How to improve collaboration in infrastructure Bouwteams

A comparative study towards collaboration in Dutch building and transportation infrastructure projects

Beppie van de Hoef

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How to improve collaboration in infrastructure Bouwteams

A comparative study to collaboration in Dutch building and transportation infrastructure projects

by

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Preface

This report contains the findings of a collaborative research on collaboration in the Dutch building and infrastructure sector to improve collaboration in Dutch infrastructure Bouwteams. It is performed as a graduation project to obtain my Masters' degree in Construction, Management and Engineering at the Delft University of Technology. The study has been executed in collaboration with Ballast Nedam.

The results of this research provide insights into the degree collaboration in Dutch building and infrastructure project differ and match. Although the topic of collaboration in building and infrastructure projects is already extensively investigated, a comparative research on collaboration in these sectors is relatively new. I really hope that these insights encourage people within the sector to explore what they can learn from the experiences of the other sector to improve collaboration in both the building and infrastructure sector.

I would like to thank my graduation committee, Paul Chan, Leonie Koops and Marian Bosch-Rekveldt. Paul, thanks for your philosophic questions and your encouragement to make my own choices during the investigation. It was very motivating for me. Leonie, thank you for your support, your pragmatic approach and your critical attitude. I really liked our weekly meetings, which were always an encouragement to keep going. Also a special thanks for your patience with which you were able to identify and correct the gaps in my thinking. It really helped me to improve the study. Marian thank you for your willingness to contribute ideas and read, sometimes at very short notice. Your questions and remarks really helped me to improve the report.

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Beppie van de Hoef
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Executive summary

In the past years a better client-contractor collaboration is increasingly mentioned as a factor to increase the successfulness of construction projects. This increasing attention can be seen both in the international and Dutch context. As a solution to increase this client-contractor collaboration, the Early Contractor Involvement (ECI) format is mentioned, in which the contractor is involved early in the project, to reduce the execution risks and failure costs of the project. A Dutch format of ECI is the Bouwteam, which could be applied in both the building and infrastructure sector. Compared to the building sector, the infrastructure sector lags behind in applying the Bouwteam. Since the building and infrastructure sector have a lot in common, it would be interesting for the infrastructure sector to learn from the experiences of the building sector. Therefore, the question that will be answered in this research is:
In what way could the transportation infrastructure sector learn from the experience of the building sector with collaboration in Bouwteams?
The main goal of this research is to investigate what lessons the infrastructure sector can learn from the experiences of the building sector regarding Bouwteams by giving insight into the differences and similarities of (collaboration in) building and infrastructure projects as a sub-goal.

To answer the main question the characteristics of the Dutch building and infrastructure sector are investigated, based on literature review, related to five topics: project-related aspects, project-participant related aspects, project procedures, project management aspects and external aspects. Building projects are vertically oriented point projects with a clear end-user, usually initiated by a private client, resulting in a great variation of client expertise. Moreover, they are tendered in more diverse ways, and there is less attention to sustainability and innovation. Transportation infrastructure projects at the other hand are horizontally oriented line projects, usually spread over a wider geographic area, resulting in more interaction with the surrounding, more stakeholders involved, more permits required, and more sensitive to underground related risks, resulting in a higher organisational complexity. They are usually initiated by public clients and mainly publicly or privately tendered. Just like building projects, the attention to sustainability and innovation is low.

Next, the collaboration perspectives of infrastructure participants are defined based on the Q-methodology. For this, 38 success factors of collaboration (obtained by (De Hoog, 2020)) have been presented to 25 employees of Ballast Nedam, experienced with client-contractor collaboration during the design phase of infrastructure projects, resulting in the identification of three perspectives: I1-Relation, clarity and communality, I2-Personal values above structure, I3-Strong relationship within the team. These perspectives are compared with the perspectives of building participants experienced with Bouwteam collaboration: B1-Relationship first, B2-Early involvement of the right people and B3-Structure first (defined by De Hoog (2020)). Although the building and infrastructure participants largely agree about successful collaboration, some differences are identified: infrastructure participants show more consensus within a certain perspective than building participants. Moreover, infrastructure participants are more unambiguous than building participants, because they show more similarities between the perspectives. Building participants however, show more diverse perspectives and less agreement about what is needed for good collaboration. Since the comparison of the perspectives does not yield sufficient results, both sectors are compared on success factor level, resulting in the following differences: early involvement of external stakeholders, clear definition of roles before the project starts working, fair risk allocation, defined scope of the process, development of common processes and tools, equitable relation and respect for all and regular meetings.

Thereafter it is investigated, with the help of the literature study and the Q-interviews, whether differences in collaboration at success factor level are caused by the nature of both sectors, or caused by other factors as well. Experts are interviewed to verify whether they agree with the explanation. As

a result, for only two factors a clear relationship between the characteristics of the sectors and the collaboration perspectives was indicated.. The greater importance of the early involvement of external stakeholders is explained by the larger geographic area of these projects, resulting in a higher number of involved stakeholders and a project location which is more intertwined with the surrounding area. Experts also mention that involved infrastructure stakeholders have more power compared to building stakeholders. The greater importance of a clear definition of roles before the project starts working is explained by the higher number of involved parties as well as the diversity of client types and experience level in the building sector. In case of more involved parties, it will be more essential to clearly define the roles of the participants. For the other differences, a clear explanation is lacking, although there are some indications that they could be related to the client or contract type of the participants.

Finally, the experiences of the building sector with (Bouwteam) collaboration are applied to the infrastructure sector. The focus hereby is on the success factors that are valued as essential in both sectors, as well as the factors that are essential for building participants and cannot be related to differences in nature: a defined scope of the process, understanding each other's objectives, transparency, mutual trust and good communication. Mutual trust is indicated as the most essential element of successful collaboration, but also addressed as a factor which is often lacking in infrastructure projects. However, to act successfully in Bouwteams, mutual trust is indispensable. Therefore, the main advice is to invest in a trustful attitude, both on individual level as on the level of teams and organisations. Other factors including a defined scope of the process, understanding each other's objectives, transparency and good communication could promote collaboration.

To utilize the biggest advantage of Bouwteams (the knowledge of the contractor about the realisation costs of a design and the execution of the design can be used in the design phase, which could result in lower costs and a design which is easier to realise), a relationship based on mutual trust is essential. This research shows that although that is recognised by infrastructure participants, they also show a suspicious attitude towards the client, and the client sometimes shows a suspicious attitude towards the contractors. To successfully participate in Bouwteams, as a contractor it is important to show confidence in the client and act reliable. Both building participants and experts indicate that the lack of mutual trust is a lower problem in the building sector. Compared to infrastructure participants, building participants emphasize more the own responsibility of the contractor to be a reliable partner. Therefore, the main advice to the infrastructure sector is to invest in the attitude towards the client. This should be done both on individual level (training, coaching etc) as well as on organisational level, since the vision of the contractor is related to their behaviour. Next, to stimulate mutual trust and collaboration within a Bouwteam, a defined scope of the process, understanding each other's objectives, transparency and good communication are essential elements.

Keywords: collaboration, Bouwteam, Early Contractor involvement, transportation infrastructure projects, Q-methodology, characteristics, building sector, learning

Samenvatting

In de afgelopen jaren wordt een betere samenwerking tussen opdrachtgever en aannemer steeds vaker genoemd als factor om het succes van bouwprojecten te vergroten. Deze toenemende aandacht is zowel in de internationale als in de Nederlandse context te zien. Als oplossing om de samenwerking tussen de opdrachtgever en aannemer te vergroten wordt de Early Contractor Involvement (ECI) genoemd, waarbij de aannemer vroeg in het project wordt betrokken, om de uitvoeringsrisico's en faalkosten van het project te verminderen. Een Nederlandse vorm van ECI is het Bouwteam, dat zowel in de bouw als in de infra kan worden toegepast. Ten opzichte van de bouwsector blijft de infra sector achter bij het toepassen van het Bouwteam. Omdat de bouw- en infrasector veel gemeen hebben, zou het voor de infrastructuursector interessant zijn om te leren van de ervaringen van de bouwsector. Daarom is de vraag die in dit onderzoek beantwoord zal worden: *Op welke manier kan de transport-infrastructuursector leren van de ervaring van de bouwsector met samenwerking in Bouwteams?* Het hoofddoel is om te onderzoeken welke lessen de infrastructuursector kan trekken uit de ervaringen van de bouwsector met betrekking tot Bouwteams, met daarbij het subdoel inzicht te geven in de verschillen en overeenkomsten van (samenwerking in) bouw- en infraprojecten.

Om de hoofdvraag te beantwoorden zijn de kenmerken van de Nederlandse bouw- en infrastructuur-sector onderzocht op basis van literatuuronderzoek, gerelateerd aan vijf onderwerpen: project gerelateerde aspecten, projectdeelnemers gerelateerde aspecten, projectprocedures, project-managementaspecten en externe aspecten. Bouwprojecten zijn verticaal georiënteerde punt-projecten met een duidelijke eindgebruiker, veelal geïnitieerd door een particuliere opdrachtgever, waardoor een grote variatie aan opdrachtgeversexpertise ontstaat. Bovendien worden ze op meer diverse manieren aanbesteed en is er minder aandacht voor duurzaamheid en innovatie. Infra-projecten zijn daarentegen horizontaal georiënteerde lijnprojecten, meestal verspreid over een groter geografisch gebied, resulterend in meer interactie met de omgeving, meer betrokken stakeholders, meer vergunningen vereist en gevoeliger voor ondergrondse risico's, wat resulteert in een hogere organisatorische complexiteit. Ze worden meestal geïnitieerd door publieke klanten en worden voornamelijk openbaar of particulier aanbesteed. Net als bij bouwprojecten is de aandacht voor duurzaamheid en innovatie laag.

Vervolgens zijn de samenwerkingsperspectieven van infrastructuurdeelnemers gedefinieerd met de Q-methode. Hiervoor zijn 38 succesfactoren van samenwerking gepresenteerd aan 25 medewerkers van Ballast Nedam, ervaren met opdrachtgever-aannemer samenwerking tijdens de ontwerpfase van infraprojecten, resulterend in de identificatie van drie perspectieven: I1-Relatie, duidelijkheid en gemeenschappelijkheid, I2-Persoonlijke waarden boven structuur, I3-Sterke relatie binnen het team. Deze perspectieven worden vergeleken met de perspectieven van bouwdeelnemers die ervaren zijn met samenwerking in Bouwteams: B1-relatie eerst, B2-vroege betrokkenheid van de juiste mensen en B3-structuur eerst. Hoewel beide groepen deelnemers het grotendeels eens zijn over de hun succesvolle samenwerking, zijn er enkele verschillen: infra-participanten tonen meer consensus binnen een bepaald perspectief dan bouwparticipanten. Bovendien zijn infraparticipanten eenduidiger dan bouwparticipanten.. Bouwparticipanten tonen echter meer diverse perspectieven en minder overeenstemming over wat nodig is voor een goede samenwerking. Aangezien de vergelijking van de perspectieven niet voldoende resultaten oplevert, zijn beide sectoren ook vergeleken op succesfactorniveau, wat resulteert in verschillen op de volgende aspecten: vroege betrokkenheid van externe stakeholders, duidelijke roldefinitie voordat het project start, eerlijke risicoverdeling, gedefi-nieerde scope van het proces, ontwikkeling van gemeenschappelijke processen en instrumenten, gelijkwaardige relatie en respect voor elkaar en regelmatige vergaderingen.

Vervolgens is met behulp van literatuuronderzoek en de Q-interviews onderzocht of verschillen in samenwerking op succesfactorniveau worden veroorzaakt door de aard van beide sectoren, of ook door andere factoren, waarna experts zijn geïnterviewd om na te gaan of ze het eens zijn met de gevonden verklaring. Hierdoor werd voor slechts twee factoren een duidelijke relatie tussen de kenmerken van de sectoren en de samenwerkingsperspectieven aangegeven. Het grotere belang van het vroegtijdig betrekken van externe stakeholders wordt verklaard door het grotere geografische gebied van deze projecten, resulterend in een hogere aantal betrokken stakeholders en een projectlocatie die meer verweven is met de omgeving. De experts vermelden ook dat betrokken stakeholders in de infrastructuur meer macht hebben dan stakeholders in de bouw. Het grotere belang van een duidelijke roldefinitie voordat het project van start gaat, wordt verklaard door het grotere aantal betrokken partijen en de diversiteit aan type opdrachtgevers en bijbehorende variëteit in ervaring. Bij meer betrokken partijen zal het belangrijker zijn om de rollen van de deelnemers duidelijk te omschrijven. Voor de overige verschillen ontbreekt een duidelijke uitleg, al zijn er enkele aanwijzingen dat deze verband kunnen houden met de opdrachtgever of het contracttype van de deelnemers.

Ten slotte zijn de ervaringen van de bouwsector met samenwerking in Bouwteams toegepast op de infrasector. Hierbij lag de focus op de succesfactoren die in beide sectoren als essentieel worden gewaardeerd, alsook de factoren die essentieel zijn voor bouwdeelnemers en niet gerelateerd kunnen worden aan verschillen in de natuur, namelijk: een gedefinieerde scope van het proces, begrip voor elkaars doelstellingen, transparantie, wederzijds vertrouwen en goede communicatie. Wederzijds vertrouwen het meest essentiële element van succesvolle samenwerking, maar wordt ook benoemd als een factor die vaak ontbreekt bij infrastructuurprojecten. Om in Bouwteams succesvol te kunnen handelen, is wederzijds vertrouwen onontbeerlijk. Daarom is het belangrijkste advies om te investeren in een vertrouwensvolle houding, zowel op individueel niveau als op het niveau van teams en organisaties. Andere factoren, waaronder een gedefinieerde reikwijdte van het proces, begrip van elkaars doelstellingen, transparantie en goede communicatie kunnen samenwerking bevorderen.

Om het grootste voordeel van Bouwteams te benutten (de kennis van de aannemer over de realisatiekosten van een ontwerp en de uitvoering van het ontwerp kan gebruikt worden in de ontwerpfase, wat kan resulteren in lagere kosten en een ontwerp dat makkelijker te realiseren is), is een relatie gebaseerd op wederzijds vertrouwen essentieel. Uit dit onderzoek blijkt dat hoewel dit belang wordt onderkend door de aannemers, zij toch een achterdochtige houding richting de opdrachtgever vertonen en dat de opdrachtgever soms een achterdochtige houding tegenover de aannemers toont. Om succesvol deel te nemen aan Bouwteams, is het als aannemer belangrijk om vertrouwen te hebben in de opdrachtgever en betrouwbaar te handelen. In vergelijking met infrastructuurparticipanten benadrukken bouwparticipanten meer de eigen verantwoordelijkheid van de aannemer om een betrouwbare partner te zijn. Daarom is het belangrijkste advies aan de infrastructuursector om te investeren in de houding ten opzichte van de opdrachtgever. Dit dient zowel op individueel niveau (training, coaching etc) als op organisatieniveau te gebeuren, aangezien de visie van de aannemer gerelateerd is aan hun gedrag. Daarnaast zijn voor het stimuleren van wederzijds vertrouwen en samenwerking binnen een Bouwteam een afgebakende scope van het proces, begrip van elkaars doelstellingen, transparantie en goede communicatie essentiële elementen.

Zoekwoorden: samenwerking, Bouwteam, Early Contractor involvement, infrastructuur projecten, gww, Q-methode, karakteristieken, bouwsector, b&u, leren

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1. Introduction to the research

1.1 Context of the problem

In the past years, a better client-contractor collaboration is increasingly mentioned as a factor to increase the successful delivery of projects (Adelbäck & Johansson, 2013; Bresnen & Marshall, 2000; McKinsey & Company, 2019). This increasing attention can be seen both in the international and Dutch context (Flyvbjerg et al., 2002; Love et al., 2011; Riggelen, 2019; van Wijck, 2018; Wondimu et al., 2016). As a solution to increase this client-contractor collaboration, the Early Contractor Involvement (ECI) format is mentioned (Van Valkenburg et al., 2008), in which the contractor is taken early on board of the project. This is different to traditional project procurement in the Netherlands, where the contractor becomes involved when the construction of a design is procured (Chao-Duivis, 2012). Currently, ECI is an umbrella term for alliances, Design & Construct, FIDIC Yellow Book and Bouwteams (Bundgaard et al., 2011; Hermans & Rots, 2019; Lenferink et al., 2013; Van Valkenburg et al., 2008; van Wijck, 2018). The common denominator here is a certain degree of collaboration between the client and contractor during the design phase of a project.

1.2 Bouwteams

As mentioned, a Bouwteam is one of the formats that can be used for the client-contractor collaboration during the design phase. It is a collaboration agreement in which the participants – while retaining everyone's independence and responsibility – work together on the preparation of a project. For that purpose, each of the participants is required to use their specific experience and expertise as best as possible (VG Bouw Model, article 1, 1992). Although a format for a Bouwteam agreement exists (VG Bouw Model, 1992), in practise Bouwteam agreements show great differences, especially on risk distribution (Chao-Duivis, 2012) and the role of the client (Westhuis & Wals, 2019). Recently a new Bouwteam model is launched (Modelovereenkomst Bouwteam DG 2020) in which the risks, costs and collaboration (specifically attitude and behaviour) are explicitly described (Duurzaam Gebouwd, 2020a). Although the Bouwteam was already introduced in the fifties, it was rarely applied (Chao-Duivis, 2012). However, in the last years, the Bouwteam is applied more often, especially in case of building projects (De Koning, 2018). This is largely prompted by the biggest advantage of a Bouwteam: the knowledge of the contractor about the realisation costs of a design and the execution of the design can be used in the design phase, which could result in lower costs and a design which is easier to realise (Chao-Duivis, 2012). This however requires a mind change from the contractor, since his traditional attitude is result-driven (De Koning, 2020). The Bouwteam is gaining popularity within the Dutch construction industry: in the last years more projects are tendered as a Bouwteam and more important: more projects are executed under this model (De Koning, 2018). This growing interest is confirmed by the enthusiasm with which the new Bouwteam model has been greeted by the market (Duurzaam Gebouwd, 2020b). However, compared to the building industry the infrastructure sector lags behind in applying Bouwteams (De Koning, 2020). Although a clear explanation is missing, this is possibly caused by a more conservative attitude of the infrastructure sector (De Koning, 2020). However, even within the infrastructure sector the Bouwteam is increasingly mentioned as a possible solution to increase the client-contractor collaboration to achieve successful project delivery.

1.3 Collaboration in building and infrastructure projects

It is not surprising that the Bouwteam is mentioned as a solution for both the building and infrastructure sector. Both sectors have a lot in common, even to the extent that, regarding to the topic of collaboration, they are often mentioned together in the existing literature under the term 'construction projects' or 'construction sector' (e.g. Nasir & Hadikusumo, 2019; Rahman et al., 2014). Although there are articles focused exclusively on the building (e.g. Ali & Kamaruzzaman, 2010; Fugar & Agyakwah-Baah, 2010; Josephson & Hammarlund, 1999; Jrade & Jalaei, 2013; Kolltveit & Grønhaug, 2004; Mathar et al., 2020) or infrastructure (Bingham & Gibson Jr, 2017; Cantarelli et al., 2010; Cheng

et al., 2016; Liew et al., 2019; Love et al., 2014) sector, only a few of them are focused on collaboration in one of these sectors (e.g. Verweij, 2015; Walker et al., 2017; Wondimu et al., 2016). Hence, in the current available literature no clear overview of the similarities and differences in collaboration of building and infrastructure projects is available.

1.4 Problem statement

Summarising, a better client-contractor collaboration is increasingly mentioned as a factor to increase the successfulness of projects. The Bouwteam is a format which is often mentioned in both the building and infrastructure sector as a possibility to increase this relationship. Compared to the building sector, the infrastructure sector lags behind in applying the Bouwteam. Since the building and infrastructure sector have a lot in common, it would be interesting for the infrastructure sector to learn from the experiences of the building sector. However, currently it is not clear to what degree the perspectives on collaboration in the building and infrastructure sector differ and match. Therefore, the main problem is: *Within the Dutch infrastructure sector, the amount of experience about the application of Bouwteams is limited.*

Since the building sector is more experienced with Bouwteams, it would be interesting for the infrastructure sector to learn from the experiences of the building sector. However, this poses a new problem: *Currently for the infrastructure sector it is difficult to learn from the experiences of the building sector, since the differences and similarities in collaboration in the building and infrastructure sector are unknown.*

Therefore the main goal of this research is to investigate what lessons the infrastructure sector can learn from the experiences of the building sector with Bouwteams with giving insight into the differences and similarities of collaboration in building and infrastructure projects as a sub-goal.

