management, alongside the contractual arrangements. Partner interaction during execution of the project is important during a partnership. This provides the third dimension for this research that is important for collaboration: *Partner interaction*. This research is focused on identifying and explaining the factors that are important for collaboration, and factors corresponding to these three dimensions will lead to a durable partnership.

Table 2: Comparison between contracting-out arrangements and partnerships (Klijn & Teisman, 2001)

	Contracting-out	Partnership
Relationship	Government and company (or consortium) are involved in principal-agent relationship	Government and company (or consortium) are involved in joint decision making and production
Problem definition	Government defines the problem, specifies the solution and selects a private company that can produce results in a cost-efficient way	Both parties are involved in joint processes early on in order to develop joint products that contribute to both their interests
Benefits	Benefits of contracting-out arrangements especially concern efficiency (quicker and cheaper)	Benefits of partnership arrangements especially concern increasing effectiveness (synergy and enrichment of output)
Keys to success	Keys to success are unambiguous definitions of goals, projects, rules of tendering, rules of selection and rules of delivery	Keys to success are an interweaving of goals, establishing rules and tailor made assignments concerning joint effort and production commitments
Principles	Based on the principles of project management because there is a clear principle, clear goals and well-defined project specifications	Based on the principles of process management because the joint goals, the art of financing, realization and utilization remain subject to joint decision making
Keys to good relationship	Contractual transparency regarding rules of tendering, selection and delivery and rules of inspection are crucial for a good relationship	Mutual trust is crucial for lasting relationship between partners who maintain their own interests, ways of working, accountability and financing principles

Different purposes of public-private partnership concepts have been researched. For example, on Infrastructure development, public policy networks, civil society and community development, and urban renewal and downtown economic development (Hodge & Greve, 2007). Despite the

fact that data-driven innovation is key in economic growth and the creation of jobs in Europe (European Commission, 2018), public-private partnerships with a focus on data collection and sharing are still not widespread (Moschovou et al., 2019).

2.3 Data-driven partnerships

Stevens et al. (2015) recognize that collaboration between multiple private organizations within public-private partnerships can be difficult, as the willingness of a firm to share (confidential) data with potential competitors can be low. Overcoming these barriers can be achieved through, for example, the use of the '*honest broker model*'. In the honest broker model, one trusted third party functions as a data warehouse, to which the collaborating organizations provide data. This intermediary party uses the data provided by these organizations to better train models. One cooperation that this model is used in is the Innovative Medicine Initiative. In this cooperation, the confidential data is only accessible by the owner of that data. The models trained by the trusted party served all involved organizations. In this case, the role of honest broker is fulfilled by a non-profit organization (Stevens et al. 2015). Advantages of such an intermediary in public-private partnerships are that it can efficiently combine data from different sources. Also, this party can easily comply with standards that are set between the collaborating organizations for data handling, without any incentives to mishandle the data (Moschovou et al., 2019).

In an attempt to stimulate data sharing, the European Commission has proposed a framework with the General Data Protection Regulation and the ePrivacy Directive, aimed at creating digital trust in business to business, and business to government collaborations (European Commission, 2018). As a key part of a partnership is mutual trust between organizations (Shamah & Elsawaby, 2014), this research takes into account ten principles that are defined in this framework that help with the establishment of this digital trust. These principles are discussed below.

The first five principles are to ensure fair markets for services relying on data. (1) *Transparency* means that agreements on which organizations have access to the data, the type and level of detail of the data that is shared, as well as for what purpose should be identified in a clear and understandable manner. (European Commission, 2018). (2) *Shared value creation* means that contractual agreements have to recognize that multiple organizations contributed to creating the data when data is generated as a by-product of a service. The third principle is (3) *respect for each other's commercial interests*. This means that contractual agreements should aim to protect commercial interests of the organizations providing data, as well as the organizations using the data. (4) *Ensure undistorted competition* means that the exchange of commercially sensitive data should have no effect on the existing competition between organizations. (5) *Minimized data lock-in* means that organizations providing a service which generates data on the side should enable the exchange of this data as much as possible (European Commission, 2018).

The last five principles are to support the supply of data. (6) *Proportionality in the use of private sector data*, means that requests from public organizations for private sector data should be justified by a clear public interest (European Commission, 2018). The data, in terms of detail, relevance, and data protection, should be relevant for the intended use. Also, the cost and effort required for the supply of the data should be in balance with the expected public benefits. An agreement should also contain a (7) *purpose limitation*. What the private sector data is used for, and/or for what time period should be made as clear as possible early on. (8) *Do no harm* means that commercially sensitive information must be respected, and private organizations should still be allowed to monetize insights that can be derived from the data. (9) *Conditions for data re-use* are to be established between public and private organizations. The collaboration should be mutually beneficial, and public organizations should get preferential treatment to other customers,

in order to acknowledge the public goals. A collaboration should also lower the need for public organizations to gather data in other ways. (10) *Mitigate limitations of data* means that the data providing organizations should help with mitigating the downsides of for example a bias that can be found in the data (European Commission, 2018).

2.4 Critical Success Factors

With a growing interest in public-private partnerships, research is being performed on Critical Success Factors (CSFs) for public-private partnerships, in an attempt to deliver better public-private partnership projects (Osei-Kyei & Chan, 2015). Rowlinson and McDermott (1999) define CSFs as “*those fundamental issues inherent in the project that must be maintained for teamwork to take place in an efficient and effective manner*” (p.270). In order to broaden the understanding of CSFs, Osei-Kyei and Chan (2015) have provided a systematic review of CSF literature for public-private partnership projects regarding infrastructure development. This review article functions as the key paper for the CSFs in this research. Osei-Kyei and Chan (2015) have identified internal organizational elements, as well as external organizational elements (Panda, 2015). For this research it has been chosen to focus on collaborating within a partnership. So, for this research the internal organizational elements, as transparency and risk allocation are the focus. External organizational success factors as, among others, political support, favorable legal framework, and mature and available financial markets fall outside the scope of this research. By researching the papers that describe internal organizational success factors, the relevant factors that are important for inter-organizational collaboration are identified.

The study by Osei-Keye & Chan (2015) has identified CSFs with a sector neutral nature. Where other review studies have identified sector specific CSFs as for example *earlier and accurate 3D visualisation of design* in Antwi-Afari et al. (2018), the expectation is that the CSFs used for this research will be applicable to multiple sectors. Below, the CSFs concerning internal organizational elements are elaborated upon.

Appropriate risk allocation and sharing requires public and private organizations to evaluate the risks concerned with a project and establish an agreed plan on how to share these among the participating organizations (Mladenovic et al., 2013). *Clear goals and objectives* help steer all involved organizations in the same direction and allow for a measurement of the project’s success to be established (Osei-Kyei & Chan, 2015). A *detailed project planning* will allow all partners to follow the direction that coherently was set out (Trafford & Proctor, 2006). The success or failure of a project can be more easily determined when a detailed planning is in place. Next to this, *consistent monitoring* of the progress made with the project is also important (Abdul-Aziz & Kassim, 2011).

If the collaborating organizations have *compatible skills*, less disputes will cause friction, and negotiations will take less time (Abdul-Aziz & Kassim, 2011). A *strong commitment* is important for managing the cooperative relationship between organizations (Jacobson & Ok, 2008), *clarity of roles and responsibilities among parties* helps to develop mutual goals that are envisioned in the cooperation (Tang et al., 2013). Another CSF identified in Osei-Kyei and Chan (2015) is *trust*. This factor, however, can be argued to be an outcome of other factors. A *strong commitment* from parties, and *open and constant communication* help to build trust between collaborating organizations (Jacobson & Ok, 2008).

2.4 Conceptual overview

By combining the literature on public-private partnerships, data-driven partnerships, and CSFs, a conceptual overview can be created. For this conceptual overview the factors identified in the literature review on data-driven partnerships and CSFs are put together. Where earlier literature showed that contractual agreements were less relevant for public-private partnerships, as relational trust is more prominent, it is expected that due to the data driven nature of the researched partnership the contractual agreements will be relevant in order to create digital trust. The factors are categorized over the three main dimensions: *Joint decision making*, *Goals and objectives*, and *Partner interaction* that were established in section 2.2. The conceptual overview is provided in Table 3.

Table 3: Conceptual overview of factors important for collaboration.

Joint decision making	Goals and objectives	Partner interaction
Shared value creation	Ensure undistorted competition	Transparency
Appropriate risk allocation and sharing	Do no harm	Mitigate limitations of data
Proportionality in the use of private sector data	Detailed project planning	Compatibility skills of partners
Minimized data lock-in	Clear goals and objectives	Open and constant communication
Respect for each other's commercial interests	Consistent monitoring	Clarity of roles and responsibilities among partners
Purpose limitation		Strong commitment by partners
Conditions for data re-use		

3. Methodology

3.1 Research design

For this research, a cross-sectional multiple-case study design is used. Qualitative data is collected on multiple cases at a single point in time. The comparison between cases can suggest concepts that are relevant to theory. Also, the multiple-case study design is said to improve theory building, as it can be used to see if a theory holds in different circumstances (Bryman, 2012).

Seven cases have been selected based on the traffic management services provided in the Socrates^{2.0} project. The traffic management services that are analyzed are the *Optimizing network traffic flow* (ONTF), *Smart destination*, and *Roadworks* services. The *ONTF* service advises road users not with the individual optimal route to their destination, but provides a route that optimizes the performance of the overall traffic network. The available infrastructure is used more efficiently by spreading traffic more evenly over the system. The *smart destination* service will suggest a different parking location to the users' destination, or suggest a different route to this destination, based on information about, for example, a large event near the users' destination or along the users travel route. The *roadworks* service can provide accurate information to the user about where, and at what start and end times, roadworks are being executed. Planned dates and times can be altered due to, for example, the weather. If these dates and times are altered, traffic will no longer be redirected when it is not necessary, allowing the available infrastructure to be used more efficiently.

Of these services, the *ONTF* service is provided in Amsterdam and Antwerp. The *Smart destination* service is provided in Amsterdam and Copenhagen. And the *Roadworks* service is provided in Amsterdam, Antwerp, and Munich. An overview of the resulting case selection for this research is presented in Table 4 below.

Table 4: Case selection

Case A	ONTF - Amsterdam	Coordinated approach
Case B	ONTF - Antwerp	
Case C	Smart destination - Amsterdam	
Case D	Smart destination - Copenhagen	
Case E	Roadworks - Amsterdam	Shared view
Case F	Roadworks - Antwerp	
Case G	Roadworks - Munich	

3.2 Data collection

Data for this research is obtained by interviewing stakeholders involved in the different partnerships for the fulfillment of the traffic management services in the different cities. In total, sixteen interviews are conducted with representatives from the different organizations participating in the partnerships. The participating organizations are often active in multiple cases. To ensure that the interviewees can provide enough detail on the differences between the different cases, the consideration was made to ask an interviewee about two cases. If in advance of the interview it is expected that an interviewee will be able to provide a high level of detail

between more than two cases, more cases are discussed during the interview. This also applies for the interviewees asked about the *roadworks* services, as the service provided is similar in different cities. Due to these similarities in the cases, it is expected that the interviewees can go into more detail about regional differences. From all cases, at least one interviewee is a representative of an organization fulfilling a public role, one interviewee is a representative of an organization fulfilling a private role, and one interviewee is a representative of an organization fulfilling an intermediary role. In addition to the representatives of these organizations, one interview has been held with an independent expert. This interviewee is able to provide a more generic overview of all activities in the Socrates^{2.0} project. An overview of all interviews and their corresponding cases discussed during the interviews is provided in Table 5.