1.5 Structure of the research

To investigate this problem, a research is designed, which is presented in chapter 2. This design contains the objective, research question, scope, methodology and relevance of the research. The body of the report starts with chapter 3 by giving some theoretical background about the client-contractor collaboration in the Dutch context, especially applied to Bouwteam collaboration. Next, in chapter 4 presents the characteristics of building projects and infrastructure projects based on five aspects. Thereafter chapter 5 aims to compare the perspectives on collaboration of the infrastructure and building sector. Next, in chapter 6 the cause of the differences will be investigated will on success factor level: are they sector related or are they influenced by other factors. In chapter 7 the connection between the identified success factors, the learned lessons of the building industry and the implication of this to client-contractor collaboration in Bouwteams of Dutch infrastructure projects will be made. Thereafter, in chapter 8 the results, the limitations and the validity of the results are discussed. Finally in chapter 9 the conclusion of the research is presented by answering the main research question and recommendations for further research are done.

2. Research design

This chapter aims to describe the research design of the research which is carried out to address the problem statement presented in the previous paragraph. Section 2.1 presents the research question, while the scope and context of the research are presented in section 2.2. Next, section 2.3 elaborates on the method used in this research. Finally, section 2.4 presents the relevance of this work for both the academic world as specifically for Ballast Nedam.

2.1 Research questions

Compared to the infrastructure sector, the building sector is more familiar with the Bouwteam model and therefore more experienced with the application of the model. The main goal of this research is to investigate what lessons the infrastructure sector could learn of the experience of the building sector with collaboration in Bouwteams. Therefore, the main research question is:

In what way could the transportation infrastructure sector learn from the experience of the building sector with collaboration in Bouwteams?

To answer this question, the following sub-questions will be used:

1. On what aspects do building projects and transportation infrastructure projects differ?
2. Does the list of success factors of collaboration in building projects also apply to transportation infrastructure projects?
3. What are the differences in perspectives of contractors on specified success factors of collaboration between building projects and transportation infrastructure projects?
4. How do the differences in perspectives on collaboration relate to the differences between building and transportation infrastructure projects?
5. What lessons can the transportation infrastructure sector learn from the building sector?

The first sub-question defines the differences and similarities between infrastructure projects and building projects. This will provide insight at what aspects building and infrastructure projects could be compared and where not. Next the second sub-question clarifies whether the success factors used by De Hoog (2020) apply to infrastructure projects. The third sub-question identifies the differences and similarities in perspectives on collaboration between both sectors, based on the results of De Hoog (2020) and this research. The fourth sub-question explores whether the differences in perspectives of contractors on specified success factors could be explained by the different characteristics of building and infrastructure projects or whether they are caused by other factors. Finally, the fifth research question applies the obtained results to improve Bouwteam collaboration within the infrastructure.

2.2 Research scope and context

To answer this research question, it is important to explain what is and what is not included in the research (scope) and in which environment the research is carried out (context).

Scope

The focus of the research will be on the client-contractor collaboration during the design phase of Dutch infrastructure and building projects. The client-contractor relationship is investigated because this is the main interparty relation in a project. Since the research will be carried out at Ballast Nedam, only the contractor's perspective will be investigated.

In this research, the Dutch building and infrastructure sector are compared. Based on Cheng et al. (2016) the term transportation infrastructure is used, which includes the realisation of roads, bridges, tunnels, railways, airports and ports and harbours (corresponding to the Dutch term Grond, Weg en Waterbouw (GWW)). This term is used in the research question to distinguish from ICT-infrastructure etc. For the readability of the report, in the report the term 'infrastructure' is used. However, it will

always be about the transportation infrastructure, unless indicated otherwise. With building projects, in this research the realisation of public and private buildings is meant, which includes both houses and utility buildings (corresponding with the Dutch term Bouw&Utiliteit (B&U)).
As stated in section 2.1 the perspectives on collaboration in the building and infrastructure sector are compared in this research. De Hoog (2020) already obtained the perspectives of the building sector on collaboration. Her research was focused on collaboration during the initiation till the end of the design phase of Bouwteams. De Hoog (2020) has chosen this frame because this are the crucial phases in which a Bouwteam differs from other types of collaboration. To enable a fair comparison of perspectives on collaboration between sectors, the number of changes in the design of the research should be minimal (Dinklo, 2016). However, since Ballast Nedam is not yet experienced with Bouwteams in the infrastructure sector, changes in the design of the research are unavoidable. During the research these changes are substantiated and discussed.

Context

The research is conducted in collaboration with Ballast Nedam N.V., a large contractor (top-10) in the Netherlands. The company was founded in 1877. Since 2015, Ballast Nedam is part of the international Renaissance Group. The core business of the company is to realise, maintain and renovate projects in the living environment, including infrastructure, utility and building projects.

2.3 Research methodology

After setting the boundaries, a literature study (Creswell & Creswell, 2017; Verschuren et al., 2010) is carried out on building and infrastructure projects to define the characteristics of both sectors. This method is chosen to do justice to the enormous amount of data that is already available on both sectors. Therefore first a desk research (Creswell & Creswell, 2017; Verschuren et al., 2010) is done to investigate to what degree the building and infrastructure sector are described within the existing literature. Next, a broad list of aspects on which building and infrastructure projects could differ and match is collected. Thereafter a framework is selected, based on which the Dutch building and infrastructure sectors are compared. This resulted in an answer to the first sub-question: *On what aspects do building projects and transportation infrastructure projects differ?*
To identify the perspectives on success factors that are important in collaboration within the infrastructure-sector, a Q-research is carried out. The Q-method is a quantitative method in which subjective results could be compared and analysed (Watts & Stenner, 2005). It is a combination of qualitative and quantitative research, designed to identify the motivations and preferences of a strategically selected group of participants (Brown, 1980). This method is preferred above qualitative research methods because of its quantitative results. De Hoog (2020) used this method in order to identify the perspectives on success factors in collaboration of Bouwteams at Dutch building projects. Since this research aims to compare collaboration within both sectors, the same method will be applied.
In this research, the perspectives on success factors in collaboration at Dutch infrastructure projects are investigated and compared with perspectives on success factors of the building industry. First a literature study is done to investigate whether the Q-set originally composed for building projects by De Hoog (2020), also applies to infrastructure projects. This results in an answer to sub-question 2: *Does the list of success factors of collaboration in building projects also apply to transportation infrastructure projects?*
Next, the actual Q-research for infrastructure projects is started. Since the objective is the identification of the contractor's perspective on success factors for collaboration during the design phase of infrastructure projects, it is important to only include participants experienced with this type of collaboration. For the first step, data collection, a predefined sorting question is given to the participants, based on which they sort a set of predefined statements in a quasi-normal distributed sorting scheme (De Hoog, 2020). The number of boxes is equal to the number of statements, which forces the participants to prioritise. With this, the subjective opinions of the participants are gathered

(De Hoog, 2020; Stephenson, 1953; Van Exel & De Graaf, 2005; Watts & Stenner, 2005). A post-sorting interview was conducted to give the participant the possibility to explain his considerations to choose a certain prioritisation. After the data collection, the obtained data is processed and analysed with the help of PQmethod, resulting in three perspectives of infrastructure participants on collaboration. Next, these three infrastructure perspectives are compared with the three building perspectives obtained by De Hoog (2020), resulting in an answer to the third sub-question: *What are the differences in perspectives of contractors on specified success factors of collaboration between building projects and transportation infrastructure projects?*

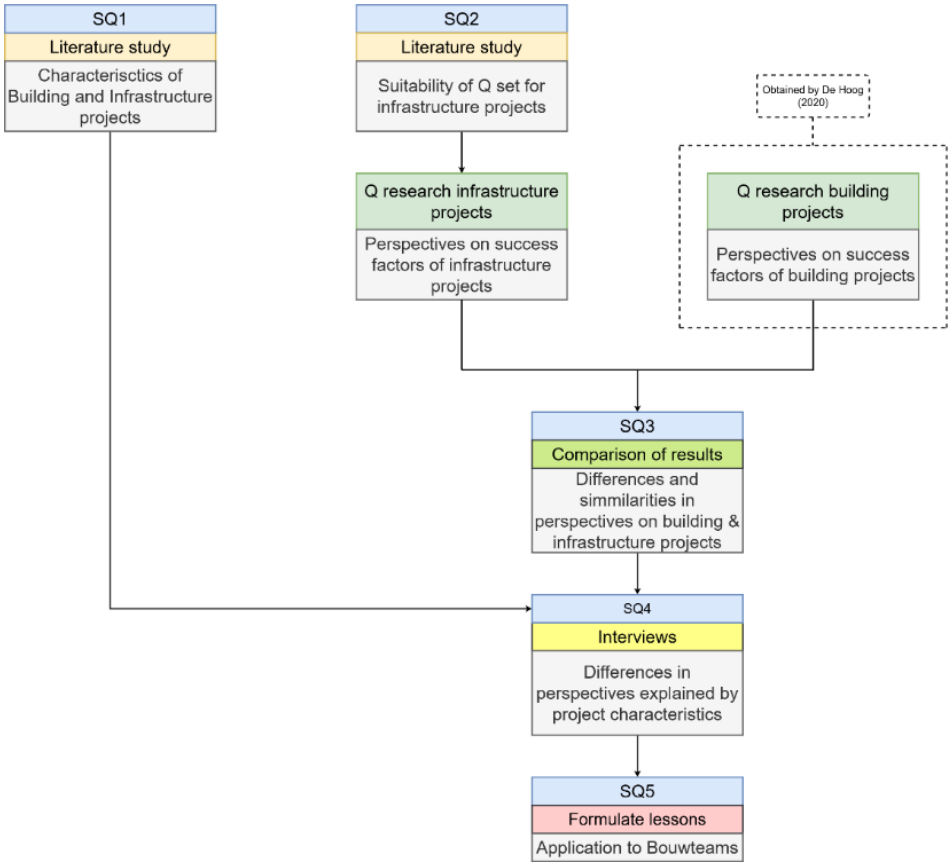

Figure 2-1 Overview of the research methods used for the several sub-questions of this research

Next, the origin of the founded differences in perspectives is investigated: are they caused by differences in nature of building and infrastructure projects, or are they caused by other factors. For this, the explanation of the participants (answers to the post-sorting interview) and the differences and similarities obtained by literature research are used. This resulted in an explanation of the occurring differences in perspectives. Additionally, experts experienced with collaboration in both building and infrastructure projects are asked during semi-structured interviews whether they recognise the differences in perspectives on collaboration and whether they agree with the given explanation or have additional explanations. The expert consultation is preferred above other research methods, because it enables the researcher to retrieve opinions of people experienced with collaboration in both building and infrastructure projects. This resulted in an answer to the fourth sub-question: *How do the differences in perspectives on collaboration relate to the differences between building and transportation infrastructure projects?*

Finally the results of the previous sub-questions and the explanations of the respondents during the post-sorting interviews and the additional semi-structured interviews are used to formulate lessons to improve the collaboration in the design phase of infrastructure projects, especially in the case of Bouwteams. With this the final sub-question *What lessons can the transportation infrastructure sector learn from the building sector?* is answered.

2.4 Relevance of the research

The uniqueness of this research is the comparison of the contractor's viewpoints on collaboration during the design phase of building and infrastructure projects. As a result, the research is relevant for both the academic world and Ballast Nedam (and other contracting parties in the Netherlands).

Academic relevance

Although some studies compare the infrastructure and building sector on a certain aspect, e.g. Building Information Modelling (BIM) and Civil Information Modelling (CIM) (Cheng et al., 2016) and the adopted procurement selection criteria (Sethuraman et al., 2016), a comparing research between both sectors is missing. In this research the sectors are compared on many aspects, resulting in an overview to what degree both sectors differ and match. This enables readers of articles related to the building, infrastructure or construction sector to distinguish if and why aspects only apply to one of the sectors, or could also be applied to other sectors. As a result, not only existing, but also future studies that are specifically focused on one of the two disciplines will be more accessible to the other discipline.
Secondly, the research will provide an overview of the perspectives of contractors on collaboration in Dutch infrastructure projects and compare this with the perspectives on collaboration on the building sector (obtained by De Hoog (2020). Although the contractor's perspective on collaboration is widely investigated by several authors (De Hoog, 2020; Hughes et al., 2012; Nader, 2019; Ng et al., 2002), none of them compares the collaboration perspectives during the design phase in both sectors. Some of them investigated the contractor's perspective in the context of partnering: Ng et al. (2002) in Australian Government construction projects and Hughes et al. (2012) in UK partnering projects. Boijens (2008) and De Hoog (2020) both focus on Bouwteams: Boijens (2008) argues that alignment of Bouwteam participants is still unknown and De Hoog (2020) focus on the building sector. Van Riggelen (2019) investigated collaboration in Bouwteams in infrastructure projects, and focuses on the client-perspective rather than the contractor perspectives. Nader (2019) compares ECI and D&C but only investigated the infrastructure sector.
This research does not only provide a clear overview of the characteristics of the building and infrastructure sector, but also provides insight whether there are differences in contractor's perspectives on collaboration in these sectors.

Practical relevance

The research is carried out in the context of Ballast Nedam. Ballast Nedam, as well as other large Dutch contractors, executes large building as well as large infrastructure projects. For this, special divisions are organised: a building department and an infrastructure department. Although both departments are part of the same company, in practise the departments are stand-alone, with little knowledge exchange. This research aims to research whether knowledge exchange is useful and how it can be applied.
For Ballast Nedam, the relevance of the research therefore is twofold. Firstly, it offers insight in their own behaviour and trade-offs as contractor (what perspectives are there, what are the characteristics, and why is a certain perspective chosen). This knowledge can be applied to - and possibly influence - the client-contractor relationship. Secondly, knowing on what aspects building projects and infrastructure projects differ and match gives the possibility for both departments to learn from the experiences and failures of the other. Hereby, experiences can be easier exchanged, and it can be prevented that the same mistakes are made in both expertise fields. In this research this is done specifically for client-contractor collaboration during the design phase, but the understanding of these differences and similarities could also be applied to other fields, e.g. cost management, risk allocation and project management.

3. Collaboration within the Dutch context

This chapter elaborates on the topic of collaboration within the Dutch context and the possibilities mentioned to achieve better collaboration. Therefore, in section 3.1 the concept of collaboration is discussed in detail. Next, in section 3.2 the Dutch context of collaboration including the main challenges and proposed solutions is explained. Thereafter in section 3.3 the Bouwteam is discussed as one of the solutions to increase the client-contractor collaboration during the design phase of construction projects and finally in section 3.4 the Bouwteam is compared with other agreements involving collaboration during the design phase.

3.1 What is collaboration?

In the past years, the topic of collaboration has been extensively investigated, both in general and applied to specific sectors. In general, collaboration is described as the process in which people work together to achieve a collective goal (Bedwell et al., 2009; Chiocchio et al., 2011). Although cooperation can often be used interchangeably with collaboration, there is a minor difference: in case of collaboration people work together to achieve a single shared goal, while in case of cooperation people work together to achieve own's own goal as part of a collective goal (Schöttle & Gehbauer, 2012; J. Walker, 2016). However, the existing literature is not always unambiguously about this. Other terms used interchangeably with collaboration are partnering, alliances and joint ventures, where the common dominator is the process of working together (Hughes et al., 2012). In this research, the focus is on client-contractor collaboration. Although both parties have their own organisation goals, they also share some mutual goals related to the project (Bresnen & Marshall, 2000; De Hoog, 2020; Dulaimi et al., 2007; S. H. A. Rahman et al., 2014), which could cause some conflicts.

Although different definitions of collaboration circulate, in most cases they emphasize the positive effect of collaboration or related terms on project performance:

- "A long term commitment between two or more organisations *for the purpose of achieving specific business objectives* by maximising the effectiveness of each participant's resources." (Himes, 1995)
- "Collaborative processes are *major contributors to efficient and efficacious interdisciplinary teams*." (Chiocchio et al., 2011)
- "A process in which owner and contractor jointly create norms, rules and structures governing their teams, their working relationships, and ways to act or decide on the issues emerging during the course of a project, *in order to bring about mutually satisfactory project outcomes*." (Suprapto, 2016)

This focus on project performance is specified by Cheung et al. (2003) by explaining that partnering was seen as the answer to the low quality of construction and the lack of client satisfaction. Fiedler and Deegan (2007) summarize the reasons why collaboration was adopted in the industry. Some of the reasons where external pressures such as setting an example, publicity and government pressure. Other reasons where internal pressures such as: economic efficiency, stability, and stakeholder analysis. Some other reasons were asymmetry, expertise, legitimacy and reciprocity (Fiedler & Deegan, 2007; Hughes et al., 2012). The impact of collaboration on team member's perceptions off team effectiveness across time is also mentioned by Chiocchio et al. (2011).

In this study the concept of collaboration is investigated in relation to project performance and improvement of collaboration, because the focus is how to improve the client-collaboration during the design phase to achieve successful project delivery. Therefore in this research the following definition of collaboration is used: "*A process in which owner and contractor jointly create norms, rules and structures governing their teams, their working relationships, and ways to act or decide on the issues emerging during the course of a project, in order to bring about mutually satisfactory project outcomes*." (Suprapto, 2016).

3.2 Collaboration in the Dutch context

Public-private collaboration plays a large role in the Netherlands for the realisation of artifacts in the public domain. In the past years however, a disturbance has occurred in the relationship between public and private parties. Fuelled by the economic crisis, private parties offered low prices to keep working. Public parties at the other hand allocated as many risks as possible to the market. Project overruns, losses and misallocation of risks and liability causes negative publicity for the Dutch construction industry (Kernteam Marktvisie, 2016). In 2016 some involved parties[1] joined hands to achieve good collaboration and healthy relationships in the whole chain of projects, called the Marktvisie 2016 (Kernteam Marktvisie, 2016). The emphasize was on attitude, behaviour, and culture. However, in 2019 a new research of McKinsey & Company (2019)[2] concludes that this Marktvisie did not achieve a reduction in undesirable behaviour between the public client and the private contractor within the Dutch infrastructure sector. To achieve a healthier infrastructure sector, they advised four measures, including the introduction of a 'two-phase process' for projects with a high complexity, in which the pricing for the construction phase only follows after the design or engineering phase (McKinsey & Company, 2019). In principle, this contract type gives the client the possibility to switch after the design phase in case they do not reach an agreement with the contractor. Within two-phase processes, the requirements remain functionally specified in order to offer market parties the space to optimize within the requirements as well as to make life-cycle costs considerations (McKinsey & Company, 2019).

Although the idea of two-phase contracts is relatively new for Rijkswaterstaat, in the international context, especially the UK, this way of thinking is more common. In the international context, the Early Contractor Involvement (ECI) strategy is mentioned to improve these client-contractor collaboration (Nader, 2019; M. Rahman & Alhassan, 2012; Scheepbouwer & Humphries, 2011; Song et al., 2009; D. H. Walker & Lloyd-Walker, 2012). In this strategy the contractor is involved in the early phase of the project, to advise the client on the constructability of the design and planning (M. Rahman & Alhassan, 2012; Song et al., 2009). One of the main benefits of this strategy is that construction issues can be addressed before execution, resulting in an improvement of the overall project efficiency (M. Rahman & Alhassan, 2012). The earlier problems are faced in a project, the lesser the impact of these problems on the project performance. Although the ECI is not clearly defined in literature, it could be seen as a collection of contract types, including two-phase contracts, but also other contracts, like Plan, Design and Build (P, D&B) (van Wijck, 2018).

3.3 Bouwteams

A Dutch form of ECI and two-phase contracts is the Bouwteam that was already developed during the 1950's (Jansen & Metsemakers, 1999). It is a collaboration agreement during the design phase of a construction project, in which at least the client, contractor and designer are involved (Chao-Duivis, 2012; De Hoog, 2020; Jansen & Metsemakers, 1999; Van Riggelen, 2019) in order to reduce the risk on delays and failure costs (Chao, 2019). Although several definitions of Bouwteams exist (Duurzaam Gebouwd, 2020a; Sijpersma & Buur, 2005; VGBouw, 1992), in this research the definition of De Hoog (2020) is used, which is a refinement of the definition of VGBouw:

The Bouwteam is a temporary collaboration agreement during the design phase in which the participants – including at least the client, contractor and designer – cooperate towards a feasible design with an associated risk log and a building contract. To this end, each of the participants perform the tasks related to their experience and expertise while retaining their independence and responsibility.

[1] Rijkswaterstaat, het Rijksvastgoedbedrijf, ProRail, Bouwend Nederland, NL Ingenieurs, de Vereniging van Waterbouwers, MKB Infra, Uneto VNI en Astri (Kernteam Marktvisie, 2016)

[2] Carried out on behalf of Rijkswaterstaat

The contractor is at least involved in the project start-up, the design and the price negotiations (figure 3-2). In case the price negotiations will be completed successfully, the contractor will also be involved during the execution phase (Duurzaam Gebouwd, 2020a). In this research the focus is on the project start-up in which the Bouwteam participants get to know each other and the common goal will be defined (Wondimu et al., 2016) and the design phase in which at least the client and contractor are jointly working to deliver a feasible design (Chao-Duivis et al., 2008; Scheepbouwer & Humphries, 2011). Especially in this phase the contractor can add value by using their expertise and experience to optimise the design to reduce problems during the execution phase, to reduce costs and to stimulate the timely delivery of the project (Boijens, 2008; De Hoog, 2020; Dewulf & Kadefors, 2012; Kelly et al., 2014; M. Rahman & Alhassan, 2012; Scheepbouwer & Humphries, 2011; Song et al., 2009; Van Riggelen, 2019).

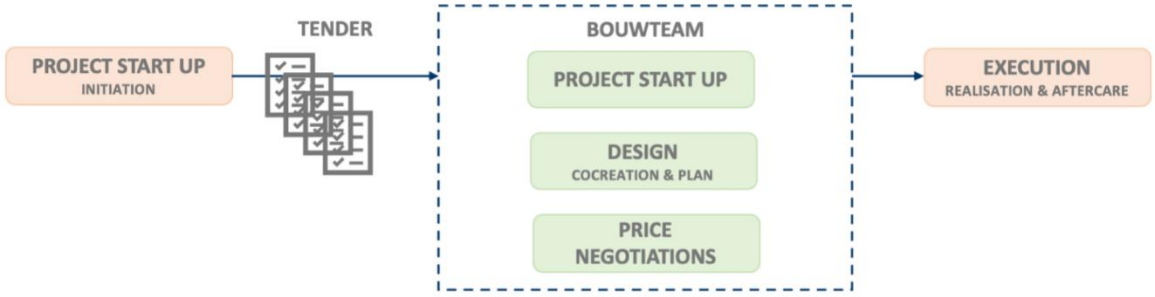

Figure 3-1 Phases of the Bouwteam (De Hoog, 2020)

3.4 Comparing Bouwteams with Alliances and IC's

Since the experience of the infrastructure sector with Bouwteams is currently relatively low, for the definitions of perspectives on collaboration in the infrastructure sector, it is impossible to invite persons experienced with Bouwteam collaboration in the infrastructure sector. Therefore, people experienced with client-contractor collaboration during the design phase of infrastructure projects are invited. To compare these experiences, it is of major importance to understand the differences and similarities of contract types regarding to this phase. Therefore, in this section the Bouwteam is discussed related to some other contract types involving collaboration in the design phase of infrastructure projects, which are regularly applied in the Netherlands: Alliances and Integrated Contracts (IC-s).

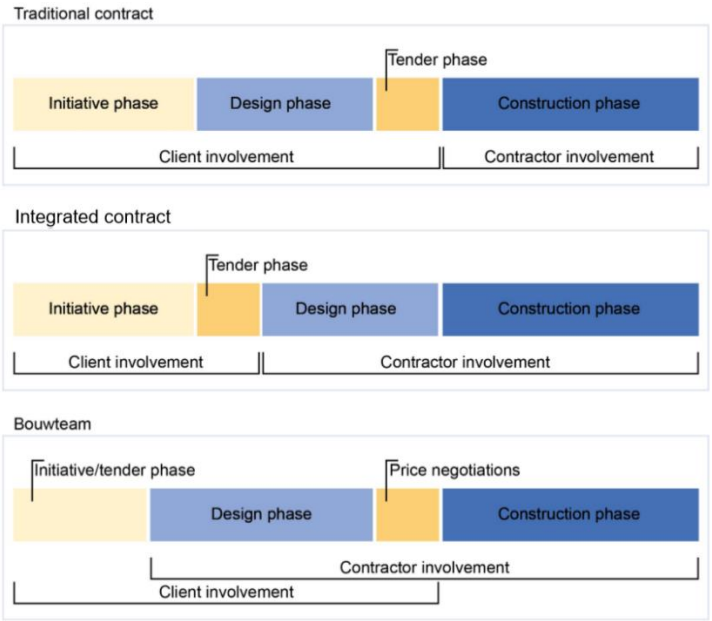

Figure 3-2 Bouwteam compared to other contracts (Van Riggelen, 2019)

Bouwteams compared to Alliances

Just like Bouwteams, in Alliances the client and contractor are working together in an equal relationship. However, in Alliances the integration and collaboration go deeper: the client and contractor setup a joint project organisation. This project organisation will be the contractor of the client and becomes a fixed budget. After finishing the project, the partners involved in the Alliance (client and contractor) will share the financial result (profit or loss) according to a predefined allocation (Chao, 2018). In the Netherlands, Alliances are mainly used for large projects, because the intensive process organisation is undesirable for small projects (Chao-Duivis, 2012; Van Riggelen, 2019). Since the preparation and tender procedure is less intensive in Bouwteams, the Bouwteams is suitable for both smaller and larger projects (HoPe, 2016).

Bouwteams compared to integrated contracts

In Integrated Contracts (IC's), some stages of the lifecycle of projects are integrated in one contract to avoid implementation gaps between the different stages of the project (Lenferink et al., 2013) (figure 3-3). In integrated contracts, the roles of the client and contractor are separated (Kent & Becerik-Gerber, 2010; Lenferink et al., 2013; Nader, 2019): the main role of the client is the monitoring of processes (a directing role), while the contractor is responsible for the stages to which the contract relates. In IC's the client and contractor are not involved in one project team and the joint working processes are not stimulated (Nader, 2019). Moreover, in IC's the collaboration starts after the tender phase, which is different in Bouwteams. Research by Nadar (2019) shows that this transition from the tender phase to the design phase can be accompanied with miscommunication. The addition of funding, maintaining and operating increases the duration of the project and the involvement of actors (Heeres et al., 2012; Lenferink et al., 2013). Finally, compared to Bouwteams, the risks are often delegated to the contractor (McKinsey & Company, 2019)

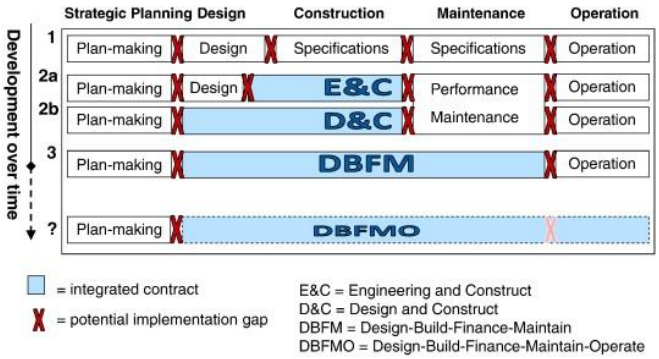

Figure 3-3 Integrated contracts (Lenferink et al., 2013)

3.5 Conclusion

Similar to Suprapto (2016), collaboration is defined as "*A process in which owner and contractor jointly create norms, rules and structures governing their teams, their working relationships, and ways to act or decide on the issues emerging during the course of a project, in order to bring about mutually satisfactory project outcomes*.". Similar to the foreign countries, within the Dutch context a shift towards Early Contractor Involvement has been made to improve client-contractor collaboration to achieve successful project performance. A typical Dutch format of ECI is the Bouwteam, which is "*a temporary collaboration agreement during the design phase in which the participants collaborate towards a feasible design with an associated risk log and a building contract"* (De Hoog, 2020). Besides Bouwteams, other contract types involving collaboration in the design phase of infrastructure projects regularly applied in the Netherlands are Alliances and Integrated Contracts (IC-s). In Alliances the initiator and contractor of the project will set-up a join project organisation in contrary to a Bouwteam in which the involved parties will retain their independence and responsibility. Compared to Bouwteams, in IC's the client and contractor are not involved in one project team and the joint working processes are not stimulated since the contractor is responsible for the for the contracted stages.

4. Comparison between Dutch Building and Infrastructure projects

To investigate what lessons the Dutch infrastructure sector can learn of the building sector, it is important to understand the degree in which building and infrastructure projects differ and match. Therefore, in the first section the way literature currently describes building and infrastructure projects is investigated. The second section aims to present a framework to compare both sectors. Next, in section 4.3 the sectors will be compared on aspects presented in the framework, while finally in section 4.4 the first sub-question: *On what aspects do building projects and transportation infrastructure projects differ?* will be answered.

4.1 Current description of building and infrastructure projects in literature

To investigate the terminology currently used within the existing literature and to what extend a distinction is made between building and infrastructure projects, an exploratory research is done on both sectors. Articles available at Google Scholar are selected, based on the key words 'characteristics', 'collaboration' and 'comparison' added with the terms 'building', 'infrastructure' or 'construction' sector. This research show that construction projects are widely described within the existing literature (e.g. Bresnen & Marshall, 2000; Chan et al., 2004; Kelly et al., 2014; Larsen et al., 2016; Smith et al., 2014). Often it is unclear to what type of project the article actually refers (e.g. Dulaimi et al., 2007; Oppong et al., 2017; Thompson & Sanders, 1998). Sometimes it refers only to building projects (e.g. Abd El-Razek et al., 2008; Fugar & Agyakwah-Baah, 2010; Mathar et al., 2020), other times to both building and infrastructure projects (e.g. Nasir & Hadikusumo, 2019; Rahman et al., 2014), or even broader including the construction of oil and gas plants (Smith et al., 2014; Suprapto, 2016; Winch, 2009). Research shows that especially articles about collaboration and project success tend to lump up several sectors by using the term 'construction projects' (e.g. Bresnen & Marshall, 2000; Dulaimi et al., 2007; Suprapto, 2016). This is confirmed by a research of Robert Youker (1999) into the differences between different types of projects. Although he distinguishes nine types of projects, buildings and roads are grouped as 'construction projects' and the plans of engineering and architectural projects are grouped as 'design of plans' (Youker, 1999).

However, there are also articles that make a distinction between the building and infrastructure sector and focus at one of them. The infrastructure sector is referred separately in literature with terms as '(large) infrastructure projects' (e.g. Adelbäck & Johansson, 2013; Bingham & Gibson Jr, 2017; Liew et al., 2019) and 'transportation infrastructure projects' (e.g. Cantarelli et al., 2013; Cheng et al., 2016; Love et al., 2014). Some articles focus specifically on collaboration within the infrastructure sector (e.g. Verweij, 2015; Walker et al., 2017; Wondimu et al., 2016). The building sector is also described separately in the existing literature, using terms as 'building projects' (e.g. Josephson & Hammarlund, 1999; Jrade & Jalaei, 2013; Kolltveit & Grønhaug, 2004) and 'construction building projects' / 'building construction projects' (e.g. Ali & Kamaruzzaman, 2010; Fugar & Agyakwah-Baah, 2010; Mathar et al., 2020). These articles focus on a certain topic within the building sector, e.g. on sustainability (Jrade & Jalaei, 2013), design coordination (Zaneldin et al., 2001) and stakeholder management (Heravi et al., 2015). The number of articles that focus on collaboration is limited within this sector. Published articles related to collaboration in building projects are focussed on relating aspects like Building Information Modelling (BIM) (Kerosuo et al., 2013) and value management (P. A. Jensen, 2005).

A few researches try to compare infrastructure projects and building projects on a certain aspect (e.g. a comparison between Building Information Modelling (BIM) and Civil Information Modelling (CIM) (Cheng et al., 2016) and the adopted procurement selection criteria in building and infrastructure projects (Sethuraman et al., 2016)). Although there are some indications that collaboration in the building sector could partly differ from collaboration in the infrastructure sector (e.g. the available literature who focus on collaboration in the infrastructure sector), currently it is unclear what the impact of the nature (characteristics) of the sector is on collaboration and a comparative study on differences in nature between the two disciplines is still missing. Therefore, this chapter aims to

identify the differences and similarities between building and infrastructure projects. The link with collaboration will be made in chapter 6.

4.2 A framework to compare both sectors

A broad literature study is done on aspects related to the construction sector that could influence the way of collaboration. Articles are searched on Google Scholar by using the key words “collaboration construction projects”, “collaboration infrastructure projects”, “collaboration building projects”, “success factors construction projects” and “characteristics construction projects” starting at the year 2000. The obtained articles are investigated on the presence of an overview of aspects of collaboration in building or infrastructure projects. Articles related to the (digital) information technology (e.g. BIM) are not further investigated, because this research is focused on physical collaborationships. Next, articles that only focus on a certain aspect (e.g. innovation (e.g. Schenk & Stokes, 2013; Smorodinskaya et al., 2017), project delivery (e.g. Kent & Becerik-Gerber, 2010; Shelbourn et al., 2007) or cost performance (e.g. Iyer & Jha, 2005; Meeampol & Ogunlan, 2006) are also excluded because it is intended to find a total overview of related aspects. Finally, articles who mainly mention soft skills (e.g. Suprapto et al., 2015) and team management related aspects (e.g. Walker et al., 2017) are also excluded, since these factors are already included in the Q-study. This selection process is outlined in detail in appendix A and finally resulted in the selection of four articles, presented in table 4-1.
Since the risks and the complexity of projects are mentioned in many articles within the search criteria, an additional literature research was done with the search terms “risks construction projects” and “complexity construction projects”. Specifically, investigations were searched that provide a clear overview of various project-related aspects. This resulted in two additional articles: a research of El-Sayegh & Mansour (2015) about the risks in highway construction projects and a research of Bosch-Rekveldt et al. (2011) in which a framework is presented to characterise project complexity. These two articles, together with the four articles that resulted from the previous step, are compared on their usefulness for comparing building and infrastructure projects (table 4-1).

Table 4-1 Explanation of the usefulness of articles for a comparison between the building and infrastructure sector

No.	Reference	Summary	Advantages	Disadvantages
2.	(Bresnen & Marshall, 2000)	The paper presents the economic, organisational and technological factors that encourage or inhibit collaboration in practise.	The research is conducted in the context of collaboration and presents factors on economic, organisational and technical level.	A clear overview of the mutual relationship between the factors is missing. Moreover, the focus of the article is on collaboration and therefore project characteristics are less mentioned.
4.	(Chan, Scott, et al., 2004)	The paper aims to present a conceptual framework on critical success factors, by identifying five main groups, namely project-related factors, project procedures, project management actions, human-related factors and external environment.	The paper presents a clear and extensive overview of factors which could influence the success of projects.	The description of the factors is minimal and therefore different to interpret. The human-related factors and project management actions are less useful for the comparison.
7.	(Cho et al., 2009)	This study aims to analyse the overall relationship between project performance and a project’s characteristics. This study deduced the overall causal relationship and the degree of influence between 17 project characteristics and five project performance indices.	The paper presents two groups of characteristics: project environment characteristics and project participant characteristics and discuss the relationship with project performance.	Although a lot of aspects are mentioned related to the project and the participants, contractual and environment related aspects are missing.
8.	(Shehu et al., 2015)	The paper aims to investigate Malaysian project characteristics in relation to time overruns.	The paper presents a clear overview of aspects which could case time overruns: type of project, nature of works, sector, procurement, tendering methods.	Although the paper is quite extensive in mentioning aspects, organisational and external aspects are missing.
9.	(El-Sayegh & Mansour, 2015)	The paper highlights the risks that are associated with highway construction projects in the UAE and mentioned technical factors, site factors, commercial factors, political factors, environmental factors and socio-economic factors.	The presented framework gives a clear overview of the aspects which are related to the risks of highway projects.	Because the framework is focused on risks, several important aspects of projects are missing including client, financial aspects and procurement strategies.
10.	(Bosch-Rekveldt et al., 2011)	The paper presents a framework for characterising project complexity in large engineering projects, based on three aspects: technical, organisational and environmental.	The paper gives a clear overview of three categories (including subcategories) which can lead to complexity.	Most of the subcategories (tasks, experience, trust, resources) do not contribute to a characterisation of the nature of the building and infrastructure projects.

It can be concluded that none of the articles gives a full overview of aspects on which building and infrastructure can differ. Chan, Scott et al. (2004) mentioned five categories of factors affecting the success of projects. Since this research aims to find out in which way the nature of projects influences the perspectives on collaboration to achieve successful project delivery, the framework of Chan, Scott et al. (2004) is chosen as the starting point. Next, the framework of Chan, Scott et al. (2004) is extended with factors which are mentioned by Bresnen & Marshall (2000) , Cho et al. (2009), Shehu et al. (2015), El-Sayegh & Mansour (2015) and Bosch-Rekveldt et al. (2011) (table 4-2).

Out of the total collected aspects (table 4-2) the aspects which are already present in the Q-set are removed as well as the aspects that focus on the client, since the role of the client is not included in this research (orange shaded). Next, for each of the remaining aspects, further study is done. The following search terms were used: "(factor) infrastructure projects", "(factor) building projects", "(factor) construction projects". Recently published (2015-2020) articles, originating from first world nations are used to stay close to the current Dutch context. In addition, publications regarding the Dutch building (B&U) and infrastructure (GWW) of the Economisch Instituut voor de Bouw (EIB), Bouwend Nederland (BN), the Aanbestedingsinstituut and the ABN AMRO are used for recent data in the Dutch context. During this research, the cost sharing within the sector became an important factor (which is also confirmed by various articles related to cost performance (e.g. Iyer & Jha, 2005; Meeampol & Ogunlan, 2006). As a result of this, the factors business key figures, costs and cost overruns were added to the category Project Management Actions. However, for a few aspects it became impossible to compare the building and infrastructure sector, because clear information is lacking. As a result, these aspects are also not further investigated (table 4-2, yellow shaded). The final remaining aspects (green shaded) will be outlined in the chapter 4.3 to define the differences and similarities between both sectors.

Table 4-2 Overview of aspects which are collected from literature.

	(Bresnen & Marshall, 2000)	(Chan, Scott, et al., 2004)	(Cho et al., 2009)	(Shehu et al., 2015)	(El-Sayegh & Mansour, 2015)	(Bosch-Rekveldt et al., 2011)
Project-related aspects						
Type of project		x	x	x	x	
Nature of project		x		x	x	
Number of floors of the project / Number of locations		x	x		x	x
Complexity of the project		x	x			x
Size of the project		x	x		x	x
Remoteness of location / Interference with existing site					x	x
Technical risks					x	x
Procurement-related aspects						
Procurement method	x	x		x		
Tendering method - contracts	x	x	x	x		
Project participants-related aspects						
Client's experience		x	x		x	
Nature of client (private / public)		x		x		
Size of client's organisation		x				x
Clients emphasize on low-construction costs		x				
Clients emphasize on high quality		x				
Clients emphasize on quick construction		x	x			
Client's ability to brief		x				
Client's ability to make decision		x				
Client's ability to define roles		x				
Client's contribution to design		x	x			
Client's contributing to construction		x				
Project team leaders' experience	x	x				
Technical skills of the project team leaders	x	x			x	
Planning skills of the project team leaders	x	x			x	
Organizing skills of the project team leaders	x	x			x	
Coordinating skills of the project team leaders	x	x	x			
Motivating skills of the project team leaders	x	x				
Project team leaders' commitment to meet cost, time, quality		x				
Project team leaders' early and continued involvement in the project		x	x			

Project team leaders' adaptability to changes in the project plan		x	x			
Project team leaders' working relationship with others		x				
Support and provision of resources from Project team leaders' parent company		x				
Project Management aspects						
Communication system	x	x	x			
Control mechanism		x				
Feedback capabilities		x				
Planning effort		x				
Developing an appropriate organisation structure		x				
Implementing an effective safety program		x				
Implementing an effective quality assurance program		x				
Control of sub-contractors work	x	x				
Overall managerial actions		x				
Organisational complexity	x					x
Size of project team	x					x
Organisational risks					x	x
External environment						
Economic environment		x			x	x
Social environment	x	x			x	x
Political environment		x			x	x
Physical environment		x			x	x
Industrial relations environment		x				x
Advanced technology	x	x				
Number of stakeholders	x					x
External risks					x	x

4.3 Comparison of both sectors

The building and infrastructure sector will be compared on five aspects: project-related aspects, project-participant related aspects, project procedures, project management aspects and external aspects (Chan, Scott, et al., 2004). Chan, Scott et al. (2004) states that the variables within each category are interrelated and intrarelated. This means that a variable in one group can affect a variable in another group and vice versa, which is also confirmed by Cho et al. (2009). As a result of this, the aspects mentioned in the framework will be discussed in relation to each other.