Table 5: Overview of the interviewees and the cases discussed

		Cases covered							
#	Organization	A	B	C	D	E	F	G	
1	Public	x		x					
2		x		x					
3		x		x					
4		x					x		
5			x					x	
6									x
7						x			
8	Private	x	x						
9		x	x	x		x	x		
10		x			x				
11		x				x	x	x	
12		x				x	x	x	
13	Intermediary (private)	x	x	x		x	x	x	
14		x			x				
15	Intermediary (public)	x				x			
16	Independent expert	x	x	x	x	x	x	x	

The interviewees have been selected following a generic purposive sampling strategy. Through this strategy, interviewees were selected that are likely to provide data to answer the research question (Bryman, 2012). The selection contains representatives from public, private, and intermediary organizations involved in the different traffic management services. The interviews were conducted in Dutch if it was the interviewees' native language, otherwise the interview was conducted in English. To increase reliability of the results, the interviews are recorded and transcribed, after consent of the interviewee. In addition, the interviewees are offered to review the transcript, and check the correct usage of their information. For the semi-structured interviews

an interview guide is prepared. The semi-structured approach is used to provide the interviewees with an opportunity to openly discuss their experiences, while making sure that the subject of the interview stays relevant to the research question. This semi-structured approach will also allow the interviewees to provide new insights. Topics for the interview guide are based on the conceptual overview in section 2.4. The interview guides for the public and private organizations, and for the intermediary organizations are provided in Appendix A and B respectively. An English version of the interview guide for the public and private organizations is provided in Appendix C.

3.3 Data analysis

After the interviews had been conducted, the interviews have been transcribed and coded. This data is evaluated in order to assess the factors that are important for collaborating in a partnership with intermediary organizations, as perceived by the interviewees. This research contains both an inductive as well as a deductive research part. In the deductive part of the data analysis, the factors from the conceptual overview are used to guide the coding process. Next to this, the data is coded inductively. Open coding is used to identify new factors that have not been identified in literature so far. The codes for these factors are derived from the original wording of the interview transcripts. The interviews were coded using QSR International's NVivo 12 software. Using this software, codes can easily be attributed to the transcript, and be structured by the different dimensions.

With this data, firstly a within-case analysis is performed. This within-case analysis allows for a very open description of what per case were the most prominent factors discussed during the interviews. The cases differ in the amount of organizations participating, the intermediary organizations that are used, and there are also geographical differences.. Next, a cross-case analysis is performed. In this cross-case analysis, the data was analyzed following the conceptual overview. Doing this, commonalities and differences on the importance of the factors become visible, which can be interpreted with the within-case analysis in mind. In this report, the names of the interviewees and the organization they are representing are left out in order to protect their privacy. To indicate what statements have been made by which interviewee, interview numbers are used. I1 is interviewee 1 in Table 5, I2 is interviewee 2, etc.

4. Results

In this section the results from the interviews are presented. First In section 4.1, a within-case analysis of the different cases is provided. Section 4.2 goes in detail into advantages and disadvantages of different organizations in an intermediary role. This is then followed in section 4.3 by a cross-case comparison of the different cases on the basis of the conceptual model, as provided earlier in Table 2. In this section also new factors identified in the interviews that are important for collaboration are discussed.

4.1 Within-case analysis

In the following sections, elaborate case descriptions will be provided. The experiences of the interviewees regarding collaborating with the different organizations in these partnerships will be discussed.

4.1.1 Case A - ONTF Amsterdam

As described earlier, the Optimizing Network Flow (ONTF) pilot in Amsterdam aims to optimize the performance of the overall traffic network. This means that the available infrastructure is used more efficiently. By combining historical traffic data with live data from road users, the probability of a traffic jam in a specified timeframe is calculated. This makes the navigation advice that road users receive proactive to prevent traffic jams, instead of reactive to existing traffic jams. The ONTF pilot in Amsterdam is the case in which the most organizations, 11 in total, are active. Due to this complexity, and the degree of collaboration that is needed between all the organizations, different interviewees (I2, I15) perceive this pilot as the best example of a public-private partnership. In total, 11 organizations are cooperating in this pilot. Of these organizations, 4 are public authorities, and 7 are private companies. Case A is regarded as one of the most complex collaboration designs due to the number of organizations participating and the different functions these organizations fulfill. The different intermediary functions as described earlier in section 2.1 are fulfilled as follows: the *Strategy table* and *Network manager* are represented by both a public and a private organization, the *Network monitor* is represented by a public organization, and the *Assessor* is represented by a private organization. A visual representation is provided in Figure 1 below.

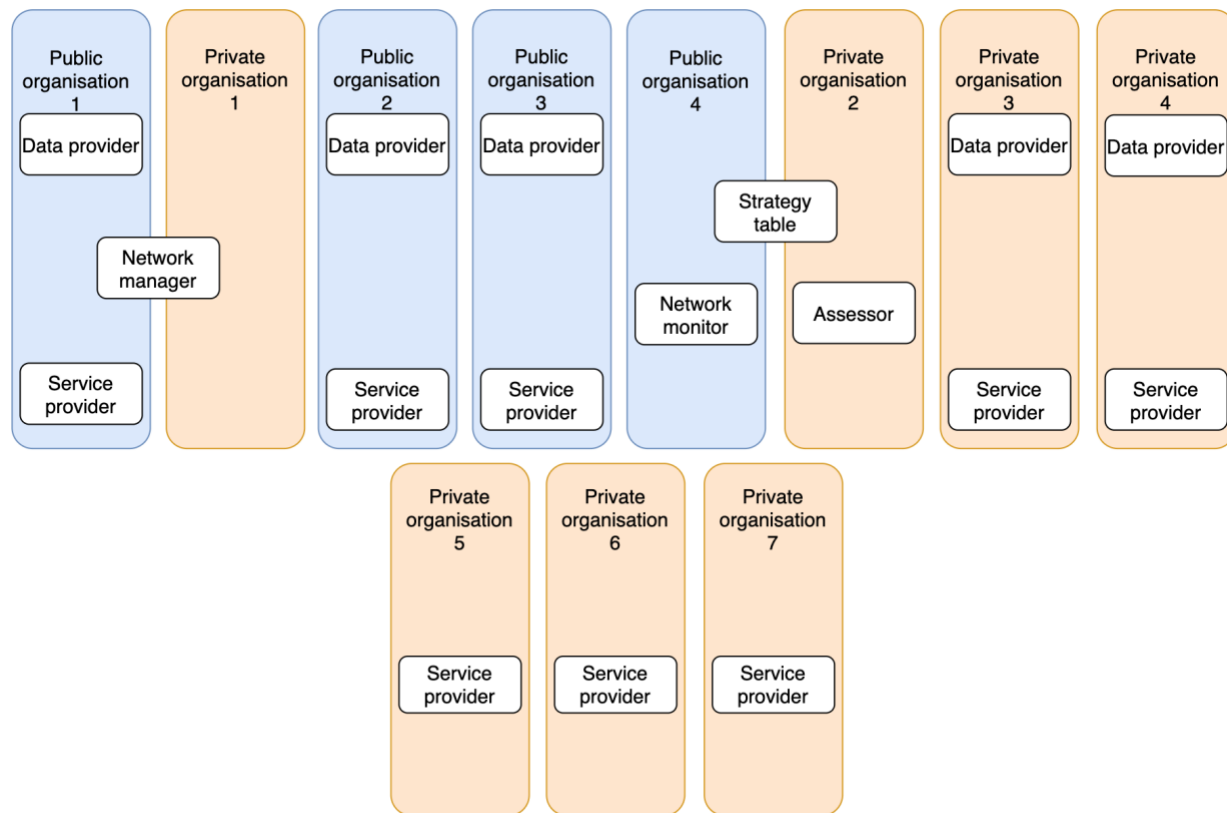


Figure 1: Collaboration structure Case A

According to the interviewees, the collaboration between the organizations is going well. In this pilot the public Network monitor is capable of creating a good image of the state that the current traffic network is in. The state of the traffic network is analyzed in the form of data on traffic speed and intensity. To create this image, data is provided to the Network monitor by different public and private data providers. As the image is created with different data sources, it creates the best possible representation of the network status. To cope with any possible commercial sensitivity regarding the data this organization receives, contractual agreements have been made that describe how this data should be handled.

“In the beginning, we have made agreements how we handle this. We have made a few design choices that handle this in a specific way. For example, by aggregating data so you cannot trace back the origin of the data” **public organization (I2)**

Now the Network monitor creates a prediction for the state of the traffic network in 15 minutes. In this pilot the private data providing organizations are capable of creating this prediction as well. However, the public Network monitor has decided to not use these predictions. This organization is interested in the working of the algorithms that are created to make such a prediction. Next to this, as a public organization they have accountability towards the public to be able to explain how the used algorithm works (I15).

The information on the current, and the predicted state of the traffic network from this Network monitor is sent to the private Network manager. This private Network manager transforms this information into a level of service. This level of service is divided into 6 levels, which reflect how

well the network is performing. Then, on the basis of these levels of service, the private Network manager can request the deployment of services from the service providers. These requests are sent using a TMex protocol, a protocol designed to contain a standardized format of information. The use of this protocol is seen as a positive contribution to this collaboration, as the public Network monitor states:

“Everyone likes to have a certain standard because you agree on them together, and implement them together. You prevent that firm A (...) holds a different standard to a different firm further along in the chain” **public intermediary (I15)**

Next to that standardization helps with streamlining the process within this pilot, it has also been relevant for attracting organizations that operate in different regions. For these multi-regional organizations it is important that their services will be scalable to usage in other locations than just Amsterdam. An interviewee from a private organization (I11) mentions that it is difficult for a large organization to customize their services to regional differences. Standardization helps with scalability. Furthermore, an interviewee from a public organization (I4) mentions the added value of involving a national public organization in the collaboration. In contrast to a regional public organization, a national organization can help with scalability of a pilot to a national level.

In this pilot the interviewees from the public organizations mention to be very vocal about their intentions with the pilot. They openly share their interests and goals. Their perception is also that the private organizations aim to do this as much as possible, but realize they probably cannot do this 100% openly. According to an interviewee from a public organization (I3) this is caused by multiple private organizations participating in the same pilot and project. If they are too open about their interests and goals in the project, it could provide a competitive advantage to one of their competitors. This can cause the private organizations to sometimes hold back a bit more. In contrast to this, for example, one interviewee from a private organization (I8) mentions that everyone interacts quite open in the collaboration. Although these statements are not directly in line with each other, so far it has not led to any problems. The public organizations realize it is not realistic to expect a private organization to be 100% open about their intentions. A private organization has to worry about the sensitivity of their data with regards to a possible competitive advantage this can provide over competitors

It is mentioned that it is important that the smaller participating organizations have an equal say in the decision-making process as the larger organizations which may invest more into the project (I4). This will help the smaller organizations to realize why they are collaborating, and how through this collaboration they can achieve their own goals.

A point made by an interviewee from a public organization (I3), is that part of this good collaboration can also be explained by the domain in which this collaboration takes place. It is almost a given that organizations will have to work together in this domain, at least in public-public relations. Road infrastructure does not end at city, municipality, or even provincial borders. As a result, these organizations will already have experience with collaborating with each other. With the addition of private organizations in this partnership, it can also be expected that working together goes well. If traffic management systems from public and private organizations would work against each other by providing road users with contradicting route advice, this would be disadvantageous for both sides. The realization that it will bring benefits to both sides if they work together and set shared goals, makes the willingness to work together higher.

This pilot has not been without any problems. It is mentioned by an interviewee from a public organization (I3) that there have been problems with organization(s) not delivering, or delivering

incomplete solutions. It is very difficult to make an organization stick to the original planning. A partnership like in the Socrates^{2.0} project is based on voluntary participation. In the end, the pilot could still be delivered as initially intended. Another point of critique, named by an interviewee from a private organization (I10), is the speed in which the organizations have been able to react to developments in the market. At the start of the project, the aim was to pay attention to developments in the market in order to adapt to these developments. Eventually, the coalition of organizations was not flexible enough to benefit from technical changes in the field of this organization. A possible cause for this inflexibility that is proposed is the scale of the Socrates^{2.0} project, with a lot of different organizations involved.