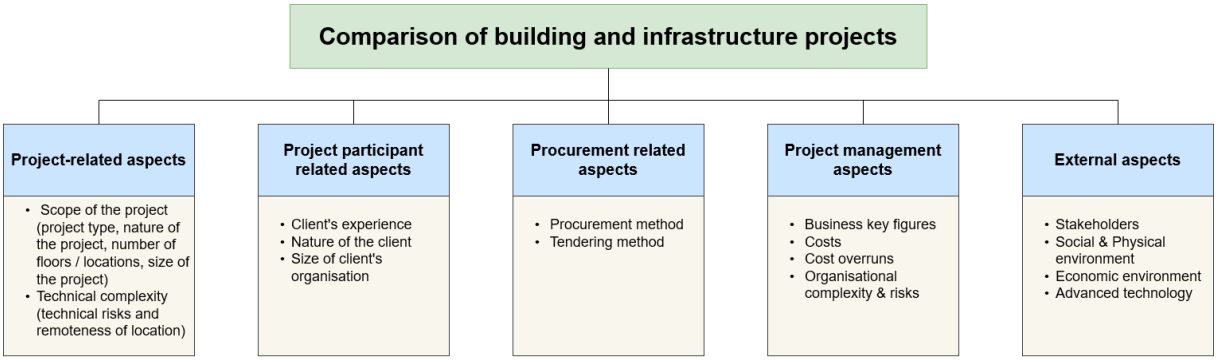

Figure 4-1 Framework which will be used to compare both sectors

4.3.1 Project-related aspects

Scope of the project

Several researches claim the relationship between the project scope and construction time (Akinsola et al., 1997; Bingham & Gibson Jr, 2017; Chan, Scott, et al., 2004; D. H. T. Walker, 1995). Scope is a term used to indicate the nature, size and limitations of a project. The scope determines what the project is and what not and what the project should and should not achieve (Bingham & Gibson Jr, 2017).

Normally, infrastructure projects are spread over a wider geographic area than building projects (Boarnet, 1995; El-Sayegh & Mansour, 2015; Reilly & Arrigoni, 2005), since building projects are often located in the same village, city or municipality, while infrastructure projects can cover several villages, municipalities or even provinces. As a result, the project locations of building projects can often be closed by construction fences, while that is more difficult for infrastructure projects, because of the

wider spreading and the large impact of closure on the users. The geographic size is related to the number of permits which must be requested (A. T. Nguyen et al., 2015) and the overall complexity of projects (Bosch-Rekveldt et al., 2011). In addition to the geographic area, the project size can also be described in terms of capital (A. T. Nguyen et al., 2015). For both types of projects, there is a large range in project turnover, since a lot of variation is possible in the size of projects (building: a single house to even a large building project including hundreds of houses of several buildings; infra: a single road to a highway construction of kilometres). During this research there was no data available about the range of project turnovers in both sectors. However, Zayed et al. (2008) link the high capital outlay and intricate site conditions to the higher risks of infrastructure projects compared to other construction projects (El-Sayegh & Mansour, 2015; Zayed et al., 2008).

Technical complexity of projects

In particular infrastructure projects have become progressively complex (A. T. Nguyen et al., 2015). Therefore the complexity of projects have been a permanent role in the research of the last years (e.g. Baccarini, 1996; Bosch-Rekveldt et al., 2011; A. T. Nguyen et al., 2015; Vidal et al., 2011). Several authors (Baccarini, 1996; Bosch-Rekveldt et al., 2011; Vidal et al., 2011) mentioned the technical complexity, including the experience with technology, technological newness of the project, technical risks, quality requirements and variety of tasks. Although none of the studies investigates the differences in (technical) complexity between the building and infrastructure sector, some researches make observations related to this topic. They emphasize the uncertain and variable underground conditions as a risky aspect of construction projects (El-Sayegh & Mansour, 2015; Ghosh & Jintanapakanont, 2004). Since infrastructure projects are more horizontally oriented, and building projects are vertically oriented, infrastructure projects are more sensitive to this type of risks.

4.3.2 Project-participant related aspects

Project participants are the key-players within a project, including project manager, client, contractor, consultant, subcontractor, supplier and manufacturer (Chua et al., 1999; Guo et al., 2014). The actual number of participants depends on the size of the project and the contract type (Guo et al., 2014). As explained in section 4.3.1 in both sectors the variation in project size is large. Although several authors agree to the influence of number of project participants to the project performance (Bosch-Rekveldt et al., 2011; El-Sayegh & Mansour, 2015; Locatelli et al., 2017) the number of participants will not be further investigated because of the lack of clear data of both sectors on this topic.

Especially the client related aspects are mentioned as a significant factor affecting the project success: client characteristics, client type and experience and knowledge of project organisation (Chan, Scott, et al., 2004; D. H. T. Walker, 1995; D. H. T. Walker et al., 2017). Several reports provide insight in the different clients of Dutch building and infrastructure projects. De Hoog (2020) identified three client types involved in building projects: the involved client (who is both the owner and end-user, partly experienced and informed, without any technical experience), the project developer (who is the owner, but not the end-user, partly experienced and informed, without any technical expertise) and the representative of the client (who is not the owner and end-user, experienced and informed and with technical expertise). The clients of the building sector are mainly from the private domain (cat. involved clients and project developers), while the infrastructure sector has a lot of public clients (cat. Representative of the client) including the national government, provinces, municipalities and regional water authorities (Van Alphen, 2018; Visser & Nicolas, 2020). Therefore, it is suggested that the building sector has to do with more knowledge difference between their clients than the infrastructure sector.

Table 4-3 Overview of the clients of both sectors (2018). Source: EIB, 2020

	Building sector	Infrastructure sector
Governments	6 %	58 %
Housing corporations	16 %	-
Companies	39 %	16 %
Main Contractors	11 %	13 %
Private Persons	12 %	1 %
Others	15 %	12 %

4.3.3 Project procedures

Chan, Scott et al. (2004) mentioned two important aspects of the project procedures: the procurement method (the selection of the organisation for the design and construction of the project) and the tendering method (procedures adopted for the selection of the project team and in particular the main contractor) (Chan, Scott, et al., 2004).

Procurement method

The importance of a proper selection of a procurement method is mentioned by several authors (Cho et al., 2009; Luu et al., 2003; Regan et al., 2011; Sethuraman et al., 2016). The owners of projects are developing various delivery methods that consider various project characteristics affecting the success of construction projects and are making an effort to select an appropriate contractor for each project (Cho et al., 2009). The selection is based on the characteristics of the project, the owner's needs and characteristics and external environmental factors (Luu et al., 2003). A proper procurement and tender method can help projects to succeed and positively influence the achievement of the project (Cho et al., 2009; Regan et al., 2011) and is therefore mentioned as a factor that influences collaboration (Eriksson & Westerberg, 2011; D. Walker & Hampson, 2008). Alhazmi & McCaffer (2000) mentioned the difference in nature of infrastructure and building projects as a reason for the application of different procurement methods in both sectors. As a result of this, Sethuraman et al. (2016) hypothesize different procurement selection criteria for building and infrastructure projects. After research, early commencement of the project, complexity of the project and clear expression of the end user's requirements are founded as parameters that mostly influence the procurement path of building projects. Time constraints, types of clients, project funding method, willingness of the client to bear risks and quality and safety policy of the client/government are mentioned as aspects which are important in the selection of a procurement path in infrastructure projects (Sethuraman et al., 2016).

Tendering method

Several studies show a great difference on the tendering method of building and infrastructure projects in the Netherlands. While 46% of the Dutch infra projects is publicly tendered and 30% privately tendered, building projects are tendered in much more diverse ways (Van Alphen, 2018; Visser & Nicolas, 2020) (table 4-4). This can partly be explained by the fact that building projects have more private parties as clients, while the infrastructure sector have a lot of public clients (Visser & Nicolas, 2020). Moreover, infrastructure projects will exceed more often the threshold of the tender rules of the European Union than building projects.

Next, the contract types applied in both sectors within the Dutch context are investigated. One of the most important principles in both the building and infrastructure sector is the determination what kind of object is asked by the client and how it should be built. For simple projects this is formulated in a document called 'specifications and conditions' (Dutch: bestek). The document describes the artefact that should be realised, and the works associated, together with the technical and legal details. In the Dutch infrastructure, the RAW-format is used, while the Dutch building sector makes use of the STABU-format.

Table 4-4 Overview of the way in which projects in both sectors are tendered (2018). Source: EIB, 2020.

	Building sector	Infrastructure sector
Public Tender	16 %	46 %
Private Tender	17 %	30 %
Single Invitation	18 %	6 %
Customer Work	8 %	5 %
Own Risk Construction	14 %	-
Bouwteam	18 %	-
Turnkey	3 %	-
Others	6 %	13 %

Table 4-5 Overview of the Contract types applied in the infrastructure sector in 2018. Source: EIB, 2020.

	Infrastructure sector
E&C	7 %
D&C	29 %
DBM	7 %
DBFM	12 %
Traditional / RAW	37 %
Others	8 %

4.3.4 Project management aspects

Project management is a key for project success (Belout & Gauvreau, 2004; Chan, Scott, et al., 2004; Hubbard, 1990; Radujković & Sjekavica, 2017). Jaselskis & Ashley (1991) stated that, by using management tools, the managers would be able to plan and execute their construction projects to maximize the chance of project success (Chan, Scott, et al., 2004; Jaselskis & Ashley, 1991). Many aspects attributes to the management of projects. However, the factors which are already included in the Q-set (soft skills and team management factors) will not be further investigated in this chapter. Besides organisational related aspects (risks, complexity and size of the project team), financial related aspects including business key figures and costs structures of both sectors will be discussed.

Business key figures

Research by the EIB shows that the that the turnover of the Dutch building sector (b&u) is three times as large as the turnover of the Dutch infrastructure sector (gww) (Visser & Nicolas, 2020). The profit margin as percentage of turnover is almost the same in both sectors (3.7% vs 3.4% (Visser & Nicolas, 2020) or 3.3.% vs 3.1% (Bouwend Nederland) (both in 2018)). However, the final return on (total) equity is much higher in in the building sector than the infrastructure sector.

Table 4-6 Business key figures of 2018 of the Dutch building sector (B&U) and infrastructure sector (GWW). Source: EIB, 2020.

	Building sector	Infrastructure sector
Turnover	€ 24.6 billion	€ 8.6 billion
Profit Margin (% of turnover)	3.7 %	3.4 %
Quick Ratio	134 %	132 %
Current Ratio	151 %	139 %
Solvency	66 %	69 %
ROC	11.6 %	7.9 %
ROE	32.9 %	24.1 %

For Ballast Nedam N.V. the revenues in 2019 from construction activities in the building and infra sector are respectively € 477.9 million and € 289.4 million (Ballast Nedam N.V., 2020). The revenues from construction activities are mainly from the execution of projects in residential and non-residential building and mobility. Compared to other companies in the sector it can be concluded that Ballast Nedam has a larger share in infrastructure.

Costs

In the building sector the consumption costs (raw materials, machines, housing etc.) are higher than in the infrastructure sector, where more money is spent on labour costs (Visser & Nicolas, 2020) (table 4-7). Also, the other costs (depreciation, interest costs and other costs not previously mentioned) are higher in the infrastructure sector. In 2020 the EIB published a research about the overhead costs of both sectors in the years 2016-2018. The results showed that the overhead costs of the building sector are lower than thee of the infrastructure sector (8.6% compared to 11.0% the direct costs) (Visser & Nicolas, 2020).

Table 4-7 Cost structure in % of the turnover (2018). Source: EIB, 2020.

	Building sector	Infrastructure sector
Consumption Costs	78.1 %	70.3 %
Direct Labour Costs	7.9 %	10.7 %
Indirect Labour Costs	5.2 %	6.4 %
Others	5.2 %	9.3 %
Various income and expenses	- 0.2 %	- 0.1 %
Result for tax	3.7 %	3.4 %

Cost overruns

Failure costs are the costs that must be paid if products or services do not meet the requirements of the client or in case the contractual specifications are not met (Cantarelli et al., 2012; van Heel et al., 2019). According to ABN AMRO (2019) the failure costs of the entire building sector are estimated at an average of 5% of the total turnover (Van Heel et al., 2019). A large part of these costs (54% of the total failure costs) occur in the execution phase. Although exact numbers about the failure costs in the infrastructure sector are missing, the failure costs are high and occur in 86% of the projects (van Gils, 2018; Dubbeling et al., 2017). Cantarelli (2009) distinguishes projects of four different sizes and demonstrates that cost overruns are more common in small projects, which is caused by the less attention paid in small projects to control of costs. However, although cost overruns are less common in larger projects, large projects contribute the most to the total cost overruns in the sector (Cantarelli, 2009; Dubbeling et al., 2017).

Organisational complexity and risks

Vidal et al. (2011) mentioned organisational complexity as the greatest source of complexity for today's projects.. Although there is no research available, it is suggested that the organisational complexity is high on both the building and infrastructure sector. In case of large infrastructure this is assumed in relation to the wider spread of the geographic area and the several disciplines involved. However, in building projects the enormous number of subcontractors needed for realisation will influence the organisational complexity.

Often large Dutch infrastructure projects are built by public private partnerships in which the public partner is acting in an active project management role (Hertogh & Westerveld, 2010; Koops, 2017; Koops et al., 2017). The combined project organization is operating in a dynamic network environment (Belassi & Tukel, 1996; Koops, 2017; Walker et al., 2017) of organizations and stakeholder groups. Therefore the project organization is constantly forced to balance between product criteria to satisfy the client, stakeholders, end-users and project management criteria to meet the given constraints (Koops, 2017). Discussions about this balance could lead to conflicts and hence they are potentials risks for the project (Koops, 2017). Therefore the parent organization is assigned as a disturbing factor for collaboration in the combined project organisation (Suprapto, 2016).

4.3.5 External aspects

Various researchers mention "environment" as a factor affecting the success of projects (Akinsola et al., 1997; Chan, Scott, et al., 2004). It is also one of the aspects to measure complexity in the TOE-framework of Bosch-Rekveldt et al. (2011). Akinsola et al. (1997) defines environment as "all external

influences on the construction process, including social, political and technical systems". Bresnen & Marshall (2000) mention also the influence of the economic circumstances.

Stakeholders

The management of both internal and external stakeholders plays an important role in building and infrastructure projects (Olander & Landin, 2008; Yang & Shen, 2015). Teoh (2010) argues that the most important stakeholder group in an infrastructure project is the end-user as this group is usually the collective sum of the other stakeholder groups, which could include government, private companies, contractors and project team members. In government-led infrastructure projects, the public is most often the end-user, hence this broad category can prove problematic when it comes to understanding, engaging and managing stakeholders. In building projects, the end-user however is much more clear and could be residents, employees of a certain company or institution and in public buildings (like swimming pools, stores, concert halls, town halls etc.) the visitors of that building.
The number of stakeholders is also different for infrastructure and building projects. While the number of end users is just a few (in case of a house) up to several thousand (in case of huge buildings) in building projects, in infrastructure projects however, even hundreds of thousands can be involved (CBS, 2020).

Social and physical environment

Infrastructure projects are mainly located in the public domain and therefore have a large influence on the population. This is related to the purpose of infrastructure, which is described by the Dutch Ministry of Infrastructure and Water management: focusing on liveability and accessibility, with a smooth flow in a safe, well-equipped and clean environment (Rijksoverheid, n.d.). In theory every citizen of the Netherlands can be affected by an infrastructure project. For building projects, however this is different. For housing construction projects, the end-users, the landowners and the residents of the relevant place are affected. In case of utility construction, the visitors and for high-rise buildings the view (and price) of surrounding homes and buildings will be affected. Therefore, the influence of infrastructure projects on society as a whole is much bigger than the of building projects.

Economic environment

Several researches claim that the building sector is more sensitive to the economic cycle than the infrastructure sector (Ballast Nedam, 2011; Boumeester & van der Heijden, 2004; Koopmans, 2011; Van Heel et al., 2019). This is largely influenced by the client type of the sectors: more than half of the Dutch infrastructure projects is initiated by governments compared to 6% in the building sector (Visser & Nicolas, 2020). In government projects, a budget is reserved for a project, while private projects are much more dependent on supply and demand (which is influenced by the economic situation). However, the COVID-19 pandemic shows a slightly different phenomenon. Hoiting (2020) mentioned that the short-term impact of the Corona virus is higher on infrastructure projects. He explains this by the relative short time between tendering and realisation of infrastructure projects, which is much longer in case of building projects.

Advanced technology

Innovation is the development and successful implementation of new ideas, products, processes or services (De Ven & Angle, 1989) and plays a crucial role in the growth, survival and success of organisations (Tohidi & Jabbari, 2012). However, research show that advanced technology is lacking in construction projects, this is partly due to a risk-averse culture, not challenging and consistent government policy, limited aspects of procurement and a lack of chain cooperation (Arnoldussen, Groot, Halman, & van Zwet, 2017; Maghsoudi et al., 2016). In the past years there is a growing attention to sustainability and circularity in several industry sectors and in the construction sector. In the last two years this transition has been accelerated by the Climate Agreement of July 2018: in 2050 the Netherlands should be completely energy neutral. For the building sector, this has the implication

that all building must be sustainable heated by 2050 (Rijksoverheid, n.d.). In the infrastructure field, the Climate agreement leads to more focus on public transport, bicycle paths and clean fuels.

4.4 Conclusion

The aim of this chapter was to answer the first sub-question: *On what aspects do building projects and transportation infrastructure projects differ?* In brief, building projects are vertically oriented point projects with a clear end-user, usually initiated by private client, while transportation infrastructure projects are horizontally oriented line projects with many end-users, usually initiated by public clients. This distinction is made based on research related to five aspects: project-related aspects, client-related aspects, project procedure related aspects, project management aspects and external aspects. Both types of projects aim to realise a certain artefact and are subject to failure costs and cost overruns. Although the size and turnover of projects in both sector show a wide variation (building: a single house to a complete business park, infra: a single road to a kilometres long road project including the construction of several artefacts), some differences and similarities are identified, which are presented in table 4-8.

Table 4-8 Comparison of the Dutch building and infrastructure sector at five aspects

	Building sector	Infrastructure sector
Project-related aspects	Vertically oriented projects, usually concentrated at a small geographic area, resulting in less interaction with the surrounding area.	Horizontally oriented projects, spread over a wide geographic area, resulting in more interaction with the surrounding, more stakeholders involved, more permits required and more sensitive to risks related to the underground.
Client-related aspects	Diverse client types (mainly private clients) resulting in a great difference in expertise and experience between the clients.	Mainly public clients, who have expertise and experience.
Project procedure related aspects	Diversely tendered, simple projects 'STABU', largely same contract types applied.	Public/Privately tendered, simple projects 'RAW', largely same contract types applied.
Project management aspects	Total turnover and return on equity are larger, consumption costs are higher, high cost overruns, high level of organisational complexity due to the number of sub-contractors involved.	Total turnover and return on equity are smaller, labour costs are higher, high cost overruns, high level of organisational complexity due to the wider geographic area and the involved disciplines, increased complexity in case of a combined project organisation.
External aspects	Lower number of involved stakeholders, clear end-user, more sensitive to the economic circle, little attention to sustainability and innovation.	High number of external stakeholders, lack of a clear end-user, high impact on society, little attention to sustainability and innovation.