4.1.2 Case B - ONTF Antwerp

As it is in Amsterdam, the ONTF pilot in Antwerp is designed to optimize the performance of its traffic network. Where the Amsterdam pilot is designed to control traffic flow over a large network, this pilot is used to control traffic flow through different tunnels. This is provided by temporarily removing toll collection on a tunnel. This is done through a voucher system, and making sure in-car navigation services make use of this information by sending road users through this tunnel. The in-car navigation device will then overrule their settings that are set to avoid toll roads. This way, less congestion will occur at the toll-free tunnel. In this pilot, 5 different organizations are collaborating. Only 1 organization is public, while 4 are private organizations. The different intermediary functions as described in section 2.1 are fulfilled as follows: the *Network monitor* is represented by a private organization, the *Network manager* is represented by a private organization, and the *Assessor* is represented by a private organization. A visual representation is provided in Figure 2 below.

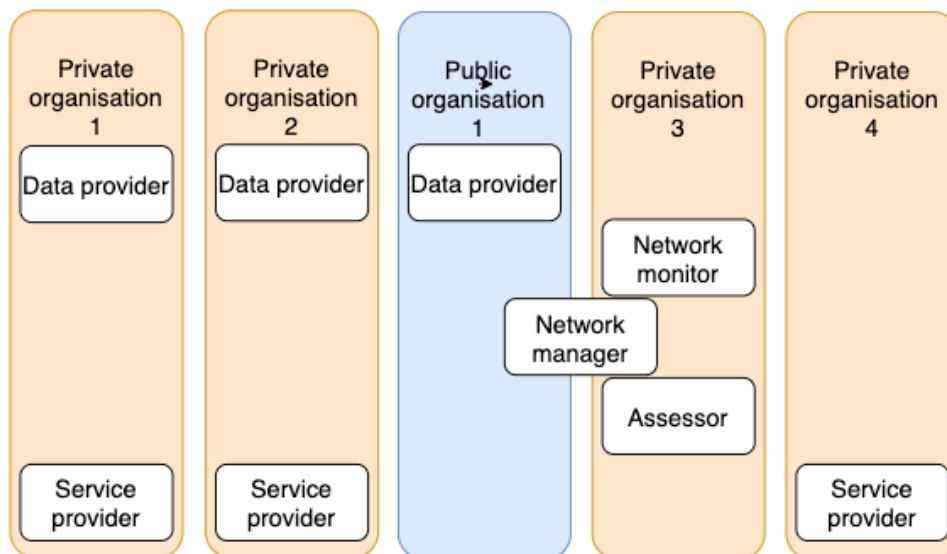


Figure 2: Collaboration structure Case B

The private Network monitor receives the data from the public organization on the traffic flow through the tunnels. On the basis of this information the Network monitor monitors when the thresholds are met to activate the voucher system for the toll tunnel. As in Case A, there are contractual agreements concerning data handling. The interviewee from the public organization (I5) mentions that the added value for this system with organizations fulfilling the intermediary roles could increase in the future. The Network manager could get the role to instruct the service

providers to send a specific percentage of the road users towards a different route. In that case it would not matter how the service requests are organized, as long as this percentage would be met. Such a situation could create more competition between the service providers. Due to the nature of this collaboration there is little competition between the service providers at this moment.

According to an interviewee from an intermediary organization (I13) it has not necessarily been the goal to make sure that every organization has an equal say in the project, as long as there was a win-win-win situation. A win-win-win means that there is a win for the public organizations, for the private organizations, and for the road users. However, according to the interviewee from the public organization (I5) this collaboration has developed in such a way that it actually is the case that organizations have an equal say. This is also something that is important to the public organization. As a public organization they are always cautious of monopoly formation. For this project though, this has never been a real worry. At the start of the collaboration there have been clear discussions about what the goals were for the project and what each member would contribute.

“We discuss beforehand what we are going to do, and you know you are in a sort of experiment. You also know that half of your investments are paid for by Europe. So of course it would be completely different when you would perform these kinds of things ‘live’. But it definitely helps to try these things now, and to learn about each other, to thereafter be able to set up such a cooperation without any subsidies.” **public organization (I5)**

Due to the Covid-19 pandemic, the execution of the pilot has had some delays. These delays have sometimes been difficult to cope with. Organizations do have a schedule that dictates when resources and personnel are allocated to a certain project. After this project, there is likely to be a new project scheduled to start that requires these resources and personnel. An interviewee from a private organization (I8) argues that this is probably a more difficult situation for larger organizations, as they are likely to have planned this in more detail. Another aspect that makes it difficult to adjust the pilot planning, is that it is part of a subsidized project by the European Commission. For these kinds of projects, a detailed project description is provided to the European Commission by the participating organizations. In this description a project planning is provided, and expected results are described. In order to receive the subsidies, the organizations will have to follow this project description.

As was the case in Case A, in this case the organizations have communicated openly about their goals and interests. And again, there is the realization that for the private organizations this will have only been to “a certain extent” due to company policy restrictions. Nevertheless, an interviewee from a private organization (I9) states that being as open as possible about your intentions is necessary to be able to understand each other. It is necessary to create a good form of communication, but also to be able to create the win-win-win situation it is important to know what the stakes are for all organizations involved.

There have been some more difficulties that have been encountered in this pilot. It is noted that for some private organizations, the commitment during the collaboration has seen a shift. The start of the collaboration has been a few years already, and it has become apparent that some company policies have changed over this period. If an organization has figured out that it could not get the results out of the project it was looking for, commitment has become a bit lower.

Another point that was difficult for all the organizations to agree upon, and this is also applicable to Case A, has been to decide on the map that would be used for georeferencing. Multiple private organizations have a map for georeferencing in place which they use to deliver their services.

The difficulty has been that competing private organizations did not want their data to be used on the map of another competing organization, according to interviews with a private organization and an independent expert (I8, I16). To resolve this point of discussion, for both these pilots an independent map is used.

4.1.3 Case C - Smart Destination Amsterdam

The second pilot in Amsterdam is regarding Smart Destination. This pilot is designed to control traffic around events that are organized in the region. It provides personalized advice for parking spots during this time. However, due to the Covid-19 pandemic, at the time of the interviews the pilot had not been operational. The events which it was designed for had all been canceled due to the pandemic. For the collaborating organizations it was important to still make sure that the technical side was ready. This would allow them to show how this service would have worked in different circumstances. The pilot has 9 collaborating organizations. Of these organizations, 4 are public, and 5 are private. The different intermediary functions as described in section 2.1 are fulfilled as follows: the *Network monitor* is fulfilled by a public organization, the *Network manager* is fulfilled by both a public and a private organization, and the *Assessor* is fulfilled by a private organization. A visual representation is provided in Figure 3 below.

Although the different organizations have not been able to experience collaborating in a running pilot, there are still some interesting insights to be seen from setting up the pilot, and creating the technical infrastructure.

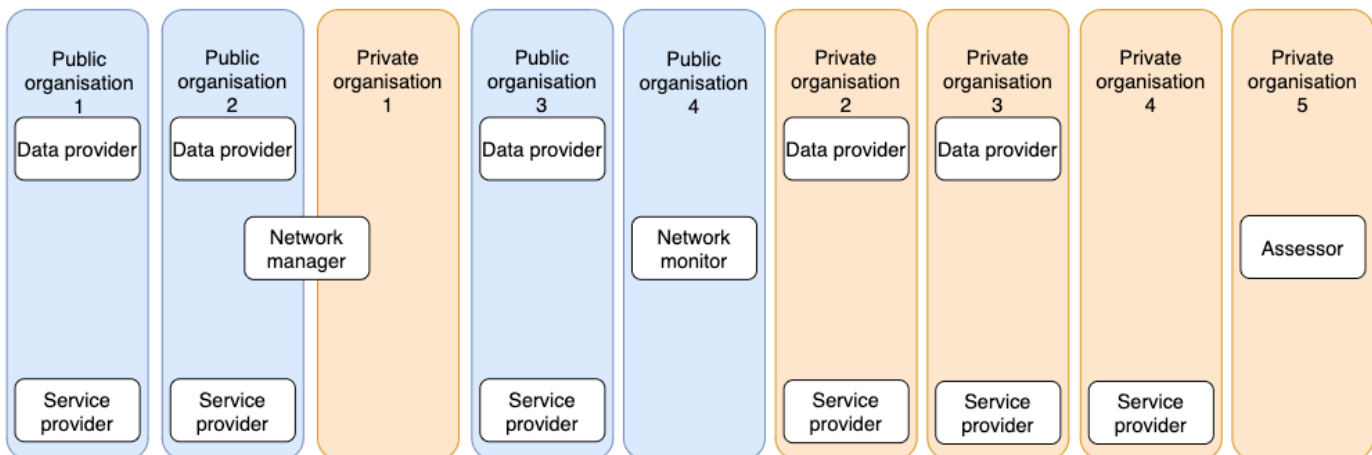


Figure 3: Collaboration structure Case C

At the start of the Covid-19 pandemic, there have been discussions if the pilot should be postponed, or if it should be cancelled completely. If it were to be postponed, the participating organizations would have to commit more time and resources to the project. The cancellation of the pilot would therefore save money for the participating organizations. But this would come at the cost that there would be no opportunity anymore to learn about the technological implementation of the pilot, or about collaborating with the other organizations. In the end the decision was made to postpone the pilot. This decision has been made unanimously, and this was also a prerequisite in order to be able to decide this. If it were not a unanimous decision the pilot would have been canceled. This prerequisite helps the smaller organizations feel valued, according to an interviewee from a private organization (I10).

“And one organization is (...) the project organizer, or the project manager, but they are not the boss. They do not prescribe what the course of the project will be. They leave that up to all the partners. So that is very good. It is a different form of collaborating than that you are used to.” **private organization (I10)**

An interviewee from a public organization (I3) notes that if you want to collaborate in a public-private partnership it is important to make sure that you also stay relevant for private organizations to collaborate with. If the public organizations themselves are not able to fulfill a data providing position it is not interesting enough for private organizations to collaborate. This can for example be because a public organization does not have the infrastructure anymore to collect relevant data. In such a situation the private organization could get a good overview of the state of the traffic network, without combining data with that of a public organization. So being able to provide supplementary data is necessary for collaborating in a public-private partnership.

4.1.4 Case D - Smart Destination Copenhagen

As well as the Smart Destination pilot in Amsterdam, the Covid-19 pandemic has had as a result that this pilot was not running during the time of the interviews. This pilot is designed to provide visitors of the region with information about events and travel advice based on these events. This makes sure that the infrastructure surrounding the event is as much as possible used by those attending the event. The cancellation of all large events, including the UEFA European Championship at which this service would have been used, has made this service superfluous. Despite this, just as in Case C, the collaborating organizations still have the goal to make sure that technically the service is working. In total, 5 organizations are collaborating in this pilot. Of these organizations, 1 is public, and 4 are private. The different intermediary functions as described in section 2.1 are fulfilled as follows: the *Network monitor* is fulfilled by a private organization, and the *Network manager* is fulfilled by both a public and a private organization. A visual representation is provided in Figure 4 below.

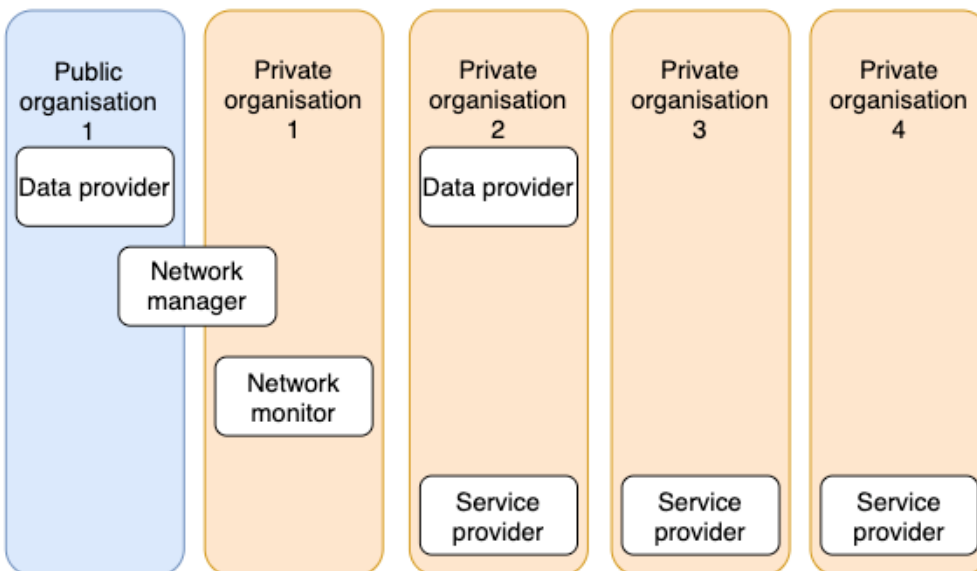


Figure 4: Collaboration structure Case D

Despite the problems due to the pandemic, multiple actors stated that the commitment from the organizations is still good. However, the circumstances in which the collaboration takes place have changed. The realization from the partners that this has happened means that there is also the understanding that this case has received less attention from the different organizations (I7, I14). An interviewee from a private intermediary organization (I14) puts forward that it has probably been easier for the private organizations to redirect their resources towards other projects. If another project seems more profitable to work on, focus can be more easily shifted towards the new or other project. For public organizations it is more that for a specific time a budget has been set to work on the project.

The importance of a good project planning is highlighted by multiple interviewees (I7, I10). However, an interviewee from a public organization (I7) notes that you can design a good project planning, but if you are not able to sanction a partner for not delivering on the planning, it does not matter how good the planning is. This is an aspect that seems difficult in general in European projects. Right now, a penalty can be withholding of the subsidy at the end of the project. This collaboration could benefit by having an evaluation system in place for the duration of the project. In addition, it is recognized by the interviewees that the organizations should be able to adapt and work flexibly with a planning if external circumstances ask for it. An interviewee from a private organization (I10) mentions that it is probably easier for the smaller organizations to be flexible with the project planning.

“You can make as many goals and plans as you like, if you don’t have opportunities to sanction partners that don’t contribute (...), it has the potential of pulling all partners down so that the goals are not reached” **public organization (I7)**

Just as in the other pilots, contractual arrangements are made between the data providing organizations, and data receiving intermediary organizations regarding the exchange of data. The public organization has an open data policy. This interviewee (I7) mentions that sometimes it can be a bit difficult to work with private organizations because of their open data policy, as it weakens the so-called bargaining chip they have. Namely, why would a private organization actively work together with an organization if all their data is openly available anyway?

An interviewee from a private organization mentions that the communication between the organizations is going really well (I10). This is regarding the communication between the organizations in this pilot, but also from this pilot towards the higher level of the Socrates^{2.0} project. Progress and information is shared on a regular basis. On the higher Socrates^{2.0} level there are strategic persons in place that try to draw a horizontal line between all the pilots. This keeps the common goals in the project aligned. In contrast to for example Case A, which has a few more organizations involved, discussions usually take less time and communication can be a bit more direct, according to an interviewee from a private intermediary organization (I14).

4.1.5 Case E - Roadworks Amsterdam

Case E, F, and G are pilots concerning Roadworks. As briefly mentioned in section 3.2, the implementation of these pilots is quite similar in Amsterdam, Antwerp, and Munich. Also, most organizations collaborate in more than one of these pilots. Due to these similarities, the common factors for the three cases E, F and G concerning Roadworks that are important for collaboration are discussed together here. Additionally, region specific comments are discussed in the separate sections.

By combining data that private service providers receive, usually in the form of feedback from road users about ongoing roadworks, with data that the public authorities receive from the construction companies, a better view of the current situation on the roads can be created. This can then be used to better inform road users about the situation on the road. In the Amsterdam pilot, 7 organizations are involved. There are 3 public and 4 private organizations. In the Roadworks pilots, the Shared view cooperation model is used. The intermediary function as described in section 2.1 fulfilled in this pilot is the *Network monitor*. This is done by a private organization. A visual representation is provided in Figure 5 below.

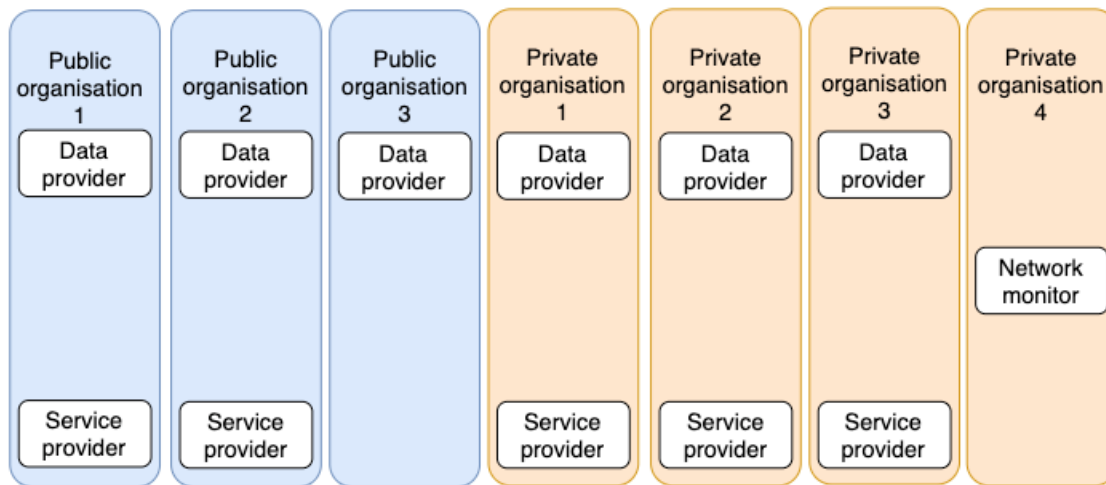


Figure 5: Collaboration structure Case E

According to the interviewees, collaborating is going well. Interviewees from the private data providing organizations mention it helps that this collaboration is still pre-commercial, making it easier to work together with direct competitors (I9, I12). However, the intermediary organization can be less transparent with how they create their common view. For the private organizations it is important that their data is not traceable, as this could hurt other parts of their business model (I13).

It is the policy from the different public organizations to work with an open data policy, so the data this organization provides is freely available. For the data provided by the private organizations, there are contractual agreements, on what happens with the data, and what the Network monitor intermediary organization is allowed to do with this data, made in the earlier mentioned Grant Agreement (I9, I11). An interviewee from a private data provider (I12) adds that they have made a specific agreement with the intermediary organization, explicitly allowing this organization to combine data from this organization's competitors with their data. An interviewee from a private organization (I9) mentions that they spend a lot less time on these agreements than was anticipated at the start of the project. This is said to be in large part because in this collaboration there is the independent intermediary organization, compared to previous collaborations without such an organization. Now the data is not shared directly to the competitor, which made the decision to share more data easier. Also, this is an organization that has had earlier experience with data sharing collaborations, which made this process easier as well.

“The good thing about Socrates is that all the competing parties bring in the content and that there is a neutral body (...) combining this content coming from all these parties and generating a common view (...), which is then provided to all interested.” **private organization (I12)**

The different interviewees generally feel that the individual goals of the organizations are discussed rather openly. An interviewee from a public organization (I4) also states that it is on the basis of a good collaboration to know each other's interests and goals for the project. This also entails that it is important for the private organizations to recognize that the public organizations have the obligation to represent a public interest. In turn, the public organizations need to recognize that for the private organizations a part of their interest is developing a good business case. In this collaboration the different organizations learn about each other's interests by spending a lot of time on determining and discussing what the win-win-win relation is. Despite the elaborate discussions about each other's interests, different interviewees realise that 100% transparency cannot be expected from the different private organizations. This is the result of competing organizations working together in the same project.

4.1.6 Case F - Roadworks Antwerp

In the Antwerp Roadworks pilot 5 organizations are collaborating. There are 1 public, and 4 private organizations. The intermediary function as described in section 2.1 fulfilled in this pilot is the *Network monitor*. This is done by a private organization. A visual representation is provided in Figure 6: below.

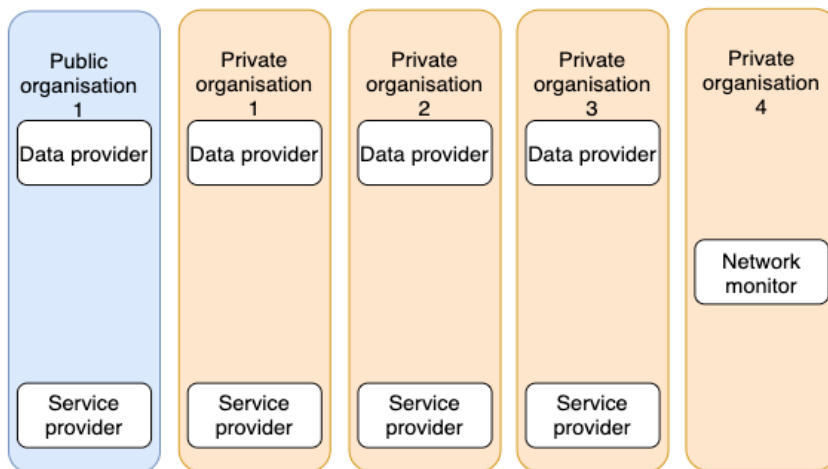


Figure 6: Collaboration structure Case F

An interviewee from a public organization (I5) feels that in this case, as it is being executed at the moment of the interviews, the role of the intermediary does not seem strictly necessary in order to carry out this pilot. The added value of the intermediary organization could increase if a different business model would be used, as it can take on more of the responsibilities that the public organization currently has. Despite the fact that the public organization would not carry out a business case, the interviewee (I5) still recognizes that it is important for collaborating in a public-private partnership that the public organization is involved in the discussions surrounding the design of a business case.

4.1.7 Case G - Roadworks Munich

In the Munich Roadworks pilot, there are 4 organizations involved. There is 1 public organization, and 3 private organizations. The intermediary function as described in section 2.1 fulfilled in this pilot is the *Network monitor*. This is done by a private organization. A visual representation is provided in Figure 7 below.

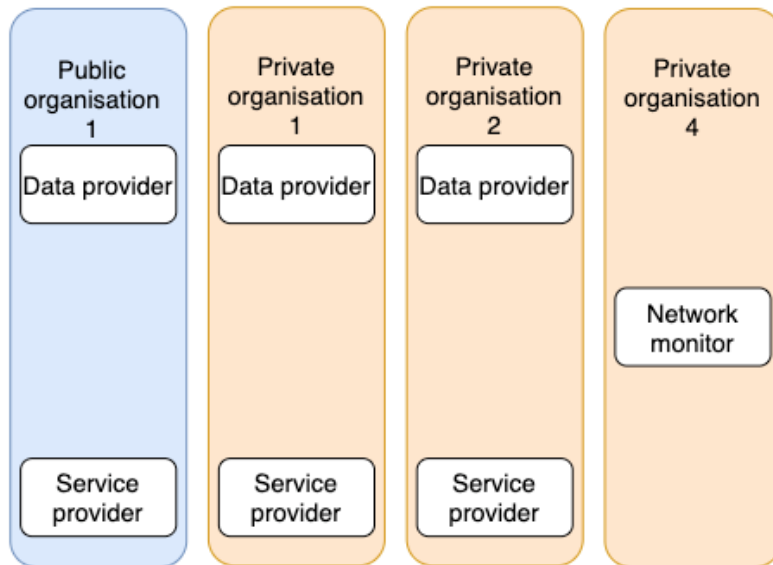


Figure 7: Collaboration structure Case G

The public organization works with an open data policy (I6). Everybody can get access to the data that this organization collects. For this pilot, the role of the public organization has been positioned as one of the data providers to the Network monitor, and will not get involved too much with setting up the services. This situation is also not expected to change much if the project would scale up in the future. Where necessary, the public organization does assist organizations that receive their data with understanding the data correctly. Despite the data providing role of the public organization, the interviewee mentioned that it is still very interesting to know what the goals and objectives of the other organizations are. It is also interesting to learn about the services that these organizations have built. Because the goal of these services are contributing to the public goals of enhancing traffic flow and traffic safety.