5. Comparison of contractor's perspectives on collaboration

This chapter aims to compare the contractor's perspectives on success factors of collaboration in the building sector and infrastructure sector. These perspectives are identified with a Q-research, developed by De Hoog (2020), originally designed for collaboration in Bouwteams in the building sector. First a research is done whether this Q-study can be applied to client-contractor collaboration in the design phase of infrastructure projects. The outcome of this research is presented section 5.1 while a more detailed overview of the applied method is given in appendix B. Next, section 5.2 identifies the perspectives on collaboration of the infrastructure sector, while the perspectives of the building sector obtained by De Hoog (2020) are summarized in section 5.3. Section 5.4 compares these perspectives, while section 5.5 concludes by answering the second and third sub-question.

5.1 Q-method

Q-methodology was explicitly designed to systematically uncover and analyse similarities and differences in the subjective viewpoints of individuals (Suprapto et al., n.d.). Subjectivity here means that a practitioner's perception stems from his/her "internal frame of reference" that was casted through the experience of carrying role in different situations (McKeown & Thomas, 2013). In this study the internal frame of reference of an employee of Ballast Nedam involved in client-contractor collaborating in the design phase is examined. This frame of reference has been established through education, the experience of carrying out this role and dealing with the responsibilities that go with it. The goal of this research is to get the project manager's subjective view on factors contributing to the success of building (already done by De Hoog (2020)) and infrastructure projects. The Q-method can show us the particular combinations of themes which are preferred by the participants, but can never 'break-up its subjective matter into a series of constituent themes' (Watts & Stenner, 2005). The Q-method is therefore unsuitable for conforming hypotheses but can bring a sense of coherence to research questions. Due to the non-random recruitment and the small number of participants, the Q-study has the disadvantage that the results found are not transferable to groups with different experiences. Q-methodology only says something about a continuum of viewpoints regarding a specific experience within a specific group of people (Jedeloo & van Staa, 2016). Therefore the widest possible participant group should be selected to closely represent the sector.

Figure 5-1 Steps of the Q methodology (De Hoog, 2020)

The Q-method consists of two fundamental aspects: the Q-sorting procedure (which is an original means of collecting data) and the Q-pattern analysis (which is effected by means of a by-person factor analysis) (Watts & Stenner, 2005). For the Q-sorting procedure a Q-set is needed. The Q-set is the collection of heterogeneous items which the participants will sort, and could be collected by a literature study, desk research, formal interviews, informal sessions and pilot studies and should contain 40-80 factors (Watts & Stenner, 2005). For this research, the Q-set obtained by De Hoog (2020) will be used, which consists of 38 success factors, collected by literature study and interviews. Since the Q-set was originally designed for collaboration in Bouwteams at building projects, a research is done if the statements also apply to client-contractor collaboration in the design phase of infrastructure projects (appendix B.2). Research shows that all success factors apply to infrastructure projects, but that three of them should be rewritten to apply to general client-contractor collaboration in the design phase (table 5-1). The final list of success factors used for the Q-study within the infrastructure sector is presented in table B-3.

Table 5-1 Overview of original success factors (De Hoog, 2020) and their reformulation for this research.

No.	Original statement	Reformulated statement
8.	Clear definition of roles before the Bouwteam starts working.	Clear definition of roles before the process starts.
12.	Defined scope of the Bouwteam.	Defined scope of the project.
38.	Evaluate the Bouwteam during the project.	Evaluate the collaboration during the project.

Next, the participants are selected for conducting the Q-sort. This set of participants is called the 'P-set' and should be a well selected limited number of participants (Watts & Stenner, 2005). Based on the redundancy rule of Webler et al. (2009), a P-set of 25 respondents is chosen. The participants are selected regarding the criteria presented in table 5-2 (based on De Hoog (2020), changes in italic).

Table 5-2 Participant criteria of the infrastructure and building participants

Infrastructure participant criteria	**Building participant criteria** (De Hoog, 2020)
The participant is currently involved or has been directly involved in *the design phase of an infrastructure project.*	The participant is currently involved or has been directly involved in a Bouwteam project.
The participant is currently or has been in contact with the client and therefore experienced client-contractor collaboration *in the design phase of an infrastructure project.*	The participant is currently or has been in contact with the client and therefore experienced client-contractor collaboration in a Bouwteam project.
The participant is or was present at *client-contractor* meetings *during the design phase of an infrastructure project.*	The participant is or was present at Bouwteam meetings during a Bouwteam project.
The participant has at least five years of experience in the construction industry*, in particular the infrastructure sector*.	The participant has at least five years of experience in the construction industry, in particular the utility and building sector.
The participant is a process, design or cost manager (result of the final P-set of De Hoog (2020)).	

To collect a suitable P-set the structured approach is used. The head of the infrastructure department of Ballast Nedam and the company director of Ballast Nedam Leerdam are asked to give the names of people who could met the criteria. Next, the involved persons are contacted whether they actually met the criteria. In the Q-sorting procedure (appendix D.1) the participants are asked to fill the Q-sort (a predefined scheme with scale -4 till +4) and answer the post-sorting questions. This was largely done by skype meetings (21/25 participants). The answers to the post-sorting questions are recorded and summarised in appendix D.2.

5.2 Perspectives of the infrastructure sector

The results obtained in the Q-sorting procedure are analysed (chapter 5.2.1) and next the perspectives are identified and interpreted (chapter 5.2.2), whereafter similarities and differences between the different perspectives are investigated (chapter 5.2.3).

5.2.1 Q-analysis

Participant group

The final P-set included 25 participants who are experienced with client-contractor collaboration during the design phase of infrastructure projects. An extra participant (pi26, cost management) was involved in the research, but excluded of the final P-set because she has been only indirectly involved in client contact. During the research it became clear that most of the cost engineers at Ballast Nedam are not experienced with direct client-contractor collaboration. As a result, only two participants of this category are included in the final P-set. Next, an extra group experienced with client-contractor collaboration was investigated: the specialists. Although they are not explicitly included in the research of De Hoog (2020), they are included in this research because of their role in client-contractor collaboration. This resulted in a P-set of 12 process managers, 6 design managers, 5 specialists and 2 cost managers. The respondents are mainly derived from three large infrastructure projects: the Blankenburg connection (€ 700 million, 32%), the A9 Gaasperdammerweg (€ 1 biljard, 24%) and the N31 Traverse Harlingen (€ 100 million, 20%). The other participants are involved in smaller projects (€ 1-40 million). 13 respondents are involved in DBFM projects, 9 participants in D&C projects and two

are working with other contract types (alliance and 1-to-1 collaboration with the client) (table 5-3). The total P-set and the correlations between the participants are presented in table C-1 and C-2.

Table 5-3 Characteristics of the final infrastructure participants

No.	Group	Function	Reference project	Budget reference project	Contract type reference project
1.	Process management	Senior Advisor	Blankenburgverbinding Baak	700 million	DBFM
2.	Process management	Project Manager	Blankenburgverbinding Baak	700 million	DBFM
3.	Process management	Project leader GWW	A9 Gaasperdammerweg	1 billion	DBFM
4.	Process management	Company director	Blankenburgverbinding Baak	700 million	D&C
5.	Process management	Process and Information manager	A9 Gaasperdammerweg	1 billion	DBFM
6.	Process management	Project manager	N31 Traverse Harlingen	100 million	D&C
7.	Process management	Tender manager	N207C	3.5 million	D&C
8.	Process management	Project manager	Blankenburgverbinding Baak	700 million	DBFM
9.	Process management	Process and Information manager	N31 Traverse Harlingen	100 million	D&C
10.	Process management	Project manager	Maastricht Groene loper	3 million	D&C
11.	Process management	Project coordinator	P+R Kralingse Zoom	40 million	D&C
12.	Process management	Adjunct director BAAK	Blankenburgverbinding Baak	700 million	DBFM
13.	Design management	Designer GWW	A9 Gaasperdammerweg	1 billion	DBFM
14.	Design management	Design manager	Stena Line RoRo Terminal	24 million	D&C
15.	Design management	Design manager	Blankenburgverbinding Baak	700 million	DBFM
16.	Design management	Design manager	N31 Traverse Harlingen	100 million	D&C
17.	Design management	Project manager design	Geluidsscherm N210	1 million	1-op-1
18.	Design management	Design coordinator GWW	A9 Gaasperdammerweg	1 billion	DBFM
19.	Specialist	Engineer	N31 Traverse Harlingen	100 million	D&C
20.	Specialist	S&L Engineer	N31 Traverse Harlingen	100 million	D&C
21.	Specialist	Systems architect	A9 Gaasperdammerweg	700 million	DBFM
22.	Specialist	Manager VVTI	A9 Gaasperdammerweg	1 billion	DBFM
23.	Specialist	Stakeholder manager	Blankenburgverbinding Baak	700 million	DBFM
24.	Cost management	Senior Advisor of costs	Blankenburgverbinding Baak	700 million	DFBM
25.	Cost management	Plan developer	De Markermeerdijk	500 million	Alliance

Q-analysis

The respondents' perspective on project success is captured in the final ranking of the success criteria in the ranking sheet (Q-sort), which is the raw data used for analysis. The aim of the analysis is to identify common perspectives between groups of respondents. In this research, the analysis is done by PQMethod (version 2.35, developed by John Atkinson). Principal component analysis is used to extract factors. To determine the number of meaningful factors (i.e. the number of meaningful and distinct perspectives), the number of different factor rotations on two- to seven-factor solutions are investigated. Similar to De Hoog (2020) the following rules are applied to select the valid factor:

1. Cumulative explained variance (CEV) > 50% (Suprapto, 2016): the cumulative explained variance should be at least 50% in order to explain at least half of the Q-sorts.
2. A factor has at least two significant Q-sorts (Brown, 1980; Suprapto, 2016):
    a. A factor loading is significant if the factor loading is > 0.418 (in case of an interval of 0.01, calculated by 2.58 (1/); N=38 statements).
    b. A factor loading is significant if the highest squared factor loading explains more than half of the common variance.
3. A high number of defining sorts (Van Exel & De Graaf, 2005): more defining Q-sorts are more appropriate.

Table 5-4 Overview of factor characteristics (infrastructure sector)

	2-Factor	3-Factor	4-Factor	5-Factor	6-Factor	7-Factor
Cumulative explained variance	47%	52%	56%	59%	62%	66%
Acceptable factors	25	24	18	17	16	13
Defining sorts	2	3	4	5	5	5

Although the 4-factor solution has a higher CEV than the 3-factor, the number of acceptable factors is much higher for the 3-factor solution. Therefore the 3-factor solution is used for further analysis. Next, the factor rotation is applied (using the functions Varimax and Rotate) to optimize the acceptable factors. A rotation of -5 degree of factor 1 and 3 is chosen for the final factor solution. As a result, pi24 (who was the only participant that was not included) is also included in the final factor solution. This resulted in six participants loading on factor 1, eleven participants loading on factor 2 and eight participants loading on factor 3 (table 5-4). These participant groups are defined by the normalised weighted average statement score (Z-score) of representing participants (Van Exel & De Graaf, 2005), which actually present the ideal Q-sort for participants of that group.

Most of the functions of the participants are present in all groups (except of the cost engineers) (table 5-5). They are relatively even distributed over the three factors, although the specialists are underrepresented at factor 2. The cases are less distributed (Blankenburgverbinding is not present in factor 1) as well as the contract types (especially factor 3 is largely defined by respondents involved in DBFM contracts). Thus, the first factor is largely presented by participants involved in D&C project, while the third factor is largely presented by respondents involved in DBFM-projects, specifically the Blankenburg connection. The second perspective shows the largest diversity in contract types and reference projects.

Table 5-5 Rotated factor loadings of the three factor solution of the infrastructure sector

	Factor 1	Factor 2	Factor 3	
3. Project leader	0.5193X	0.2260	0.3693	X
11. Project coordinator	0.6446X	0.2568	0.2975	O
14. Design manager	0.5078X	0.3406	0.3009	O
18. Design coordinator	0.4398X	-0.0358	0.2252	X
19. Engineer	0.6972X	0.1756	0.1397	O
20. S&L engineer	0.6798X	0.3209	0.3170	O
1. Senior Advisor	0.3678	0.5312X	0.1554	X
2. Project manager	0.0357	0.6392X	0.3348	X
5. P&I manager	0.1646	0.5189X	0.3925	X
7. Tender manager	-0.1042	0.7955X	0.2985	O
9. P&I manager	0.2787	0.5719X	0.4211	O
10. Project manager	0.2804	0.6758X	0.1517	O
15. Design manager	0.3342	0.5477X	0.3428	X
16. Design manager	0.1510	0.3959X	-0.1081	O
17. Design manager	-0.0395	0.5522X	0.3735	I
22. Manager VVTI	0.3132	0.7167X	0.1988	X
25. Plan developer	0.4225	0.6268X	0.1771	I
4. Company director	0.2801	0.3070	0.6105X	X
6. Project manager	0.1316	0.0022	0.6131X	O
8. Project manager	0.0264	0.3963	0.4785X	X
12. Project adjunct-director	0.2232	0.2290	0.7617X	X
13. Designer GWW	0.4806	0.0739	0.6329X	X
21. Systems architect	0.4058	0.2953	0.6742X	X
23. Stakeholder manager	0.1772	0.3190	0.5741X	X
24. Senior Cost advisor	0.3866	0.2811	0.4810X	X

Process management	A9 Gaasperdammerweg	X	DBFM
Design management	Blankenburgverbinding	O	D&C
Specialists	N31 Harlingen	I	Others
Cost management	Others		

5.2.2 Perspectives on collaboration in the infrastructure sector

Next, the factors are interpreted, based on the characterising (-4, -3, +3 and +4), consensus (statements that are valued equally at the three perspectives, presented in table C-4) and distinguishing statements (statements with a distinct Z-score compared to other factors) and the results of the post-sorting questions, which resulted in three perspectives on collaboration.

Infra perspective 1: Relation, clarity and communality

This perspective is represented by six respondents. According to this perspective, mutual trust (+4) and an equitable relation and respect for all (+3) are the fundamental aspects of good collaboration. Collaboration without a respectful and reliable relationship is impossible (pi3, pi14, pi19, pi20). These positive characterising statements are also consensus statements and thus agreed by participants of other perspectives. A fair risk allocation (+3), a defined scope of the project (+2) and the understanding of each other's objectives (+2) are the most essential distinguishing characteristics of this perspective. The fair risk allocation because an unfair risk allocation will harm the collaboration. According to pi3: "If the risk allocation is not fair, it is impossible to collaborate.". The clear definition of the scope at the start at the project, because it determines the size of the project and the available budget (pi14, pi19). Moreover, a clear definition at the start of the process prevents design changes during the process (pi11). The understanding of each other's objectives is essential to achieve the best solution for the problem. In addition to the clarity of risks, scope and objectives, communality plays an important role in this perspective: external stakeholders should be early involved (+2) and a joint planning with the participants (+2) is essential. However, this perspective is not in favour of forced collaboration: separate conversations in small disciplines (-1), integrated project teams (-2) and the development of common processes and tools (-3) are less essential for successful collaboration. The contractor's track record in terms of innovation (-4) is not a condition for a successful project delivery in this perspective, because the experience with innovation does not influence the extend of collaboration (pi3, pi14, pi18, pi19).

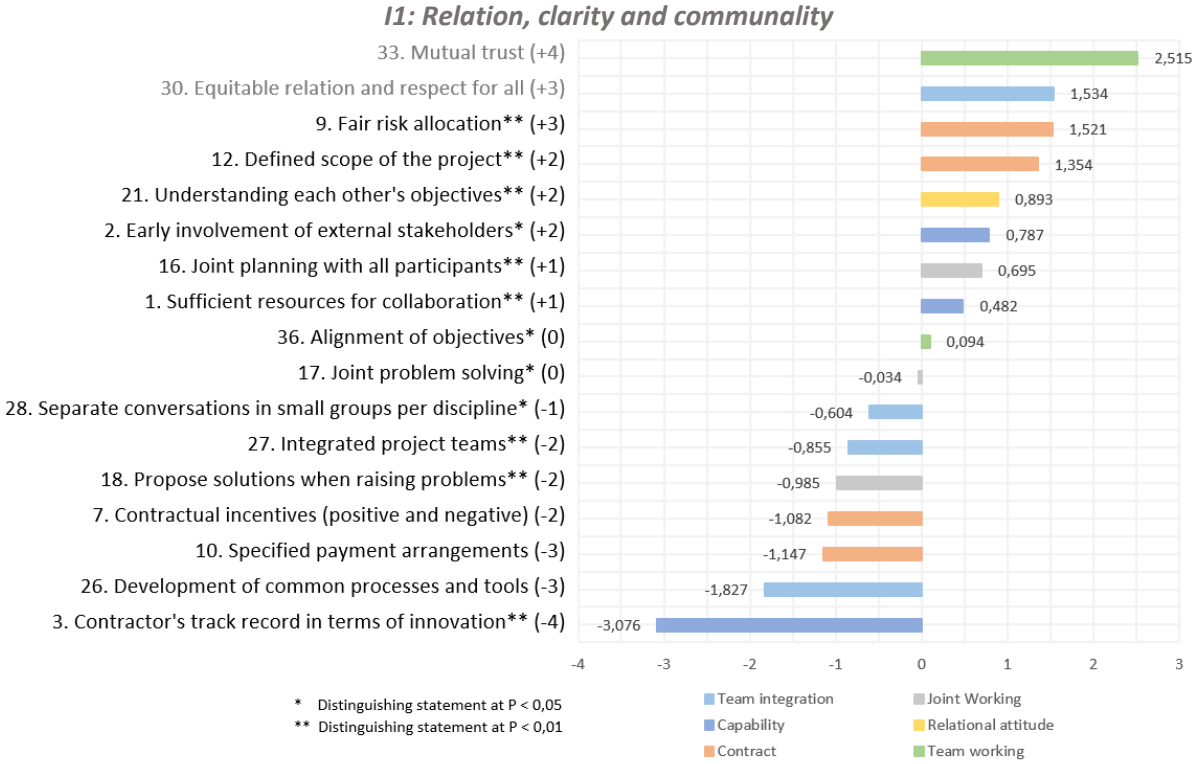

Figure 5-2 Factor scores of the first infrastructure perspective (the consensus statements are grey-coloured)

Infra perspective 2: Personal values above structure

This perspective is presented by most of the respondents (N=11). People with this perspective link their personal values to their vision on collaboration. According to pi2: "The most essential values reflect my personal values.". They believe that it is impossible to collaborate without trust (+4): "without trust, you will reach nothing" (pi1, pi5, pi9, pi15, pi25). The understanding of the objectives is thereby of great importance (+3) including both the objectives of the companies as the specific objectives of the project. To understand these objectives, transparency (+3) is indispensable (pi2, pi7,

pi9, pi10, pi15). Especially transparency about the budget is often mentioned, because participants experienced that lack of understanding of the cost distribution often leads to mistrust at the clients' side (pi1, pi9, pi10, pi25). Several contractual related aspects (risk allocation (+1), agreement about financial range (+1), scope of the project (+1), contractual incentives (+1)) are neutral valued by the respondents. People of this perspective believe that a contract is necessary, but that the actual collaboration is needed in the grey-zones (the aspects which are not included in the contract). In that case it is important to live the most essential values (pi2, pi10). The role of the project leader is also neutrally valued. People argue that a competent project leader is important, but that impact of a single person is less significant in large projects. Several aspects related to the structuring of the collaboration process (separate conversations (-2), support of senior management (-3), development of common processes and tools (-3) and regular meetings (-4)) are the least essential according to this perspective. The low-ranking of the common processes and tools is often explained by the contract-type: in a D&C or DBFM equality in tasks is impossible. The support of senior management is low-ranked, but sometimes miss-interpreted by respondents (i.e. external advisors, or the participant should support the senior management) and therefore difficult to understand. Respondents mentioned that meetings are often organised without a goal and therefore meaningless. According to pi2: "a meeting should have added value for the participant, otherwise it is meaningless".