“Basically it is openly available, it can be used, it can be enriched, it can also be sold, so it is data that can be used by any company or any service provider that wants to set up some service.” **public organization (I6)**

This public organization is collaborating with (an) other organization(s) in this pilot that it has worked with in the past. The interviewee (I6) states that this makes collaborating easier. They better know what to expect from the other organization. That this pilot has been developed during the covid-19 pandemic, has meant that some organizations have seen some unforeseen financial and economic problems. Despite this, the interviewee has seen that the commitment from all the organizations is still good, and they are still involved in the same way as before. This is seen as really positive for collaborating in this partnership.

There is for this pilot not a specific risk allocation between the different organizations. The interviewee thinks that the largest risk in this pilot is probably for the private service providers, as they can be held accountable by their customers for providing a certain quality of their service. Also, the private organizations have the risk that the data is not consistently provided by the public data provider. That the risks are not tried to be spread evenly over the different organizations is not thought to be a negative influence for the collaboration, according to the interviewee of the public organization (I6), as there does not seem to be any motivation from either the public or the private organizations to change this.

4.2 Collaborating with an intermediary organization

During the interviews, it became clear that it was interesting to analyze the preferences for the intermediary organizations. Especially the Network monitor role was a frequently discussed subject during the interviews. The organization that fulfills this role is expected to be a so-called “trusted third party”. This organization receives potentially sensitive data from the different public and private data providers. It therefore needs to be trusted to handle this data with care, and comply with the agreements made in the Grant Agreement and different case specific agreements. But as an interviewee from a public organization (I2) states: *“There is no such thing as a trusted partner, that doesn’t make sense. It is a quality that you assign to a public or a private organization”* Interviewees offer different insights on the most suitable organization to fulfill the different intermediary roles

At this moment, in the cases A (ONTF Amsterdam) and C (Smart destination Amsterdam) the Network monitor role is fulfilled by a public organization. In the other 5 cases, this is done by a private organization. In cases A and C it was also believed to be the best fit to have a public organization in this role (I2, I3), while others can also see advantages of having a public organization in the Network monitor role, but do not necessarily see it as the best option (I6, I8, I9). One advantage that is named by multiple interviewees is that a public organization is believed to have no intention to misuse data, as it only has public goals to represent. A public organization is not interested in any business case with the data it receives. Furthermore, it is by definition not competing in a similar market as any of the private data providers. Another advantage of a public intermediary would be that it is likely more easily capable of collecting data for a specific geographical region. Confirming this argument, it is mentioned that different countries already have an organization that collects traffic data on a national level. In addition, public organizations are already providing data to interested organizations. Therefore, these will have a lot of experience with the data handling, and have infrastructure in place to do this well.

Multiple interviewees from private organizations mention that private organizations can fulfill the role of the Network monitor (I6, I8, I9, I11). And there are also interviewees from public organizations that can see the benefit of a private Network monitor (I1, I4) The requirement set by the private data providing organizations is that the private intermediary is not a direct competitor in a similar market outside of the Socrates^{2.0} project. If the private organization is indeed not a competitor in other markets, the contractual agreements provide the trust needed to share data with the intermediary. An advantage that is mentioned for a private intermediary organization in general is that it is expected to feel more pressure to innovate and be a fast moving organization (I8, I11), which would improve the services provided with the collaboration.

In the cases A to D, the Assessor role is fulfilled by a private intermediary organization. This is also what according to interviewees is preferred (I2, I16). A private organization, as long as it is not linked to another private organization, can objectively assess the performance of the services

provided by the service providers. The same criteria that this organization does not compete in the same market as a private data provider is mentioned by the independent expert (I16).

Concluding, the following advantages and disadvantages of a public intermediary organization and a private intermediary organization with the role of the Network Monitor, and to a certain extent the Assessor, can be found.

- Public intermediary
 - Not collaborating to fulfill a business case is an advantage
 - Not gaining a competitive advantage if receiving data is an advantage
- Private intermediary
 - Feels more pressure to innovate is an advantage
 - Is more capable to adapt to changes in the market is an advantage
 - Can have a shared customer base with the data provider is a disadvantage

4.3 Cross-case analysis

In this section, a cross-case analysis is performed in which the concepts from the conceptual overview are analyzed. It starts with the factors attributed to the dimension Joint decision making. The dimensions Goals and objectives and Partner interaction follow respectively.

4.3.1 Joint decision making

In Table 6 provided below, the number of interviews in which each factor is coded for the dimension Joint decision making is presented. In addition to the elaboration the interviewees have provided during the interviews, this will help with identifying the importance of each of the factors for collaboration.

Table 6: Number of interviews for which a factor has been coded for the dimension Joint decision making.

Joint decision making	#
Purpose limitation	13
Appropriate risk allocation and sharing	7
Minimised data lock-in	7
Respect for each other's commercial interests	6
Equality	5
Proportionality in the use of private sector data	3
Conditions for data re-use	3
Shared value creation	1

4.3.1.1 Purpose limitation

Purpose limitation of shared data was concerned with agreements about what data is used for. As can be seen in Table 6, this factor is coded most often, and is one of the most important subjects talked about during the interviews. In all the pilots there seems to be a similar trend, where this factor seems to be mainly concerned with the intermediary role of the Network monitor. This is understandable, as this is the organization that is the data receiver in the pilots. For all pilots, the public organizations have an open data policy. The private organizations mention the need for contractual agreements around what data is shared, with whom it is shared, and what is allowed to be done with the data. Broader agreements about this are made in the Grant Agreement, at the Socrates^{2.0} project level, while further specified agreements are made at the pilot level.

These purpose limitations to the data also have an effect on which organizations are a good fit to fulfill the Network monitor intermediary role. It is important that this organization is not a direct competitor, a competitor that has a nearly identical customer base for this collaboration and outside of this collaboration. Next to private organizations being afraid that their data is received by a direct competitor, there are also private organizations that provide data which will not directly lead to a competitive disadvantage if their data is received by another private organization. In this case, the interviewees mentioned that it is important to have agreements in place regarding publication of results from the project. Conclusions from initial results for example, should not be made public before the project has been finished and an evaluation has been performed by the collaborating organizations. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.1.2 Appropriate risk allocation and sharing

As described before in the theory, risk allocation and risk sharing is seen as a major part of a public-private partnership, in contrast to a contracting-out arrangement. As in public-private partnerships the public and private organizations benefit from each other's knowledge and skills, Mladenovic et al. (2013) suggested that they should also try to define in advance which organizations take what risks, and share this risk evenly between them. In the overall Socrates^{2.0} project, there have not been any major discussions on the different risks the organizations all take. However, some interviewees in different cases mention that this balance is created quite naturally (I4, I7, I13). They mention that when it is thought that an organization may have a bigger part in the collaboration, there is often also more risk associated, for example in the size of the current investments. The independent expert has mentioned that with the design of the Socrates^{2.0} project, and the division of the roles each organization has, risks are also minimised. The roles that all the organizations play in the project are determined by what they have experience with, and what they can probably perform well on.

However, some interviewees mention that for any continuation of the project, it could be a good idea to determine in advance which organizations share what risks. An interviewee from a private organization (I9) discusses that it is not always self-evident that the benefits from the collaboration are in proportion to the size of the investments of an organization. An attempt to redistribute more of the benefits to the organizations that take the most risks, or make higher investments, could be beneficial to this collaboration (I1). Although Table 6 shows this factor has been coded often, based on this information it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

4.3.1.3 Minimized data lock-in

Minimized data lock-in means that an organization that provides a service that generates extra data should share this as much as possible. When new data streams are to be discovered during the course of the project, it is expected that this is shared within the project. An interviewee from a public organization (I7) argues that all shared knowledge should be “transparent and equally accessible”. If it is created with European funding it should also be openly accessible. It can always be that an organization gets inspired by this project and with that inspiration creates value outside of the scope of the project, but as long as it is related to the main goal, or the scope of the project, the information should be shared. Right now, the feeling is that this is shared openly. Interviewees from private organizations (I8, I11) mention that the expected data streams were well defined at the start of the project, and therefore it is not often that there have been any discussions about sharing other data streams. Based on this information, it can be concluded that this factor is important for collaboration in the traffic management sector

4.3.1.4 Respect for each other’s commercial interests

Respect for each other’s commercial interests means that contractual agreements need to aim to protect commercial interests of the organizations providing data, as well as the organizations using the data. The commercial interests in this project are low, as it is still pre-commercial. Despite this, the organizations are thinking about how to do this in the future, and have already allocated roles and responsibilities with this in mind. One interviewee from an intermediary organization (I13) calls it also an unwritten rule that an organization concludes on its own whether an organization really can add value in a certain position, or can better leave it to another organization. Also, interviewees from public organizations call it important that they consider what business cases the private organizations can create (I1, I2). Based on this information it can be concluded that this factor is important for collaboration in the traffic management sector.

4.3.1.5 Equality

The factor *Equality* is a factor that was not found in literature yet. It is brought up by different interviewees. This factor shows the importance for the valuation of different sized organizations participating in the collaborations. For important decisions, such as determining whether to continue work on a pilot despite external developments that make it difficult to continue, the vote of small organizations should be weighted the same as the vote of a large organization in the collaboration (I10). This is said even in some of the most complex pilots of the Socrates^{2.0} project, with the highest number of organizations collaborating in the pilot. Interviewees from public organizations substantiate the importance of equality by saying that it provides incentive to collaborate for even the smallest organizations (I4), and to make sure that one organization does not become too dominant (I5). The interviewee from the private organization (I10) however, also mentioned that this situation can provide problems for cooperating. If everyone is treated equal, you can get never ending discussions, which would result in little progress. Based on this information it can be concluded that this factor is important for collaboration in the traffic management sector.

4.3.1.6 Proportionality in the use of private sector data

Proportionality in the use of private sector data, meant that requests from public organizations for private sector data should be justified by a clear public interest. The data, in terms of detail, relevance, and data protection, had to be relevant for the intended use. As presented in Table 6, this factor is not coded often. In this public-private partnership it is not necessarily about requests from the side of the public organizations, although there is a clear public interest that forms a

reason for collaboration, namely a better and safer traffic flow. There is a mutual interest in using data from both the public as well as the private organizations. It is mentioned by an interviewee from a private organization that the sharing of data with the Network monitor should have a clear added value by optimizing the information that can be retrieved from it, instead of an intermediary organization that just passes along information (I8). Based on this information, it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

4.3.1.7 Conditions for data re-use

The collaboration should be mutually beneficial, and public organizations should get preferential treatment to other customers, in order to acknowledge the public goals. A collaboration should also lower the need for public organizations to gather data in other ways. This factor is not coded often in the interviews. However, as can be seen from the factor *equality* described above, the public organizations do not receive a preferential treatment. As mentioned by an interviewee from a public organization (I3) the collaboration does also not lower the need for public organizations to gather data. There are public organizations, not necessarily in this collaboration, that remove their own infrastructure to gather data. But according to the interviewee (I3) it can also be positive to maintain a data generating position. It lowers dependency on the data from other organizations. It also allows for verifying data you do receive from other organizations. Based on this information, it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

4.3.1.8 Shared value creation

Shared value creation means that contractual agreements have to recognize that multiple organizations contributed to creating the data, when data is generated as a by-product of a service. This factor seems to be closely related to that of *minimised data lock-in*. So the data generated as a by product should be shared. Recognition that multiple organizations have contributed to creating the data is not really mentioned. This is possibly due to the project being in a pre-commercial stage, where it does not really matter. Based on this information, it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

4.3.2 Goals and objectives

In Table 7 provided below, the number of interviews in which each factor is coded for the dimension Goals and objectives is presented. In addition to the elaboration the interviewees have provided during the interviews, this will help with identifying the importance of each of the factors for collaboration.

Table 7: Number of interviews for which a factor has been coded for the dimension Goals and objectives.

Goals and objectives	#
Detailed project planning	10
Clear goals and objectives	10
Ensure undistorted competition	6
Do no harm	3
Consistent monitoring	3

4.3.2.1 Detailed project planning

The planning of the project is also deemed very important by the interviewees. It is also one of the most talked about factors for the dimension Goals and objectives, as can be seen in Table 7. It provides a guideline to achieve the goals that are set, while also providing an obligation for partners to provide their work. While it does provide an obligation to partners, it is also noted by an interviewee from an intermediary organization that it is difficult to keep a partner to their commitments, as this partnership is also driven by freewill of the partners to invest resources into the project (I3). An interviewee from an intermediary organization (I13) states that for an intermediary organization it could well be even more important to work with a detailed project planning, as this organization is always dependent on another organization to provide data, and you are also responsible towards the service provider to provide them with the necessary information to execute the service. Next to the project planning being important, with recent circumstances surrounding the Covid-19 pandemic, it has shown that a flexible handling of the planning by partners is important. The Covid-19 pandemic has made for some traffic management services to be not relevant, as the traffic intensities have dropped enormously, and events have been cancelled on a large scale. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.2.2 Clear goals and objectives

Setting clear goals and objectives is important for collaboration. It is one of the factors talked about most during the interviews, as can be seen in Table 7. The interviewees seem to agree that there is an important distinction to be made between common goals, and individual goals. The common goals are the goals that are set out to be achieved with the different pilots. All organizations want the traffic management services to improve what they have been set up for. But organizations also have individual goals. Those of the public organizations will align most with the common goals. In the case of the ONTF pilots, optimizing the use of the existing infrastructure is directly in line with the goals for public organizations, where for the private service providers this can mean providing individuals with a sub-optimal route advice (I8). For the private service provider to prioritize the common goal over their own competitive advantage to other private service providers offering a similar service, they will have to be incentivized through, for example, a reward system (I10). Different interviewees from public organizations provide another reason why they want that during a collaboration other organization communicate their goals and objectives. It can provide them with a learning opportunity about what the market is working on. And this is often in order to fulfill the interests of public organizations, namely improving traffic flow and traffic safety. This, in turn, can help these public organizations to improve their own services (I2, I6). Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.2.3 Ensure undistorted and fair competition

The factor *Ensure undistorted competition*, according to the European Commission, means that the exchange of commercially sensitive data should have no effect on the existing competition between organizations. As was the case with earlier factors, this is ensured through the intermediary role of the Network monitor. Commercially sensitive data will not be shared between competing organizations directly. This is then also a factor that is important for the private organizations. Additionally, a closely related subject talked about by the public organizations in different cases during the interviews is *ensuring fair competition*. The public organizations have the obligation to make sure that there will be no cases of monopoly formation, where one private organization would decide everything. It also needs to be able to justify to the public why they

have chosen to work together with one private organization, but not a different one. An interviewee from a public organization (14) also mentions that it is also not the goal of the collaboration to subsidize developments from, or create services with, private organizations, that would also have been developed or have entered the market without subsidies. However, as the project is pre-commercial, the public organizations are not yet concerned about the effect of the partnership on the existing competition. Therefore, based on this information, it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

4.3.2.4 Do no harm

This point made by the European Commission about data sharing collaboration, means that commercially sensitive information must be respected, and the private organizations should still be able to monetize insights that can be derived from the data. That this is an important point concerning the private organizations is reflected during the interviews. The interviewees from all the public organizations mentioned that they have an open data policy, so their data is freely available for everyone interested in using it. But for the private organizations, their data is often their source of a possible competitive advantage over their competitors. As a result, the private organizations for which this was the case, are hesitant to share this data with a direct competitor. This has a large impact on the decision of which organization fulfills the intermediary role of the *Network monitor*, who collects data from different organizations in order to create a common view of the state of the network. It is important that this organization is not active in the same market as the private data providers outside of the collaboration. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.2.5 Consistent monitoring

Consistent monitoring is an important factor in order to identify whether the provided services are effective. In three out of the four cases that use the coordinated approach cooperation model an Assessor intermediary organization is used that evaluates and monitors progress. And an interviewee from a public organization (17) mentions the need for more regular monitoring of the achieved goals. At this moment it is mostly at the end of the project that failing to achieve objectives can have monetary effects, in the form of not receiving the reimbursement from the European Union. It is not a factor often specifically coded in the interviews, as can be seen in Table 7, but from the arguments above it can be concluded that this factor is still important for collaboration in the traffic management sector.

4.3.3 Partner interaction

In Table 8 provided below, the number of interviews in which each factor is coded for the dimension Partner interaction is presented. In addition to the elaboration the interviewees have provided during the interviews, this will help with identifying the importance of each of the factors for collaboration.

Table 8: Number of interviews for which a factor has been coded for the dimension Partner interaction.

Partner interaction	#
Strong commitment by parties	10
Transparency	6
Open and constant communication	6
Clarity of roles and responsibilities among partners	6
Standards	6
Compatibility skills of partners	5
Mitigate limitations of data	2

4.3.3.1 Strong commitment by all organizations

Strong commitment is the factor most often coded for the dimension Partner interaction, as can be seen in Table 8. It is deemed really important by interviewees to have strong commitment from their partners. However, during the Covid-19 pandemic it has become clear that even when commitment from individuals to work on the project can stay high, changing circumstances can cause commitment from firms to change. This change is more visible for the private organizations, as the financial impact will force them to switch their attention to more profitable actions more quickly, whereas public organizations feel this pressure less. The tasks of organizations that, due to these extreme circumstances, had to lessen their activities and responsibilities, have been taken over by different organizations that could take on these tasks. Despite the external circumstances influencing the commitment some organizations can give to the project, it can be concluded this factor is very important for collaboration in the traffic management sector.

4.3.3.2 Transparency

Transparency, as defined by the European Commission, meant that agreements on which organizations have access to the data, the type and level of detail of the data that is shared, as well as for what purpose should be identified in a clear and understandable manner. Quite some interviewees mention that, as soon as it concerns data with a certain privacy issue or sensitivity, all the agreements made are very clear (I1, I3, I4, I12, I13). This is important for the data providing organization to agree upon sharing the data, and trust the data receiving organizations to handle this data with care. As one interviewee from a public organization states: *“This trust is not necessarily like you and I trust each other, but you really write it down. That is also a good thing about Socrates, that you learn how to write these things down”*. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.3.3 Open and constant communication

Open and constant communication helps to build trust between collaborating organizations. Interviewees mention that there is a lot of communication between all the partners. The interviewees from the intermediary organizations mention that communicating and operating openly is important to them. As an interviewee from an intermediary organization (I14) says: *“I think you only make each other stronger”*, and another interviewee from an intermediary organization (I13) speaks: *“Yes, we are completely transparent. (...) except that there are some*

parties that don't want their data to be traceable when it is mixed with other sources". The interviewees do realize that 100% openness would not be realistic from private organizations, as some may be working with direct competitors in this cooperation. For the Roadworks pilots, how transparent the intermediary organization can be, is mentioned to be more limited than in the other pilots. The private organizations are stricter about the traceability of their data in the Roadworks pilots. This can likely be explained as the common view created by the Network monitor is the result of combining data for these pilots. In the other pilots, this common view is translated into key performance indicators for the traffic network, and into service requests by the Network monitor. As a result, the individual data streams are getting mixed up more. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.3.4 Clarity of roles and responsibilities among partners

Clarity of roles and responsibilities helps to develop mutual goals that are envisioned in the cooperation. And in the Socrates^{2.0} project, there is a clear understanding of the different roles and responsibilities of all the organizations. At the start of the project the time was taken to define really well what all the roles and responsibilities are (I8). An interviewee from an intermediary organization (I14) states that this is important to make sure this is clear at the beginning of the collaboration. However, although this division is clear, it is also mentioned that in a pre-commercial collaboration, organizations can legitimately argue that they did not have time to perform some of the responsibilities (I1). This factor is slightly less often coded, as can be seen in Table 8, but combined with the previous information it can be concluded that this factor is important for collaboration in the traffic management sector.

4.3.3.5 Standards

Different interviewees mention that the use of technical standards is necessary in this type of public-private partnership. Using standards will reduce costs, and more importantly, help scale projects. For public organizations this will help to create a nationwide traffic management system. Out of the private organizations, scalability is especially important for the multinational private organizations. It is difficult for multinationals to work together with organizations that do not use any, or the same, standards. These large organizations do not have the time to tailor all their services towards different countries, or even municipalities (I11). Next to this, it is also important that a well-fitting standard is used for the task that needs to be performed. Based on this information, it can be concluded that this factor is very important for collaboration in the traffic management sector.

4.3.3.6 Compatibility skills of partners

It makes it easy for organizations to work together with organizations that they have already worked with before (I6, I14), as they are familiar with their way of working and their goals. One interesting factor that is named during an interview, is that the domain in which the collaboration takes place will likely influence how well the collaboration goes. In the traffic management domain, there are probably organizations involved that are used to collaborating due to the nature of how this domain operates. At least already with public-public collaborations. In traffic management it is a requirement to collaborate, as infrastructure has the inherent attribute, that it does not stop at regional borders. As a result the public organization will already have a lot of experience with collaborating with other organizations, says an interviewee from a public organization (I3). Based on this information, it can be concluded that this factor is important for collaboration in the traffic management sector.

4.3.3.7 Mitigate limitations of data

Mitigate limitations of data means that the data providing organizations should help with mitigating the downsides of for example a bias that can be found in the data. It is not coded often in the interviews. An interviewee from a public organization (16) mentions that they do offer to help with understanding data correctly, but the private organizations mainly know the limitations of using public data, and accept these limitations. Also, an interviewee from an intermediary organization (114) has stated that they do not aim to improve the quality of data if they find a limitation in the data that is provided. Based on this information, it can be concluded that this factor is less relevant for collaboration in the traffic management sector.

5. Conclusion

European cities increasingly encounter traffic related problems. Costs associated with these problems account for 100 billion euros, and these problems also add significantly to vehicle emissions. This asks for innovative solutions. In this research the European public-private partnership Socrates^{2.0}, which aims to develop innovative traffic management services, is studied. One of the core ideas in this partnership, is to use a so-called intermediary organization to fulfill different functions in the collaboration process. To date, scientific literature studied success factors contributing to successful collaboration in public-private partnerships. However, this literature does not take into account the presence of intermediary organizations in these partnerships. Therefore, this research has aimed to answer the following research question:

What are important success factors for collaboration with an intermediary organization in a public-private partnership in the traffic management sector?

This question has been researched by performing a qualitative cross-sectional multiple case study on seven pilot projects from the Socrates^{2.0} project. The pilots that are studied use intermediary organizations to carry out the different traffic management services. By interviewing representatives of all the organizations involved in these pilots, it is determined what factors have been important for the collaboration so far. Analysis of the interviews shows that not all factors from the theoretical framework have shown to be as important as others. It has also shown that the importance of some of the factors depends on the intermediary role that the organization fulfills. The traffic management sector has a characteristic that also influenced the results. It is a sector that is characterized by the infrastructure that does not stop at any borders, and therefore, organizations in this sector are already used to collaborating. Additionally, the Socrates^{2.0} project is co-funded by the European Union and has a pre-commercial character. This has had an impact on the importance of factors as well. The most important factors are highlighted below.