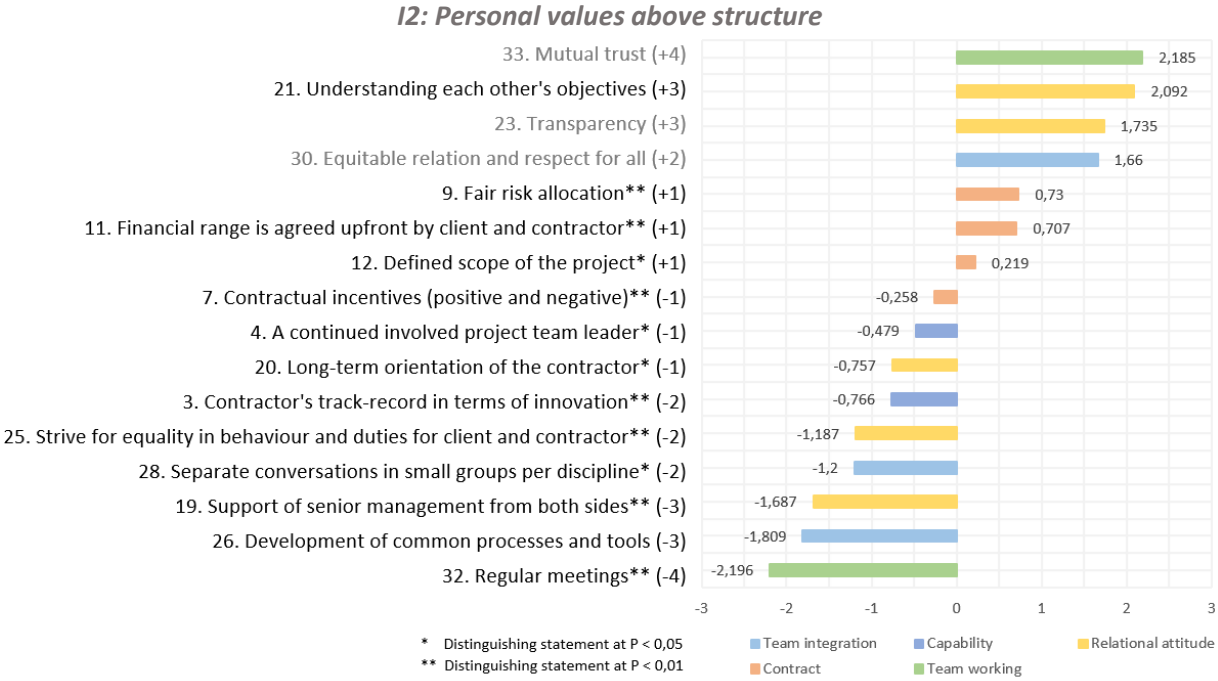

Figure 5-3 Factor scores of the second infrastructure perspective (the consensus statements are grey-coloured)

Infra perspective 3: Strong relationship within the team

This perspective is represented by eight participants. Participants with this perspective score high on factors related to relational attitude and team working, while they value contractual related factors as less essential for collaboration. Just like perspective 1 and 2 mutual trust (+4) is the most essential in this perspective, while mistrust is the "biggest obstacle for collaboration" (pi8). The understanding of the objectives (+3) of each other is also important, because that enables the client and contractor to help each other in reaching these objectives (pi12, pi23, pi24). Good communication (+3) is thereby important: without good communication it is impossible to understand the objectives (pi4, pi12). Bad communication is often the cause of poor project presentations (pi6). In order to create a strong team, it is important to select people on their personalities rather than their competences (pi15, pi21). For a successful project delivery a joint drive of both client and contractor is important: the level of commitment of the participants (+2) should be high (pi4: "participants should have 100% commitment to the project") and granting the other (win-win attitude, +1) is important. A fair risk allocation (0) and

a defined scope (-1) are also important, but subordinate to the importance of a strong relationship within the team. People with this perspective give a low ranking to specified payment arrangements. This low-ranking can be explained by the high number of respondents involved in a DBFM contract, were the contractor gets paid during the construction phase and is therefore not a factor influencing the collaboration during the design phase. Just like perspective 1, the contractor's track record in terms of innovation (-4) is the least essential, because it does not influence the collaboration.

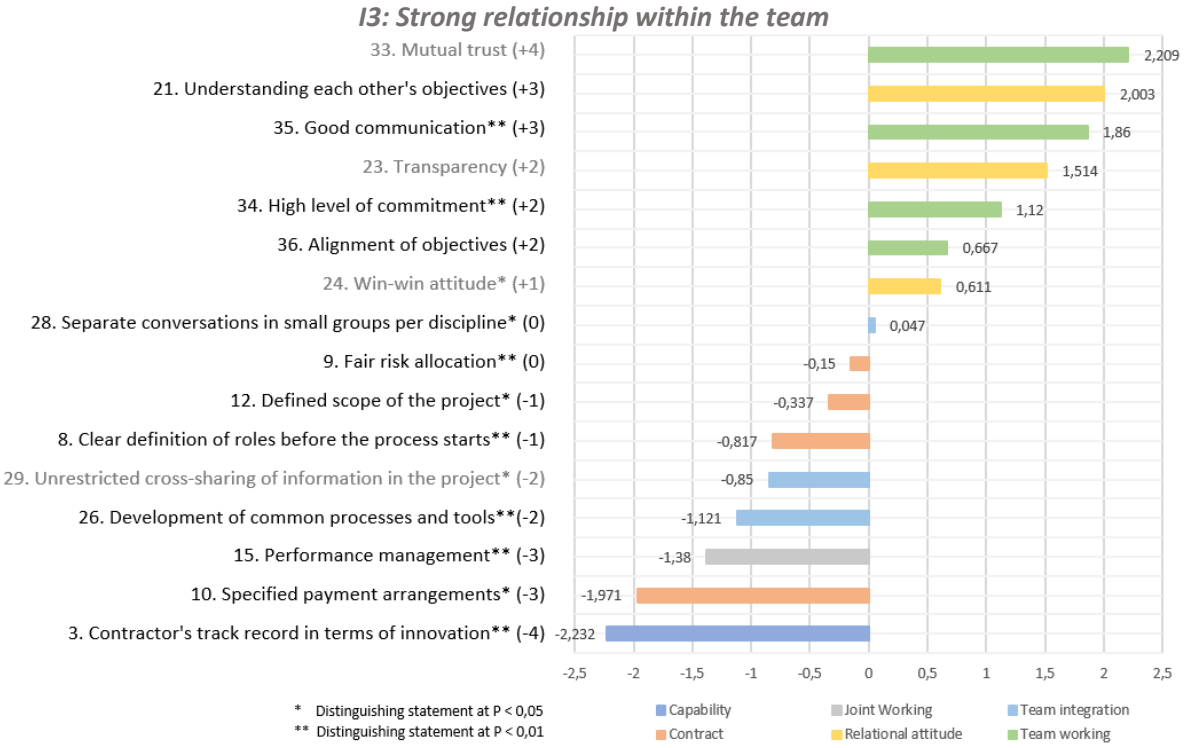

Figure 5-4 Factor scores of the third infrastructure perspective (the consensus statements are grey-coloured)

5.2.3 Similarities and differences

The similarities and differences are indicated based on characterising statements (+4/+3/+2 and -3/-4) of the factor arrays of the perspectives (table C-5). For all perspectives, mutual trust, understanding the objectives, equitable relation and transparency are the most essential elements for collaboration (figure 5-5). Perspective I2 and I3 share the essential values good communication and alignment of objectives. Perspective I1 shares some least essential values with other perspectives: the development of common tools and processes with perspective I2 and experience with innovation and payment arrangements with perspective I3. The uniqueness of the first perspective is defined by the essential values: a fair risk distribution, a defined scope and early involvement of external stakeholders, which show the focus on clarity and communality. Perspective I2 is distinctive at the essential value of joint problem solving and the low rating of senior management's support and regular meetings, which show the low priority for structuring. Finally, perspective I3 adds the high level of commitment as unique essential factor to the perspective and gives a low rating to performance management, which emphasize the preference for a strong relationship within the team.

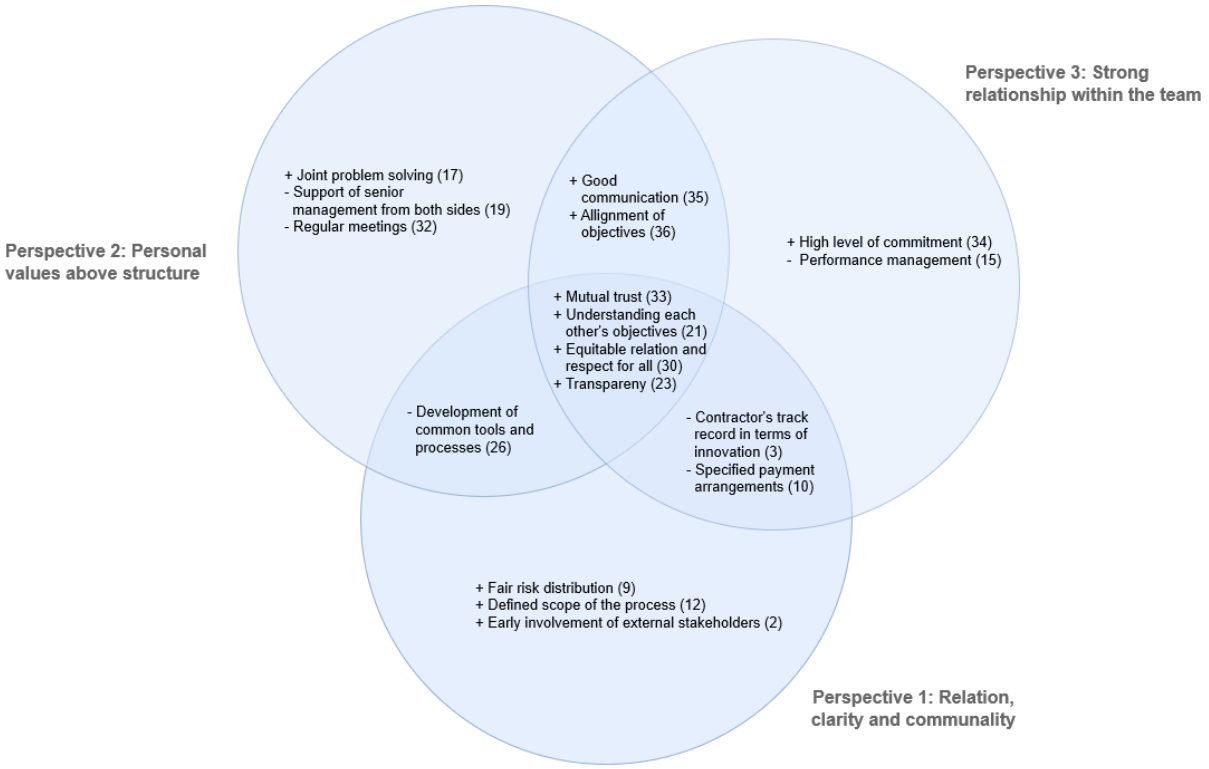

Figure 5-5 Similarities and differences of infrastructure perspectives

5.3 Perspectives of the building sector

The perspectives of the building sector are identified by De Hoog, out of a P-set of 25 participants (table C-6) experienced with client-contractor collaboration in Bouwteams in the building sector. These perspectives are summarised in section 5.3.1, while the similarities and differences are explained in section 5.3.2.

5.3.1 Perspectives of the building sector

Building perspective 1: Relationship first

"The focus lies on the relationship between the client and contractor. Mutual trust plays a major role in collaboration, and this can be established with transparency and good communication. The connection between Bouwteam participants is important and ensures a collaborative and positive attitude. At the same time, open and honest interaction, together with the exchange of information, creates teamwork in which soft skills can be applied. This group of people believes that a long-term vision is subordinate to the other factors because the Bouwteam has to focus on their current tasks" (De Hoog, 2020).

Building perspective 2: Early involvement of right people

"The second building perspective is about involving the right competent people early in the project of which senior management and the project leam leader can be part. The people involved want to understand each other and define common goals to create a win-win attitude. It is desirable to be involved early to influence and steer the project, but at the same time, it is less essential to exchange much information and work together through joint processes. This group of people shows a less collaborative attitude in comparison to perspective one and three and focuses more on the individual organisation and content of the project" (De Hoog, 2020).

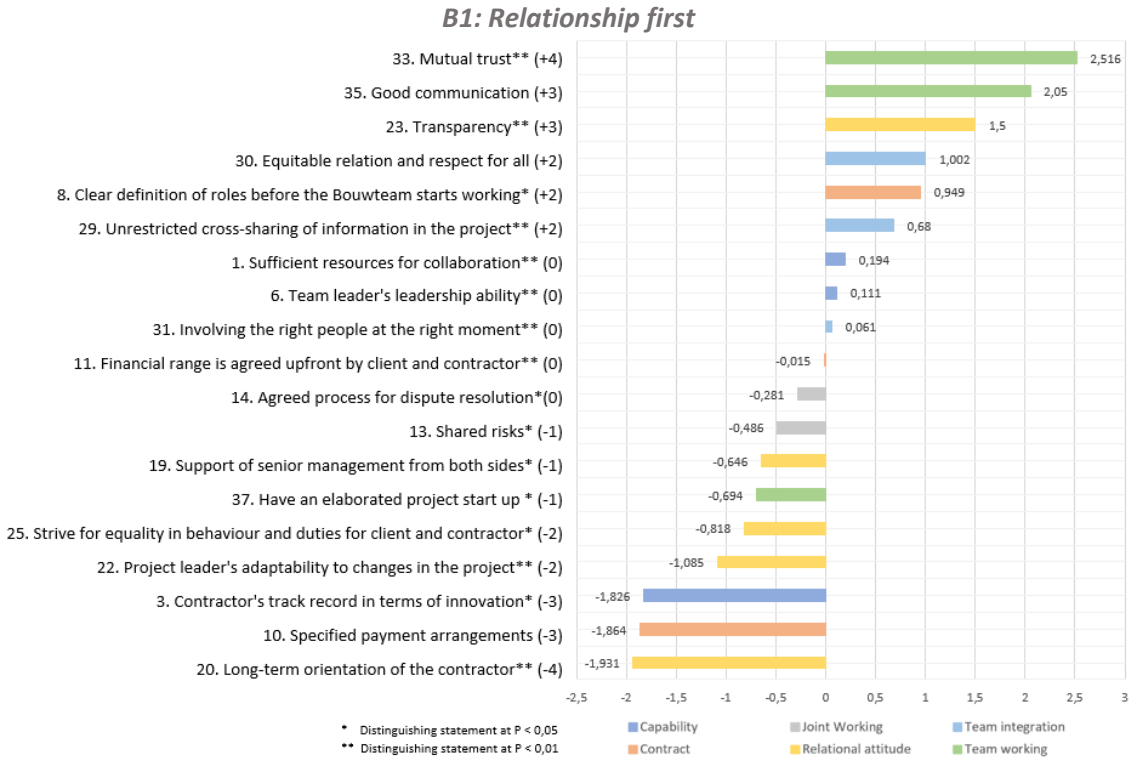

Figure 5-6 Factor scores of the first building perspective (De Hoog, 2020)

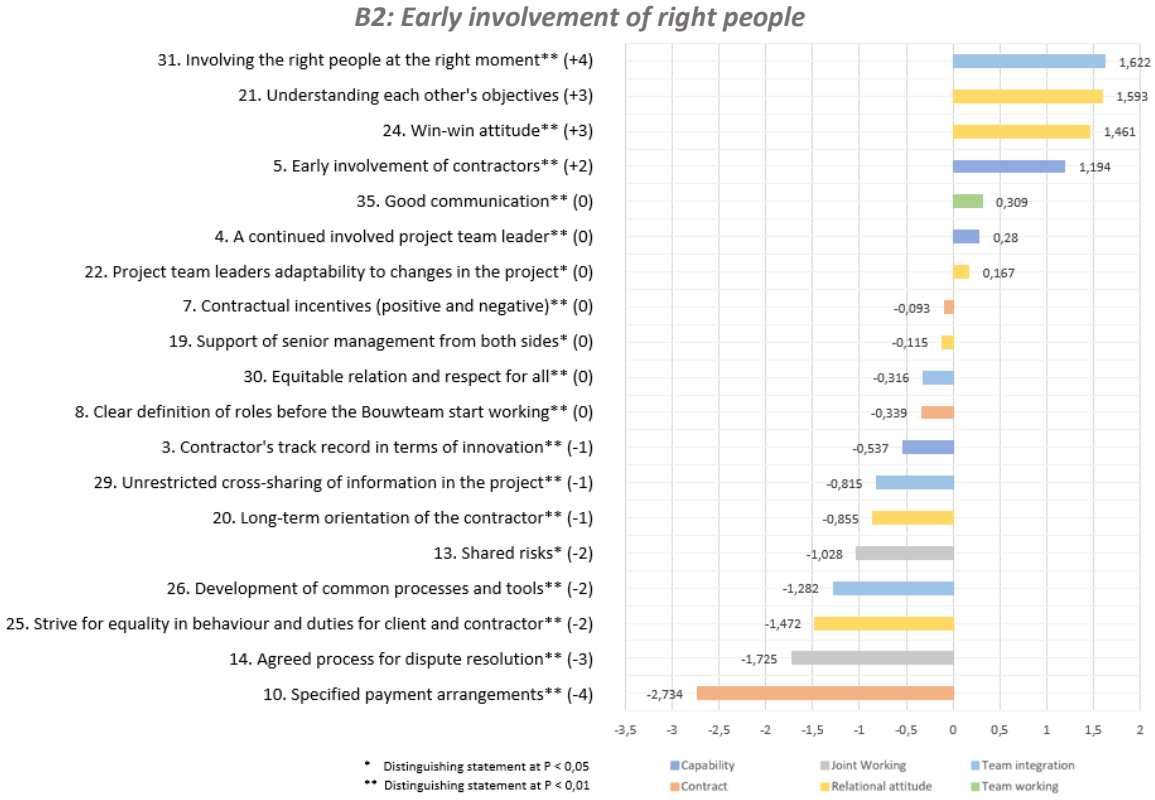

Figure 5-7 Factor scores of the second building perspective (De Hoog, 2020)

Building perspective 3: Structure first

"The essence of this perspective is to identify and determine the variables of the Bouwteam. The scope and roles are ideally defined early to give structure and provide clarity for the Bouwteam. Efficient communication can contribute to this, if only the necessary information is shared. Once the project has been formulated, the focus can shift to the relationship between client and contractor. This group is willing to share occurring risks to deliver the project successfully" (De Hoog, 2020).

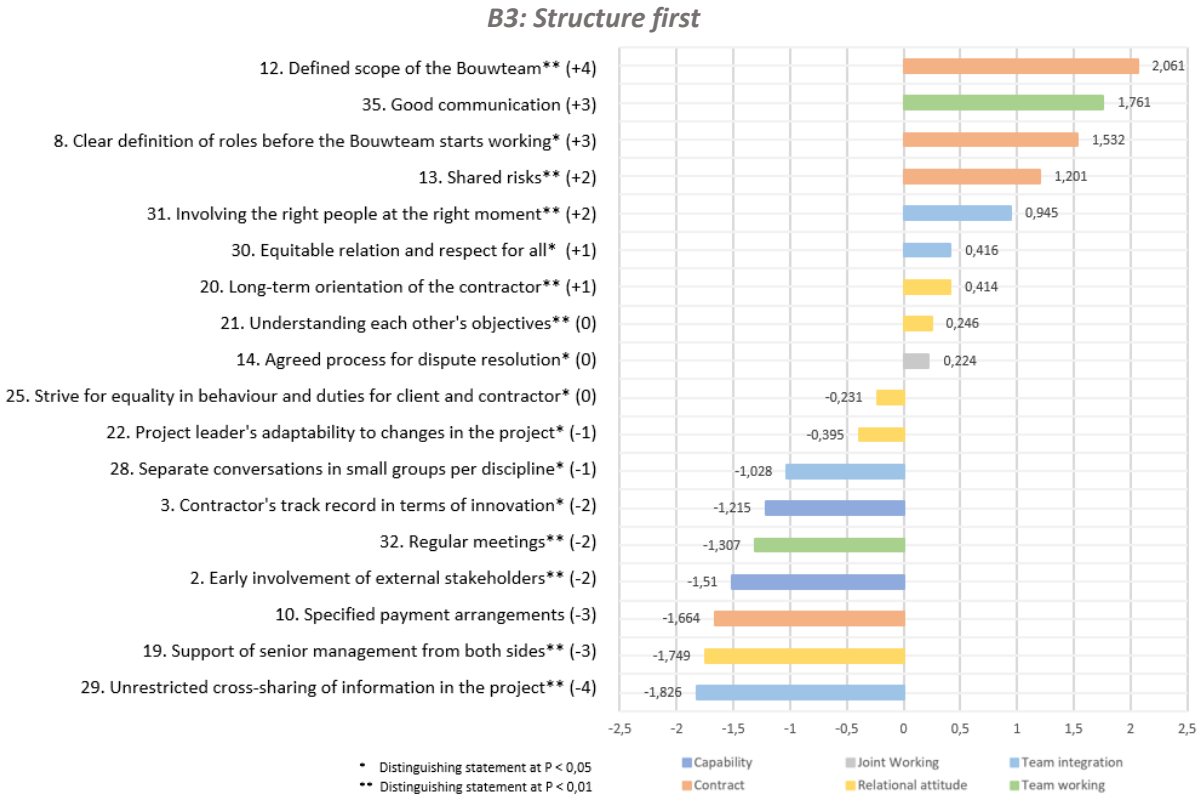

Figure 5-8 Factor scores of the third building perspective (De Hoog, 2020)

5.3.2 Similarities and differences

In this research the infrastructure sector perspectives are compared the differences and similarities are indicated based on characterising statements (+4/+3/+2 and -3/-4) of the factor arrays of the perspectives, De Hoog (2020) did so for the building sector (table C-4). For all building perspectives, mutual trust and a defined scope are essential for collaboration, while payment arrangements are less essential (figure 5-9). Perspective B1 and B2 agree about the importance of understanding each other's objectives, perspective B2 and B3 about the involvement of the right people at the right moment and perspective B1 and B3 about the clear definition of roles and good communication.