The following conclusions can be made regarding the factors about the dimension Joint decision making. *Purpose limitation* of shared data is one of the most important factors. Agreements about this factor enable an organization to be regarded as a “trusted third party”, and operate as the Network monitor intermediary role. A factor that is maybe less explicitly written down in agreements, is *respect for each other’s commercial interests*. Especially when exploring different business models during the pilots, it is important that they are attractive for all the organizations involved.

From the factors regarding the dimension Goals and objectives, the factor regarding the *project planning* was in theory mostly focused on the detail of the planning. This research has shown that besides having a good planning, it is also very important that the project planning is flexible. This means that organizations should recognize that external circumstances can alter the planning. It is also important that technological advancements in the market are monitored, in order to incorporate these in the project planning. Additionally, it is important that the *goals set for the project are clear*. And with that, there is a distinction between individual and common goals. By discussing openly about what these goals are, the organizations can design the execution of the pilot so that it best fits the goals for all organizations involved.

The third dimension, Partner interaction, has four very important factors. Organizations need to notice a *strong commitment* from their partners. External circumstances, like the Covid-19 pandemic, have influenced the commitment some organizations could show. The other organizations however recognize that this is natural for these extreme circumstances. *Transparent* agreements about the shared data are seen as crucial, and a good learning point

from the project. Also, *open and constant communication* is important to generate trust between the organizations. *Standards* is a new factor, and is very important for scalability of a project, and attracting large organizations for a partnership.

An overview of the factors that, based on this research, are important or less relevant for collaborating with an intermediary organization in a public-private partnership in the traffic management sector is provided in Table 9.

Table 9. Overview of factors that are important for collaboration with an intermediary organization

	Joint decision making	Goals and objectives	Partner interaction
Very important	Purpose limitation	Detailed <i>and flexible</i> project planning	Strong commitment by partners
	Respect for each other's commercial interests	Clear goals and objectives	Transparency
		Do no harm	Open and constant communication
			Standards
Important	Equality	Consistent monitoring	Compatibility skills of partners
	Minimized data lock-in		Clarity of roles and responsibilities among partners
Less relevant	Appropriate risk allocation and sharing	Ensure undistorted <i>and fair</i> competition	Mitigate limitations of data
	Shared value creation		
	Conditions for data re-use		
	Proportionality in the use of private sector data		

To these findings, some nuances have been found for certain factors. Firstly, before collaborating could even start the right organization has to be chosen for the fulfillment of an intermediary role. It can be both a public and a private organization. Both have advantages and disadvantages, and thus it should collectively be decided upon which is the best fit for the collaboration. Advantages of public organizations are mainly concerned with their inherent attribute of not having to make a profit. Therefore, a public organization will not gain a competitive advantage by receiving data. However, a private organization is thought to be able to adapt more quickly to changes in the market. A private organization that does not have a similar customer base to a private data providing organization is able to fulfill all intermediary roles.

To summarize the above findings:

- Public intermediary
 - Not collaborating to fulfill a business case is an advantage
 - Not gaining a competitive advantage if receiving data is an advantage
- Private intermediary
 - Feels more pressure to innovate is an advantage
 - Is more capable to adapt to changes in the market is an advantage
 - Can have a shared customer base with the data provider is a disadvantage

Secondly, it was found that the different cooperation models have an influence on the importance for some of the factors. The traceability of the private sector data was a bigger concern in the pilots with the Shared view cooperation model. The common view of the current state of the traffic network made by the Network monitor is in this model the end result that the service providers receive. In the Coordinated approach model, service requests are placed to the service providers based on the common view of the current state of the traffic network. This extra step means that the provided data from other organizations is less traceable by the service providers. In addition, the importance of monitoring in the Shared view cooperation model is regarded lower than in the Coordinated approach cooperation model. This is most likely because there is less dependence on the service providers. In the Coordinated approach model, the service providers are expected to execute on the service requests from the Network manager.

To summarize the above findings:

- Coordinated approach
 - The importance of purpose limitation is larger for data received by the Network monitor
- Shared view
 - The monitoring of the collaboration is less important

Thirdly, the importance of some of the factors differs for different intermediary roles. The factors based on the European Commission (2018) regarding collaboration in data drive partnerships seem to be mainly important for the Network monitor intermediary role. The most prominent factor that is important for a good cooperation between the partners is *purpose limitation*. When talking about purpose limitation, other factors as identified by the European Commission (2018), the interviewees often interchangeably talked about *conditions for data re-use*, *respect for each other's commercial interests*, and *do no harm*. These three factors all seem to cover part of the conversation about purpose limitation of exchanged data between the data providers, the Network monitor, and the service providers. These arrangements regarding the data exchange between the organizations are critical in order to fulfill the Network monitor role.

To summarize the above findings:

- For the intermediary Network monitor role:
 - Purpose limitation of data received is extra important
 - Do no harm is extra important
 - Respect for each other's commercial interests is extra important

6. Recommendations

This research has been conducted as part of an internship with MAPtm, and set out to learn about how an intermediary organization can successfully act in a public-private partnership. Based on this research, a few recommendations can be made to organizations aiming to fulfill an intermediary role in a public-private partnership.

The first recommendation is to communicate clearly to the private partners in the collaboration what the customer base is that an intermediary partner serves outside of the concerned collaboration. Explain how being in the position to handle data from other private organizations provides no competitive advantage to the intermediary organization. This will create trust with other organizations. In addition, propose contractual agreements stating that the received data is not shared with other organizations, and about what can be done with the data. Trust can furthermore be created by openly communicating about the role your organization has had in previous projects. Next to this, it is important to clearly determine what the added value will be from receiving data from different organizations to each of the participating organizations. The intermediary position should not only be used for receiving and passing on data, but an added value should be created with this data.

The second recommendation is to propose a standard for data handling. It is easiest if this is a standard that is already used in the industry, as more organizations will be familiar with it, and it should be fit for its purpose. This also makes it easier to attract larger organizations to the collaboration, which are vital for scalability of a service. It is important that there is enough technical know-how about this standard in-house.

The third recommendation is to aim to continually try to add value to the partnership. Advantages of a private organization are its capability to adapt to changes in the market and its pressure to innovate. Therefore, the recommendation is to try and take advantage of technological developments that take place outside of the collaboration.

7. Discussion

7.1 Theoretical contributions

The results of this research have provided new insights into public-private partnerships. Firstly, combining theory on CSF's for public-private partnerships, and data-driven partnerships has proven to be relevant for a data-intensive sector like the traffic management sector. Factors like *purpose limitation*, *conditions for data re-use*, *respect for each other's commercial interests*, and *do no harm* were found to be the most important factors for collaboration with an intermediary organization in the traffic management sector. This is dependent on the type of role the intermediary organizations fulfill. It is especially relevant for an organization receiving and handling data from multiple private data providers. Not all factors from data-driven partnership theory are as relevant. For example, *mitigate limitations of data* and *minimized data lock-in* have not found to be important topics for this sector. *Undistorted competition* is less relevant in pre-commercial partnerships.

Secondly, in section 2.2, a definition by Klijn and Teisman (2003) is provided for a public-private partnership "*cooperation between public and private actors with a durable character in which actors develop mutual products and/or services and in which risk, costs, and benefits are shared*" (p.137). This definition highlights the importance of the factor risk allocation and sharing. However, the results show that this is not deemed very relevant by the interviewees. A possible explanation for this could be that previous research on public-private partnerships has often focused on the construction of infrastructure. The upfront costs of those projects, as well as operation costs are a lot higher than for the risks and costs in the Socrates^{2.0} project.

Thirdly, the use of *standards* can be added to the factors for successful collaboration. For data sharing partnerships the use of standards streamlines the operation between organizations in one collaboration. And additionally, it enables larger organizations to be able to join a collaboration. Larger organizations are less flexible to customize their services to a specific region. Therefore, in the traffic management sector, it will be beneficial to work with standards across geographical regions.

Fourthly, this research has shown that, due to external circumstances, the factor detailed project planning is not all encompassing. The project planning also has to be flexible. This way, it can incorporate changes in the market into the project, and be easily altered if other circumstances, in this research the Covid-19 pandemic, alter the plans.

7.2 Research limitations

Reflecting on the execution of the research, there are some limitations to this research that can be discussed. Firstly, the choice to set up this study as a multiple case study can be argued. The different pilots and pilot sites in the Socrates^{2.0} project have been studied as separate cases. However, in the Socrates^{2.0} project, there are a lot of agreements made on a higher level than the pilots. As a result, it has been difficult to recognize differences in the importance of factors for collaboration between the different cases. Sometimes, this also made it difficult to stick to the prepared interview guides, as interviewees sometimes answered questions about collaborating on the level of collaborating on the Socrates^{2.0} level, instead of the pilot level.

Secondly, the sample of interviewees poses some limitations itself. The number of interviewees per case differs. As a result, it could be that some of the cases have a lower data saturation than other cases. Also, the interviewees were questioned about two cases at most in order to ensure

that the interviewee could provide in-depth answers on the cases. However, it turned out to be difficult to keep interviewees to stick to these two cases if they were also involved in other pilots. This occurred despite stating at the beginning of the interview about which cases the interview was, and asking questions about the specific cases. Also, some cases involve more collaborating organizations than others, which also partly explains why some cases were discussed in more interviews than other cases.

Thirdly, different biases could have occurred during the research. A bias of the researcher can occur regarding the interpretation of the data. From the qualitative interviews, the researcher interprets the wording of the interviewees in order to establish what factors they deem important. This is partly tried to deal with by qualitatively asking interviewees how important they deemed something. This sometimes allowed to make a distinction on the importance through the wording of the interviewee. However, it should be recognized that not all the interviewees will use the same wording to describe how important they think a factor is. Other biases could occur through the interviewees. The interviewees were aware that their colleagues in the Socrates^{2.0} project were also subject for an interview. This could lead to interviewees answering in a manner to try to minimize any risk of insulting or discrediting any of their colleagues, or describing the collaboration as better than actually experienced. This has been tried to deal with by telling all interviewees before the interview that results would be anonymized by leaving out any names and company names. Also, the interviewees have been given an opportunity to check the statements or quotes used in the report.

Fourthly, it can be debated whether the decision to categorize the factors identified in theory to the three dimensions. These dimensions were created from key differences between contracting-out arrangements and partnerships. On these dimensions, internal organizational factors as well as data driven partnership factors were sorted. For future research it can be better to add another dimension specifically for data driven partnership factors. An example of a research that took such an approach is Sussha (2020), who used the dimensions *Organizational, Technological, Legislation and policy, and Environmental*.

Lastly, the generalizability of the results are low. Generalizability is always a concern with qualitative research, as one subject is researched in depth. The generalizability of the results to other sectors than traffic management are low, as interviewees mentioned that the context of the collaboration should be taken into account. Organizations in this sector are often already used to collaborating. Furthermore, the willingness to share data was said by some interviewees to be higher in this collaboration due to it being in a pre-commercial stage. In addition, the project being part of a subsidy program from the European Union can also negatively influence the generalizability to other collaborations in the traffic management sector.

7.3 Further research

This study does not encompass everything that can be researched about collaboration with intermediary organizations. Some recommendations can be made for further research into this area.

Firstly, this research focused on a European collaboration subsidized by the European Union. Interviewees argued that this subsidy arrangement made it sometimes easier to share information between organizations. Therefore, further research can be performed on public-private partnerships that do not use any form of subsidies in order to establish how the findings of this research will differ in those circumstances. Also, the public-private partnership Socrates^{2.0} is an experiment. The pilots that are in a pre-commercial stage. As public-private partnerships will have

to be commercial in the long run to attract private organizations, research can be performed on a collaboration that is in a commercial stage. First this can be done for other projects in the traffic management sector, and afterwards in other sectors. Based on the results of this research it can be expected that the factors regarding data sharing, especially those that cover data protection will be more important. And for commercial partnerships, shared value creation is also likely to be more important

Secondly, in order to better generalize results from this study, a more quantitative approach can be taken to expand on this research. For example, a survey study can be performed on multiple collaborations over different sectors in order to identify in what conditions the results of this study will hold. In other sectors, organizations can be less used to collaborating, which could alter the importance of some of the factors.

Thirdly, at the time of the interviews, the business cases that would be employed after the Socrates^{2.0} project would end are not determined. Further research could be performed on identifying applicable business cases.

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Appendix A: Interview guide Private / Public organization

Mijn onderzoek richt zich op success factoren voor een publiek-private samenwerking waarin intermediaire organisaties een rol spelen.

MAP traffic management wil hiermee uiteindelijk achterhalen welke maatregelen zij kunnen treffen om een samenwerking zo goed mogelijk te laten verlopen.

Gaat u ermee akkoord als dit interview wordt opgenomen en gebruikt in het onderzoek? De resultaten zullen anoniem worden verwerkt. Als u het transcript wilt inzien voor het wordt gebruikt dan kan dat. Ook mag u op elk moment het interview stoppen.

- Algemeen
 - Kunt u een toelichting geven op het werk wat uw bedrijf doet binnen het project? (Service provider / Data provider / intermediary role)
 - Hoe is uw bedrijf betrokken geraakt bij het project?
 - Heeft uw bedrijf ervaring met publiek-private samenwerkingen?
 - Ja?
 - Hoe zijn deze eerdere publiek-private samenwerkingen verlopen?
 - Hoe verloopt de samenwerking in het Socrates project vergeleken bij de eerdere publiek-private samenwerkingen?
 - Nee?
 - Wat was de reden om deel te nemen aan deze publiek-private samenwerking?
- Intermediair¹
 - Bent u op de hoogte van de verschillende samenwerkingsmodellen die worden gebruikt in het Socrates project? (Exchanged data / Common view / Coordinated approach)
 - Ja?
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Nee?
 - Uitleg geven
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Bent u op de hoogte van de verschillende intermediaire rollen die zijn geïdentificeerd voor het Socrates project?
 - Ja?
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Nee?
 - Uitleg geven
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
- Samenwerking

¹ These questions are mainly used as part of an internship with MAP traffic management

- Open vraag, kunt u vertellen hoe het samenwerken met intermediaire partij X bevalt?
 - Wat zijn in uw opinie de redenen dat dit (niet) goed verloopt? Kunt u daar voorbeelden bij geven?
- Punten om naartoe te sturen tijdens het interview:
 - Het maken van beslissingen
 - Wordt er gelet op het creëren van toegevoegde waarde voor de verschillende partijen (win-win)? Is dit belangrijk voor u?
 - Wordt er overlegd welke risico's door verschillende partijen op zich worden genomen? Is dit belangrijk voor u?
 - Wordt er meegenomen of de toegevoegde waarde van het project het waard is om data te delen? Is dit belangrijk voor u?
 - Wordt er een afbakening gemaakt waarvoor data gebruikt mag worden?
 - Krijgt deze samenwerking een voorkeursbehandeling ten opzichte van andere klanten, om het publiek belang te voorzien? Is dit belangrijk voor u?
 - Stellen organisaties rest data beschikbaar? Is dit belangrijk voor u?
 - Wordt er rekening gehouden met elkaars commerciële interesses? Is dit belangrijk voor u?
 - Doelstellingen
 - Worden er duidelijke doelen gesteld? Is dit belangrijk voor u?
 - Wordt er een duidelijk project planning opgesteld? Is dit belangrijk voor u?
 - Wordt er op gelet of het samenwerking de competitie tussen organisaties op andere gebieden verstoort? Is dit belangrijk voor u?
 - Wordt er consequent gemonitord of de doelstellingen worden gehaald? Is dit belangrijk voor u?
 - Interactie
 - Is het duidelijk dat organisaties een grote commitment hebben? Is dit belangrijk voor u?
 - Is het duidelijk welke rollen en verantwoordelijkheden beide organisaties hebben? Is dit belangrijk voor u?
 - Wordt er transparant en consequent gecommuniceerd? Is dit belangrijk voor u?
 - Hebben organisaties goed aansluitende kwaliteiten/vaardigheden? Is dit belangrijk voor u?
 - Helpen de organisaties elkaar bij het oplossen van problemen die worden gevonden in de aangeleverde data? Is dit belangrijk voor u?
- Is er nog iets dat u wilt toevoegen wat nog niet besproken is?

Dan wil ik u hartelijk bedanken voor het deelnemen aan dit interview. Kan ik later nog contact met u opnemen als er nog ergens verduidelijking voor nodig is?

Appendix B: Interview guide Intermediary organization

Mijn onderzoek richt zich op success factoren voor een publiek-private samenwerking waarin intermediaire organisaties een rol spelen.

MAP traffic management wil hiermee uiteindelijk achterhalen welke maatregelen zij kunnen treffen om een samenwerking zo goed mogelijk te laten verlopen.

Gaat u ermee akkoord als dit interview wordt opgenomen en gebruikt in het onderzoek? De resultaten zullen anoniem worden verwerkt. Als u het transcript wilt inzien voor het wordt gebruikt dan kan dat. Ook mag u op elk moment het interview stoppen.

- Algemeen
 - Kunt u een toelichting geven op het werk wat uw bedrijf doet binnen het project (Service provider / Data provider / intermediary role)
 - Hoe is uw bedrijf betrokken geraakt bij het project?
 - Heeft uw bedrijf ervaring met publiek-private samenwerkingen?
 - Ja?
 - Hoe zijn deze eerdere publiek-private samenwerkingen verlopen?
 - Hoe verloopt de samenwerking in het Socrates project vergeleken bij de eerdere publiek-private samenwerkingen?
 - Nee?
 - Wat was de reden om deel te nemen aan deze publiek-private samenwerking?
- Intermediair²
 - Bent u op de hoogte van de verschillende samenwerkingsmodellen die worden gebruikt in het Socrates project? (Exchanged data / Common view / Coordinated approach)
 - Ja?
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Nee?
 - Uitleg geven
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Bent u op de hoogte van de verschillende intermediaire rollen die zijn geïdentificeerd voor het Socrates project?
 - Ja?
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Nee?
 - Uitleg geven
 - Is dit merkbaar in de werkzaamheden van uw bedrijf? En hoe?
 - Klopt het dat uw organisatie intermediaire rol X vervult in dit project?

² These questions are mainly used as part of an internship with MAP traffic management

- Ja? Verloopt dit goed?
 - Nee? Kunt u uitleggen wat de rol is die uw organisatie vervult? Verloopt dit goed?
- Samenwerking
 - Open vraag, kunt u vertellen hoe het samenwerken met intermediaire partij X bevalt?
 - Wat zijn in uw opinie de redenen dat dit (niet) goed verloopt? Kunt u daar voorbeelden bij geven?
- Punten om naartoe te sturen tijdens het gesprek:
 - Het maken van beslissingen
 - Wordt er gelet op het creëren van toegevoegde waarde voor de verschillende partijen (win-win)? Is dit belangrijk voor u?
 - Wordt er overlegd welke risico's door verschillende partijen op zich worden genomen? Is dit belangrijk voor u?
 - Wordt er meegenomen of de toegevoegde waarde van het project het waard is om data te delen? Is dit belangrijk voor u?
 - Wordt er een afbakening gemaakt waarvoor data gebruikt mag worden? Is dit belangrijk voor u?
 - Krijgt deze samenwerking een voorkeursbehandeling ten opzichte van andere klanten, om het publiek belang te voorzien? Is dit belangrijk voor u?
 - Stellen organisaties rest data beschikbaar? Is dit belangrijk voor u?
 - Wordt er rekening gehouden met elkaars commerciële interesses? Is dit belangrijk voor u?
 - Doelstellingen
 - Worden er duidelijke doelen gesteld? Is dit belangrijk voor u?
 - Wordt er een duidelijk project planning opgesteld? Is dit belangrijk voor u?
 - Wordt er op gelet of het samenwerking de competitie tussen organisaties op andere gebieden verstoort? Is dit belangrijk voor u?
 - Wordt er consequent gemonitord of de doelstellingen worden gehaald? Is dit belangrijk voor u?
 - Interactie
 - Is het duidelijk dat organisaties een grote commitment hebben? Is dit belangrijk voor u?
 - Is het duidelijk welke rollen en verantwoordelijkheden beide organisaties hebben? Is dit belangrijk voor u?
 - Wordt er transparant en consequent gecommuniceerd? Is dit belangrijk voor u?
 - Hebben beide organisaties goed aansluitende kwaliteiten/vaardigheden? Is dit belangrijk voor u?
 - Helpen de organisaties elkaar bij het oplossen van problemen die worden gevonden in de aangeleverde data? Is dit belangrijk voor u?
- Is er nog iets dat u wilt toevoegen wat nog niet besproken is?

Dan wil ik u hartelijk bedanken voor het deelnemen aan dit interview. Kan ik later nog contact met u opnemen als er nog ergens verduidelijking voor nodig is?

Appendix C: Interview guide Private / Public organization (English)

My research focuses on success factors for public-private partnerships, in which intermediary organizations are present.

MAP traffic management aims to identify what measures they can take in order for a partnership to go as smoothly as possible.

Is it okay for me to record this interview and use it for my research? The results will be treated anonymously. If you want to review the interview transcript before it is used, that can be arranged. You are free to stop the interview at any time.

- General
 - Can u tell me about the work that your organization does within the project? (Service provider / Data provider / Intermediary role)
 - How did your organization get involved with the project?
 - Does your organization have experience with public-private partnerships?
 - Yes?
 - How did these earlier experiences with public-private partnerships go?
 - How is the collaboration in the Socrates project going compared to earlier public-private partnerships?
 - No?
 - What was the reason to take part in this public-private partnership?
- Intermediary³
 - Are you aware of the different cooperation models used in the Socrates project? (Exchanged data / Common view / Coordinated approach)
 - Yes?
 - Do you notice this in the practices of your organization? How is this noticeable?
 - No?
 - Explain the cooperation models
 - Do you notice this in the practices of your organization? How is this noticeable?
 - Are you aware of the different intermediary roles that are identified for the Socrates project?
 - Yes?
 - Do you notice this in the practices of your organization? How is this noticeable?

³ These questions are mainly used as part of an internship with MAP traffic management

- No?
 - Explain the intermediary roles
 - Do you notice this in the practices of your organization? How is this noticeable?
- Collaboration
 - Open question, can you elaborate on how you like the collaboration with intermediary organization X?
 - What are, in your opinion, the reasons for it to be going (not) well? Can you provide examples?
- Points to steer towards during the interview
 - Joint decision making
 - Is it important that there is shared value creation in the partnership for the different organizations (win-win)? Is this important for you?
 - Are there discussions about what risks are taken by what organization? Is this important for you?
 - Is it discussed whether the end goal is worth the sharing of data? Is this important for you?
 - Is there a clear purpose limitation for which shared data can be used? Is this important for you?
 - Does this partnership get preferential treatment compared to other customers, to provide the public interests? Is this important for you?
 - Is a data lock-in minimized? Do organizations make rest data available? Is this important for you?
 - Is there respect for each other's commercial interests? Is this important for you?
 - Goals and objectives
 - Are there clear goals and objectives set? Is this important for you?
 - Is there a detailed project planning? Is this important for you?
 - Is it being monitored whether the cooperation distorts competition between organizations on different subjects?
 - Is there consistent monitoring of achievements of goals? Is this important for you?
 - Interaction
 - Is it noticeable that organizations have high commitment? Is this important for you?
 - Is it clear which roles and responsibilities organizations have? Is this important for you?
 - Is there transparent and clear communication? Is this important for you?
 - Do organizations have compatible skills? Is this important for you?
 - Do organizations help each other with mitigating data limitations? Is this important for you?
- Is there anything that you would like to add that we have not talked about yet?

I would like to thank you very much for cooperating with this interview. Can I contact you later if something needs any further clarification?