The unique aspect of perspective B1 is an open and transparent attitude based on respect while the long-term orientation of the contractor and the experience with innovation are less essential in this perspective. Perspective B2 differentiates from the other perspectives by attaching value to the early involvement of the contract, the win-win attitude and the importance of agreement of the financial range upfront the project. This perspective does not attach value to the agreed process for dispute resolution and equality in behaviour and duties between the client and contractor. Finally, perspective B3 highlights the importance of the leaderships abilities of the team leader and shared risks, while the support of senior management and the unrestricted cross-sharing of information are less essential to this perspective (De Hoog, 2020).

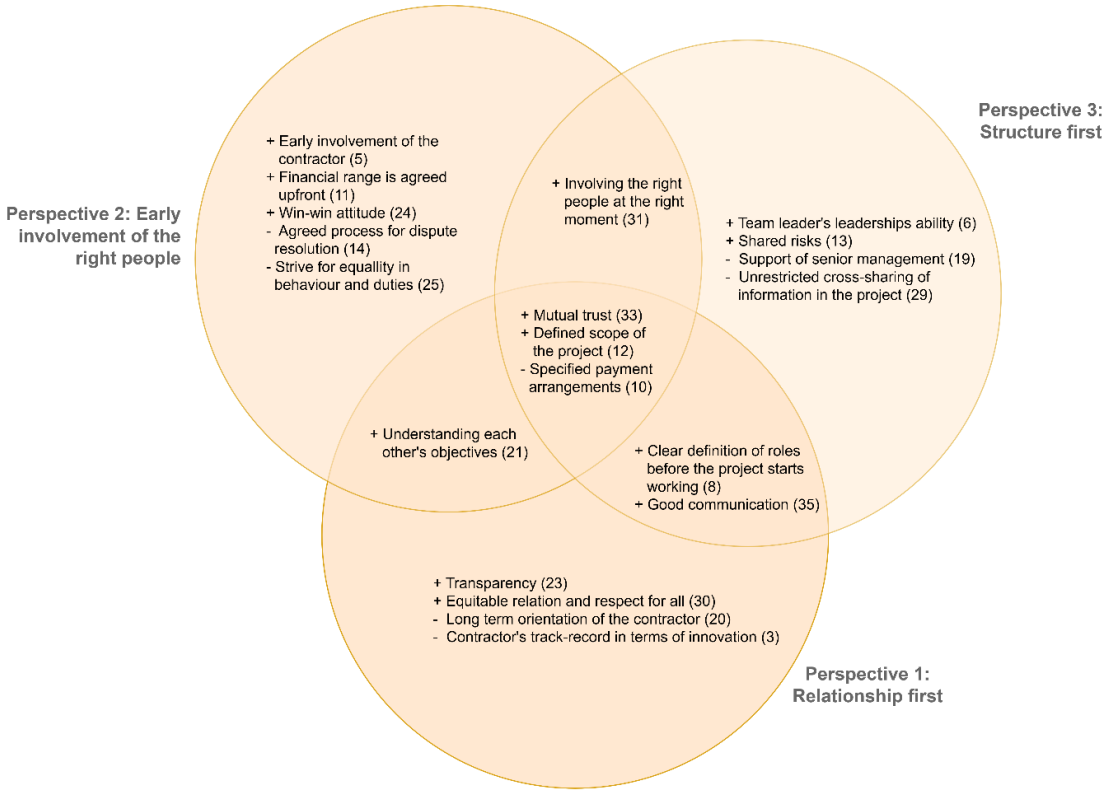

Figure 5-9 Similarities and differences of the building perspectives (De Hoog, 2020)

5.4 Comparison of the perspectives of the building and infrastructure sector

After defining the perspectives of both sectors the degree in which they differ and match will be investigated. Therefore, in section 5.4.1 it will be checked whether it is justified to compare the results, while in section 5.4.2 the results will be compared on perspective level, while in section 5.4.3 the focus will be on the success factor level.

5.4.1 Justification of comparison

Since all of the respondents of the building sector have been involved in a Bouwteam, it is important to verify whether these results can be compared with the results of the infrastructure sector (which are more general about client-contractor collaboration during the design phase). Therefore, after sorting the statements and answering the post-sorting question, the 25 respondents are asked if they would change the prioritisation of the cards in case of a Bouwteam agreement. Fifteen of the respondents would not change the Q-sort, while ten of them indicate that they would make small changes, although the most essential aspects will be the same (figure 5-10). Five respondents argue that they would rank the risks (sf9, sf13) and the financial range (sf11) higher in case of a Bouwteam. These participants are notably represented in perspective 1 (2 participants of the total of 6 participants), which is striking since participants in this group already give a high score to the risks compared to the other perspectives. One person (pi3-I1) mentions the opposite, because the risk allocation will be done after the design phase and is therefore not affecting the collaboration in the design phase. Although two respondents (pi9-I2, pi11-I1) mention the prioritisation of soft aspects, most of the respondents (7 in total) will make the hard aspects (especially contract related) more important. These minor changes are outlined in table C-8.

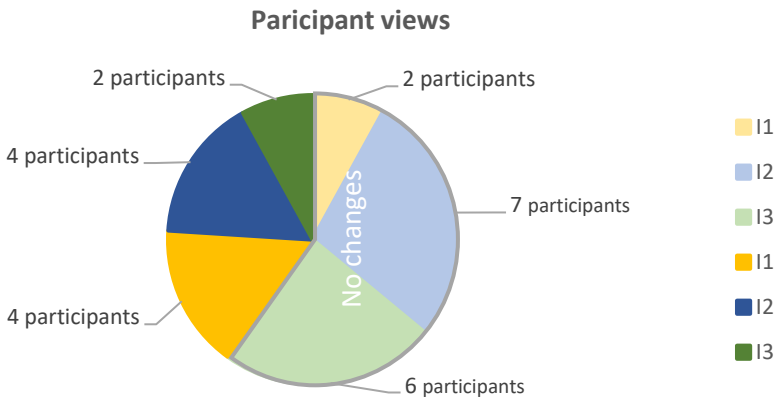

Figure 5-10 Participant views whether they would change the Q-sort in case of Bouwteams (light coloured is no changes)

5.4.2 Comparison on perspective level

To compare the perspectives, two different analyses are done. First, the infrastructure perspectives (section 5.2) are compared with the building sector perspectives (section 5.3), where after the Q-sorts of both sectors are analysed in one set (combined P-set).

Separate P-sets

The three infrastructure perspectives are compared both qualitatively (based on the description of the perspectives and the graphics) and quantitively (based on the factor arrays and Z-scores) with the three building perspectives. These differences are displayed in figure 5-11 by the use of the factor-arrays of the different perspectives. The distinguishing statements are only implicitly used, because these statements are distinguished from other perspectives *in* the sector, rather than distinguished from perspectives *of the other* sector.

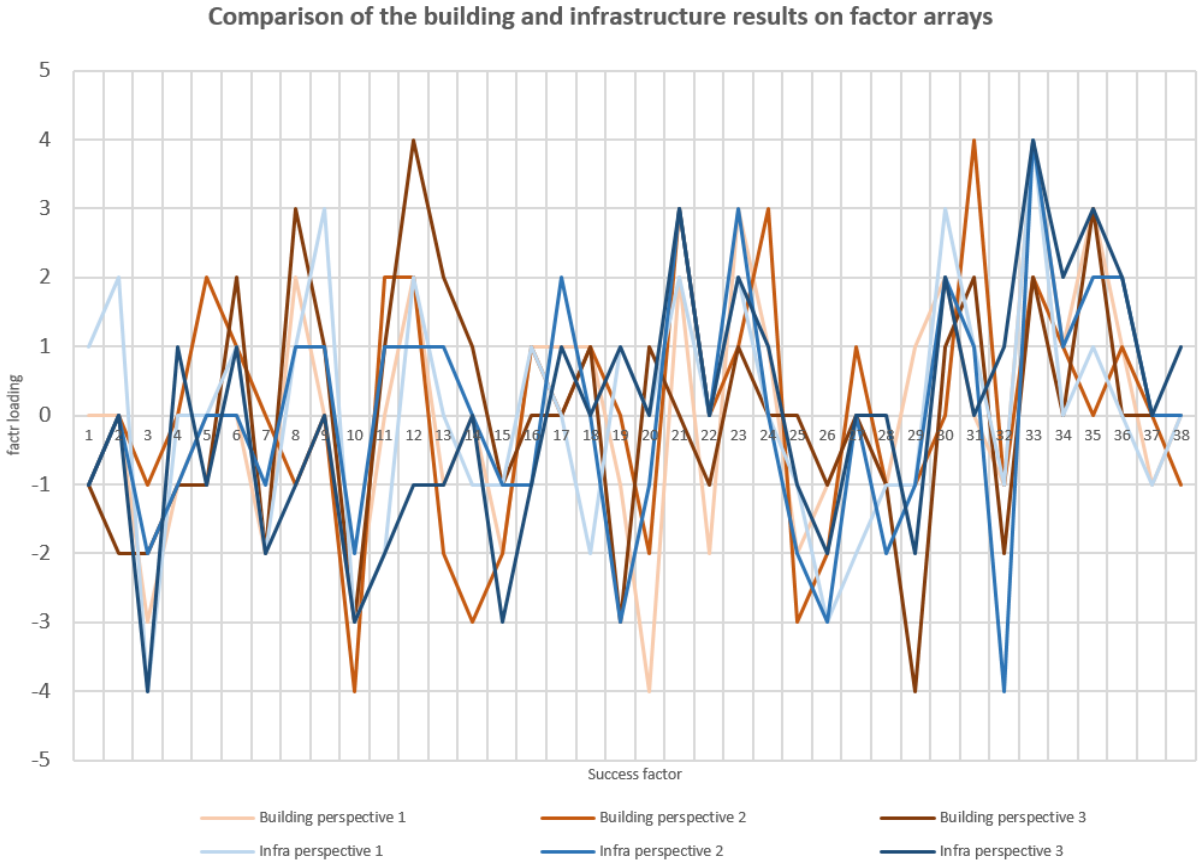

Figure 5-11 Comparison of the building and infrastructure results on factor arrays

Perspective B1 (relationship first) and I3 (strong relation within the team) show large similarities on the characterising statements. However, in the middle of the Q-sort (-2/+2) they show some differences. Although both perspectives focus on relationship, this building perspective wants to reach this by clarity (definition of roles and sharing of information), while this infrastructure perspective wants to reach this by the attitude of participants. Since the third infrastructure perspective is largely represented by participants of the Blankenburg connection (87,5%) this strong emphasize on relationship within the team can possibly be project-specific, rather than a sector-wide perspective.
Perspective B1 also shows some overlap with I2 (personal values above structure) on the positive aspects, but disagree on the negative aspects (according to the graphics). This overlap is not surprising since the whole infrastructure sector emphasize the importance of relation. Quantitative research on the Z-scores and factor arrays shows that these perspectives are largely overlapping (figure C-2, table C-9).
Perspective B3 (structure first) and I1 (relation, clarity and communality) also show some overlap, although the infrastructure prioritises the relation before the clarity of scope and risks, what is the opposite of the building sector. They also disagree about the least essential factors (-1/-4).
Both quantitative and qualitative research show that perspective B2 shows little resemblance to infrastructure perspectives and is therefore considered as a unique aspect of the building sector (table C-9 and C-12).

Combined P-set

Next, the Q-sorts of both the building and infrastructure participants are combined to one set and analysed with PQMethod (Appendix C.4) to understand whether certain perspective is mainly represented by one sector, or that that the perspectives are mixed over de sectors. Four perspectives are identified: Perspective A: Strong relationship through understanding mutual objectives and risks, Perspective B: Early involvement of right people, Perspective C: Scope & Relation and Perspective D: Relation and clarity above structuring the process. Only 36 participants of the 50 participants are included in the combined P-set, since the other 14 show no agreement with one of the perspectives (so called non-loaders) (figure 5-12).

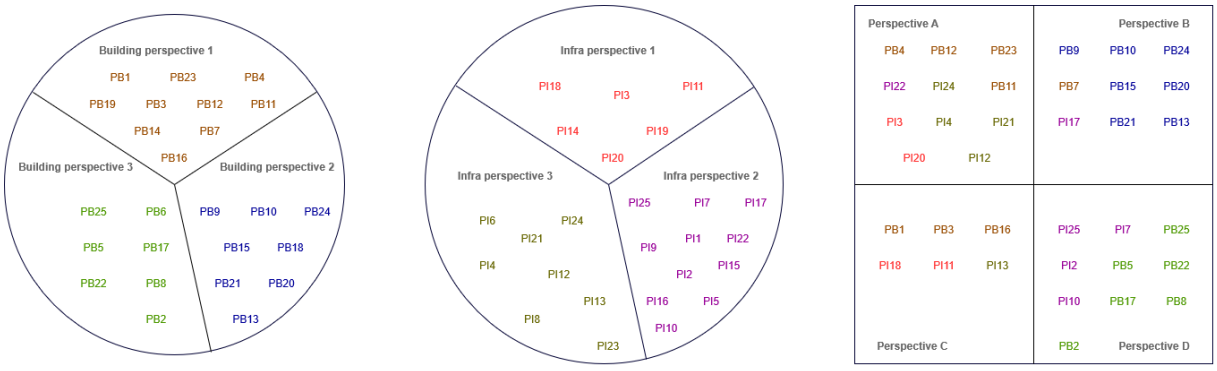

Figure 5-12 Classification of participants under the different perspectives

Analysis shows that in three of the four combined perspectives (expect perspective B) the relational aspects score high. Since perspective B is largely represented by the building sector (89%), it is concluded that within the building sector a certain group attaches less value to relationships. Perspective D shows great overlap on the essential aspects with perspective I1 but due to differences in the least essential aspects, this aspect is not clearly represented in the combined P-set. Therefore, this perspective is considered as a recessive infrastructure factor perspective.

5.4.3 Comparison on success factor-level

A comparison of the main factor arrays and Z-scores of the success factors of both sectors show the differences and similarities at success factor level (Appendix C.5). According to the main factor array, aspects with a difference of two are identified. The most differentiating success factors are: (2) Early

involvement of external stakeholders, (8) Clear definition of roles before the project starts working, (9) Fair risk allocation, (12) Defined scope of the process, (26) Development of common processes and tools, (30) Equitable relation and respect for all and (32) Regular meetings (table 5-6). Most of the factors score relatively high (+2/+3) at one sector and have a mean score (0/1) at the other sector. There are two exceptions: the early involvement of external stakeholders (sf2) scores around average in both sectors, but is valued as more essential by infrastructure participants and the development of common processes and tools (sf26) is low valued by participants of both sectors, but is the least essential for infrastructure participants. Analysis shows that the factors that score higher among building participants (sf8, 12, 26) are largely process related, while the factors which score higher among infrastructure participants, show a more diverse image.
Next, the Z-scores of both sectors are compared with each other. Although this largely results in the same output as the comparison of the factor arrays, one additional statement is identified as being differently valued among both participants: regular meetings (sf32; B:0,09; I:-0,96).

Table 5-6 Most differentiating statements between building and infrastructure participants

No.	Description	Building sector	Infrastructure sector
2.	Early involvement of external stakeholders	*MF = -1*	*MF = 1*
8.	Clear definition of roles before the project starts working	*MF = 2*	*MF = 0*
9.	Fair risk allocation	*MF = 0*	*MF = 2*
12.	Defined scope of the process	*MF = 3*	*MF = 1*
26.	Development of common processes and tools	*MF = -1*	*MF = -3*
30.	Equitable relation and respect for all	*MF = 0*	*MF = 2*
32.	Regular meetings	*Z-score = 0.09*	*Z-score = -0.96*

When determining the similarities, the characterising statements (-4, -3, -2 and +2, +3, +4) are observed. Hereby stands out that the positive values are indicated by the infrastructure sector, while the negative values are indicated by the building sector.

Table 5-7 Most matching characterising statements

No.	Description	Building sector	Infrastructure sector
3.	Contractor's track record in terms of innovation	*MF = -3*	*MF = -4*
10.	Specified payment arrangements	*MF = -4*	*MF = -3*
15.	Performance management	*MF = -3*	*MF = -2*
21.	Understanding each other's objectives	*MF = 2*	*MF = 3*
23.	Transparency	*MF = 2*	*MF = 3*
33.	Mutual trust	*MF = 4*	*MF = 4*
35.	Good communication	*MF = 3*	*MF = 2*

Finally, both sectors are also compared at category-level (figure C-4). Due to the large variation in scores within a certain category it is difficult to draw conclusions regarding differences between the building and infrastructure sector. However, it can be concluded that infrastructure perspective 3 scores much lower on contract-related aspects than the other perspectives (both building and infrastructure related).

5.5 Conclusion

The aim of this chapter was to identify the differences and similarities of perspectives on collaboration between the Dutch building and infrastructure sector, by answering the second and third sub-question.

To check whether the existing Q-set of De Hoog (2020) could be applied to infrastructure projects, the second sub-question is formulated: *Does the list of success factors of collaboration in building projects also apply to collaboration in the design phase of transportation infrastructure projects?* Therefore the Q-set of De Hoog (2020) is investigated on their applicability to client-contractor collaboration during the design phase of infrastructure projects. After a small reformulation, the total Q-set turned out the be suitable to this type of collaboration.

Next, the third sub-question is investigated: *What are the differences in perspectives of contractors on specified success factors of collaboration between building projects and transportation infrastructure projects?* Therefore, a Q-study is done with 25 participants of the infrastructure sector, resulting in the following perspectives: I1-Relation, clarity and communality, I2-Personal values above structure, I3-Strong relationship within the team. These perspectives are compared with the perspectives of the building sector: B1-Relationship first, B2-Early involvement of the right people and B3-Structure first (defined by De Hoog (2020)).
Although the building and infrastructure sector largely agree about successful collaboration (there are no opposite perspectives), there are some differences between these sectors:

- The infrastructure perspectives show larger Z-scores than the building sector, indicating that there is more consensus within a certain perspective in the infrastructure than the building sector.
- The infrastructure sector is more unambiguous than the building sector, because they show more similarities between the perspectives (high number of characterising consensus statements). The building sector however has more diverse perspectives and show less agreement about what is needed for good collaboration (high number of characterising distinguishing statements).
- The second building perspective (Early involvement of the right people) is a typical building perspective since it does not show overlap with an infrastructure perspective.
- Although perspective B1 (Relationship first) and I3 (Strong relationship within the team) show great overlap on emphasizing relationships, the focus is different: while the building sector wants to reach this by clarity, the infrastructure wants to reach this by the attitude of participants.
- Perspective B3 (Structure first) and I2 (Personal values above structure) are different, but in both sets, participants are included who attach value to relation and clarity, but less value to the design of the process.
- Perspective I1 (Relation, clarity and communality) shows little overlap with building participants and is therefore identified as an infrastructure perspective.

Comparison of factor arrays and Z-scores shows the differences and similarities at success factor level. The most differentiating statements are: (2) Early involvement of external stakeholders, (8) Clear definition of roles before the project starts working, (9) Fair risk allocation, (12) Defined scope of the process, (26) Development of common processes and tools, (30) Equitable relation and respect for all and (32) Regular meetings. The similarities are identified based on the matching characterising statements: (3) Contractor's track record in terms of innovation, (10) Specified payment arrangements, (15) Performance management, (21) Understanding each other's objectives, (23) Transparency, (33) Mutual trust and (35) Good communication.

To conclude, the building sector and infrastructure show some similarities and differences in their view on collaboration. Although the perspectives show some differences, the main differences between both sectors are caused by the scores on success factor level. Therefore in the rest of this study the focus will be on success factor level rather than on perspective level.

6. Exploring the differences on success factor level

This chapter aims to identify how the differences on collaboration relate to the obtained differences and similarities between building and infrastructure projects on success factor level. Therefore, in section 6.1 the process used for this investigation is explained. Next, section 6.2 focusses on the differences in collaboration between the infrastructure sector and the building sector and tries to explain these. Finally section 6.3 concludes by answering the fourth sub-question: *How do the differences in perspectives on collaboration relate to the differences between building and transportation infrastructure projects?*

6.1 Research approach

This section presents the process applied to explore the differences and similarities. Therefore, in section 6.1.1 the approach is outlined, while in section 6.1.2 the characteristics of the experts are discussed.

6.1.1 Research approach

Both the Q-interviews and the output of the literature study on characteristics of building and infrastructure projects are used to investigate whether there is a relationship between the nature of projects and collaboration. The question thereby was whether there is an indication that the differences and similarities on success factor level are caused by a difference in nature of the sectors, or whether there is an indication that they are caused by other factors, like contract types, project types, project size etc. The assumption of a relation between the nature of sectors and the way humans collaborate, is not new. A similar idea is presented by A. Jensen et al. (2016) when they state that there is a large relation between the nature of projects and the human behaviour by identifying four aspects: "what we do (activity), where we do it (space), when we do it (time) and with whom we do (relations)" (A. Jensen et al., 2016).

Next, experts are consulted to verify whether they recognise the differences in perspectives on collaboration and whether they agree with the explanation of these differences. The expert consultation consists of two parts: an online survey and a one-to-one interview. In the online part general questions are asked about the experience of the participants to identify whether they are equally experienced in both sectors. Next, the obtained differences in scores on success factors of collaboration as well as the possible explanations of these differences are presented in the form of statements (agree/disagree). In the second part, the semi-structured one-to-one interviews, the respondents were asked to explain why they agree or disagree with a certain statement. In case of disagreement, the experts were asked for other explanations. The total procedure of the expert consultation is outlined in detail in Appendix E.1.

6.1.2 Characteristics of the experts

For the expert meetings, people who are experienced with client-contractor collaboration during the design phase of both infrastructure and building projects were selected. Experience with Bouwteams was a benefit, but not preferred. Due to the absence of people experienced in both sectors within Ballast Nedam, people from other companies were asked. Since the research was focused on the contractor's perspective, only people experienced with this perspective were invited. During the search for participants it became clear that people experienced in both sectors were difficult to find. In the end, six participants were selected, but because two of them withdrew, eventually four experts were consulted for this step (table 6-1).

Table 6-1 Characteristics of the experts consulted for this research

	Expert 1	Expert 2	Expert 3	Expert 4
Organisation type	contractor	consultancy	consultancy	consultancy
Experience [collaboration perspectives]	contractor	client and contractor	client and contractor	client and contractor
Experience [building /infrastructure projects]	building	infrastructure	building and infrastructure	building and infrastructure
Experience building sector [years]	1999-2020	2008-2013	1992 - 2020	2007 - 2020
Experience building sector [number of projects]	15	3	30	10
Experience building sector [contract type]	Alliance, DBFM, UAV and UAV GC	DBFM, D&C	Bouwteam, DBM, UAV	Bouwteam, D&C
Experience building sector [budget]	2.5M-250M	1M-80M	130K-100M	1M-15M
Experience building sector [client type]	Public, private	Public, private	Public, Private, foreign parties	Public, private
Experience infra sector [years]	2019-2020	1995-2020	1997 - 2020	1981 - 2020
Experience infra sector [number of projects]	0	20	40	100
Experience infra sector [contract type]	Alliance, DBFM, Two-fase contracts	Alliance, Bouwteam, DBFM, DBM, D&C	Bouwteam, DBFM, D&C, UAV	Alliance, Bouwteam, DBM, D&C
Experience infra sector [budget]	30M-250M	1M-1200M	1.5M-2.1B	100K-35M
Experience infra sector [client type]	Private	Public, private	Public	Public, private

Although the experts are selected based on their experience with client-contractor collaboration from a contractor's perspective in both building and infrastructure projects, the characteristics of these experts (table 6-1) show that they are not equally experienced. Expert 3 and 4 do perfectly fit the criteria since they are experienced in Bouwteams of both building and infrastructure projects from a contractor's perspective. Expert 1 and 2 show a less perfect fit: they are mainly involved in one sector and little experienced with Bouwteam collaboration. Expert 1 is not experienced with involvement during the design phase of infrastructure projects, but currently she is researching how her company could improve the successfulness of infrastructure projects. Expert 2 is mainly experienced in infrastructure projects from the client-perspective, but for a few years he was also involved in building projects and has some experiences from the contractor's perspective. Moreover, expert 1 and 2 are (partly) inexperienced with Bouwteams. Expert 1 is experienced with Alliances and Two-phase contracts, which could in many aspects be compared to Bouwteams (Chao, 2018; Van Riggelen, 2019). Although expert 2 is experienced with infrastructure Bouwteams, in building projects he is only experienced with integrated contracts (in which the degree of collaboration is relatively low compared to Bouwteams (Lenferink et al., 2013)). Thus, when researching the answers, for expert 1 and 2 it should be considered that they are mainly experienced in one sector and for expert 2 that he is inexperienced with Bouwteams in the building sector.

6.2 Exploring the differences on success factor level

The differences between the building and infrastructure sector are already identified in chapter 5.4.3. Firstly the factors which score higher among building participants will be discussed, next the factors which score higher among infrastructure participants.

Table 6-2 Most differentiating statements between building and infrastructure participants (Van de Hoef, 2020)

No.	Description	Building sector	Infrastructure sector
2.	Early involvement of external stakeholders	*MF = -1*	*MF = 1*
8.	Clear definition of roles before the project starts working	*MF = 2*	*MF = 0*
9.	Fair risk allocation	*MF = 0*	*MF = 2*
12.	Defined scope of the process	*MF = 3*	*MF = 1*
26.	Development of common processes and tools	*MF = -1*	*MF = -3*
30.	Equitable relation and respect for all	*MF = 0*	*MF = 2*
32.	Regular meetings	*Z-score = 0.09*	*Z-score = -0.96*

6.2.1 Factors that score higher among building participants

Success factor 8: The clear definition of roles before the project starts working

The high score (B:2, I:0) of this factor is at least partly related to the fact that the building participants answered the questions specifically for Bouwteams: according to the participants, the responsibilities and tasks of each of the involved parties should be clear before the Bouwteam agreement could be signed (de Hoog, 2020, pb1, pb2, pb25). Although this clear definition at the start of the process is recognised by some of the infrastructure participants (pi16, pi18), most of them consider these factors of lesser importance. This could be related to the expertise of the clients: infrastructure projects are mainly initiated by primary experienced clients (public clients), while building projects are more privately owned and therefore also initiated by secondary experienced (e.g. multinational companies) and secondary inexperienced (e.g. hospital directors) clients (Masterman & Gameson, 1994; Van Alphen, 2018; Visser & Nicolas, 2020). In case of less experienced clients, the clear definition of roles will be more important to avoid ambiguity about who is responsible. In addition, the expertise and experience of the client will determine the role of the contractor. Therefore, especially the relational aspect could be an explanation for this difference.

Three of the experts recognised the clear definition of roles before the project starts working as a factor that is more important in the building sector than in the infrastructure sector. They relate this higher score to the number of parties involved in the project: "(…) a higher number of disciplines is involved in a smaller location" (E1), "in a building project more parties are involved compared to an infrastructure project" (E2) and "the building sector is more complex, with more parties involved" (E3). Three of them agree with the explanation that the higher diversity in client types and experience could be a cause of this difference. They mention that a clear definition of roles will be more important in case of inexperienced clients (E3, E4). Expert 1 believes that the higher number of involved parties is a more plausible explanation. Given these results, the different valuation between both sectors of the clear definition of roles before the project starts working is considered as a difference caused by the nature of the projects.

Table 6-3 Opinions of the experts to aspects with a higher score in the building sector (1=agree, 0= disagree)

No.	Statement	E1	E2	E3	E4
8.	Clear definition of roles before the project starts working is more import in the building sector than the infrastructure sector.	1	1	1	0
	This can be explained by the fact that more different types of clients with different levels of experience are involved in the building sector than in the infrastructure sector.	0	1	1	1
12.	The defined scope of the process is more import in the building sector than the infrastructure sector.	0	1	0	1
	This can be explained by the fact that more different types of clients with different levels of experience are involved in the building sector than in the infrastructure sector.	0	1	0	1
26.	The development of common processes and tools is more import in the building sector than the infrastructure sector.	0	1	1	0
	This is related to the higher number of clients of the building sector compared to the infrastructure sector.	0	0	0	0
32.	Regular meetings are more import in the building sector than the infrastructure sector.	0	1	0	1
	This can be explained by the difference in project size.	0	1	0	1

Success factor 12: A defined scope of the process

The same applies to the definition of the scope (B:3, I:1), linked to the development of common processes and tools. Building participants mention this as important factors to prevent the Bouwteam from deviating from the main tasks: once the scope is clear, common processes and tools will steer the Bouwteam in the right direction (de Hoog, 2020, pb1, pb3, pb6, pb20, pb22, pb25). Although this vision is shared by participant I12 and I24, most of the infrastructure participants prioritise soft aspects above process related aspects.

This could also be related to the expertise of the clients: infrastructure projects are largely initiated by primary experienced clients (public clients), while building projects are more privately owned and therefore also initiated by secondary experienced and secondary inexperienced clients (Masterman & Gameson, 1994; Van Alphen, 2018; Visser & Nicolas, 2020). In case of less experienced clients, it will be more important to define the scope of the process. This could also result in a larger role for the contractor in setting-up the process. Other aspects that might influence a higher score at the discussed

success factors are the contract type, the project size and the number of people involved. Therefore, both the relational aspect as the activity itself could be an explanation of this difference.
Two of the experts recognise that this aspect is more important in the building industry. Just like the previous success factor, they relate this to the diversity in client types and experience level (E2, E4). However, expert 2 mentions the number of involved parties as a more plausible explanation: "the question 'What should be done to realise the project?' is more important in case more parties are involved". Expert 4 gives as additional explanation the different interest of building clients and infrastructure clients: infra clients are often administrators, while building clients could also be the owner. Since the interests of the building clients are more diverse, it will be more important to define the scope (E4). Both expert 1 and 3 did not recognise this aspect as being more important in the building sector. For them, this factor is equally important in both sectors. Expert 1 believes that the infrastructure sector does not yet realize that it is equally important and expert 3 does not have an explanation why these factor scores higher among building participants. Due to the lack of agreement between the experts and the lack of a clear explanation of the cause of these difference, this success factor of collaboration is not seen as a difference in collaboration caused by the nature of sectors.

Success factor 26: The development of common processes and tools

The final process-related factor scoring higher among building participants is the development of common processes and tools and is often mentioned in relation to Bouwteams, the clear definition of roles and the defined scope. Among building participants this factor is seen as a way to steer the Bouwteam in the right direction (de Hoog, 2020, pb1, pb3, pb6, pb20, pb22, pb25). However, the low score (B:-1) shows that building participants do not consider this factor as essential. Infrastructure participants however, give an even lower rating (I:-3). They emphasize the importance of building a relationship (pi1, pi2, pi3, pi10, pi17, pi18, pi19, pi20, pi21, pi25) and clear defined scope and goals (pi10, pi11, pi14, pi16, pi17, pi18, pi25) above the design of the process.
This could also be related to the number of clients of both sectors. Since the number of clients of the infrastructure sector is relatively low (Visser & Nicolas, 2020), within the infrastructure sector the client and contractor are more familiar with each other's processes, while in case of building projects the number of clients is higher, with the consequence that client and contractor are less familiar with each other's processes. Therefore, especially the relational aspect could be an explanation for this difference.
The development of common processes and tools is also recognised as a more important factor in the building sector by two of the experts (E2 and E3 agree, E1 and E4 disagree). All the experts disagree with the explanation that this could be client related. According to expert 1 the infrastructure sector does not realize yet the importance of the common processes and tools, while expert 4 has no explanation why this factor scores higher. Both expert 2 and 3 believes that the differences in P-set (Bouwteam participants vs. DBFM/D&C participants) could be an explanation of the difference in score. Expert 3 also has an additional explanation: "the number of disciplines and functionalities is higher in case of building projects (…) making it quite a puzzle to tune all the different parts together."
Since half of the experts mention that this factor could also be participant related rather than sector related and there is a lack of agreement on the explanation of the difference, there is insufficient indication that this difference is caused by the nature of both sectors.

Success factor 32: Regular meetings

The Z-scores show a large difference between both sectors at the factor *regular meetings* (B:0,09; I:-0,96). Unfortunately, during the Q-interviews the choice for these ranking is only justified by both sectors in case of a score of -4. As a result, it is hard to explain this difference. Moreover, some infrastructure participants mention that it is not about the regularity of the meetings, but more about the efficiency: every meeting should have a clear goal, otherwise it is meaningless (pi2, pi7, pi20, pi22, pi25).

This difference may be related to the project size: the higher the number of involved people, the higher the number of meetings organised, the more difficult to be efficient. Therefore, the activity itself ('what we do') is addressed as an explanation of these difference in score.
The higher importance of regular meetings is recognised by two of the experts. Expert 2 agrees that it will me more difficult to meet efficient in case of large infrastructure projects, due to the number of participants. Expert 4 argues that meetings are more important in the building sector due to the higher level of details of building projects. Although expert 3 does not agree with the statement, he recognises the necessity of meetings on project details. Expert 1 mentions that meetings are equally important in both sectors, but that meetings in the infrastructure sector could be improved in terms of understanding each other and solution options. Therefore, there is no clear indication that the different valuation of the factor 'regular meetings' is caused by the nature of the sectors.

6.2.2 Factors which score higher among infrastructure participants

Success factor 2: The early involvement of external stakeholders

The early involvement of external stakeholders is in both sectors valued as a mean contributor to successful collaboration (B:-1, I:1), although it is considered as more essential in the infrastructure sector. According to the infrastructure participants, the early involvement of the external stakeholders is essential to prevent delays and scope changes later in the process (pi5, pi11, pi23). Unfortunately, an explanation of building participants for their lower rating is missing.
The role of internal and external stakeholders in the management of building and infrastructure projects is mentioned by several authors (Olander & Landin, 2008; Teoh & others, 2010; Yang & Shen, 2015). They appoint a relationship between the project size (geographic area) (Boarnet, 1995; El-Sayegh & Mansour, 2015; Reilly & Arrigoni, 2005), the contract type (Guo et al., 2014), the clearness of the end-user (Teoh & others, 2010), the client-type (public or private) (Van Alphen, 2018; Visser & Nicolas, 2020), the number of stakeholders involved (Rajablu et al., 2015) and the importance of managing this group. In general, infrastructure projects are spread over a wider geographic area (Boarnet, 1995; El-Sayegh & Mansour, 2015; Reilly & Arrigoni, 2005) than building projects, resulting in a higher number of involved stakeholders. This higher number of involved stakeholders in infrastructure projects will make stakeholder management more challenging, resulting in a higher score of the early involvement of external stakeholders. Moreover, the end-user is less clear in infrastructure projects than in building projects (Teoh & others, 2010), which makes it even more challenging to involve them. These sector related aspects will be increased by the P-set of the infrastructure respondents: they are generally involved in large DFBM-projects, initiated by a public party, with a large geographic area, a large budget, many different types of stakeholders and a huge number of end-users, making this effect extra visible. Therefore, this difference seems to be influenced by the activity, the location were the activity takes place and relation.
Three experts (E1, E2, E4) agree that the early involvement of external stakeholders is more important in the infrastructure sector. Expert 3 does not have a clear opinion on this aspect, but mentions: "(…) in building projects the number of stakeholders is lower, which makes it clearer.". The higher number of involved stakeholders is also mentioned by the other experts, because of the larger geographic area of infrastructure projects compared to building projects (E1, E2, E4). Experts 1 and 3 also mention the higher power of infrastructure stakeholders: " … in most cases they have the power of license." (E3). The lack of a clear end-user was also recognised by most of the experts (E2, E3, E4), but not as a good explanation for the higher score of this success factor. Expert 1 mentions the difficulty of defining the end-users in building projects: "In case of a large building with several departments, the diversity in cultures is high, which makes it very difficult to get a clear understanding of the end-user." Therefore according to the experts, the lack of a clear end-user is not a good explanation of the higher score of this success factor.
Since the difference in the number of external stakeholders is clearly explained in literature and most of the experts agree with the explanation, the different scores between both sectors on the early involvement of external stakeholders is considered to be originating from the nature of both sectors.

Table 6-4 Opinions of the experts to aspects with a higher score in the infrastructure sector (1=agree, 0= disagree)

No.	Statement	E1	E2	E3	E4
2.	The early involvement of external stakeholders is more important in the infrastructure sector compared to the building sector.	1	0	1	1
	This can be explained by the fact that infrastructure projects take up a larger geographic area, resulting in more involved stakeholders and a work location that is more intertwined with the environment.	1	1	1	1
	Another explanation is that infrastructure projects have a less clear end user than building projects.	0	1	1	1
9.	A fair risk allocation is more important in the infrastructure sector compared to the building sector.	0	1	0	1
	This can be explained by the fact that infrastructure projects are more horizontally oriented.	1	1	0	0
	Another explanation could be that infrastructure projects take up a larger geographic area than building projects.	1	0	0	1
30.	An equitable relation and respect for all is more important in the infrastructure sector compared to the building sector.	0	1	0	1
	This factor is more important in the infrastructure sector, because this sector has a smaller client base compared to the building sector.	1	1	0	0
	Another explanation is that infrastructure projects have a longer duration time compared to building projects.	0	1	0	1

Success factor 9: A fair risk allocation

The fair risk allocation (B:0, I:2) is also higher ranked by infrastructure participants compared to building participants. For infrastructure participants the fair risk allocation is one of the most essential aspects of successful collaboration. Some of them even claim that without a fair risk allocation it is impossible to collaborate since private parties are not able to bear all the risks of large infrastructure projects (pi3, pi14, pi19, pi21, pi22, pi24). This risk sensitivity of infrastructure projects is endorsed by several authors (Goh & Abdul-Rahman, 2013; Liew et al., 2019; Marques & Berg, 2011; Reilly & Arrigoni, 2005; Smith et al., 2014). Since infrastructure projects are horizontally oriented, they are more sensitive to risks related to the surface conditions (which are the largest technical risks in construction projects) (El-Sayegh & Mansour, 2015; Zayed et al., 2008). Moreover, due to the wider geographic area of infrastructure projects, the external complexity will also be much higher, which is the greatest source of complexity of for today's projects (Vidal et al., 2011). Therefore, the horizontal orientation and the wider geographic area (which are both space-related factors) are, based on the literature, addressed as potential explanation for the higher score of the infrastructure sector at the fair risk allocation. However, this high score could also be related to the projects in which the infrastructure participants are involved (large DBFM-projects for public clients). Research show that Rijkswaterstaat has placed a disproportionate amount of risks to the market in the past years, which is mainly caused by large DBFM contracts (McKinsey & Company, 2019). Therefore, the difference could also be caused by a combination of the activity and relation aspects.

Two of the experts (E2, E4) agree about the higher importance of a fair risk allocation in infrastructure projects. The importance of this success factor was not recognised by expert 1, since she believes that the importance of risk allocation depends on the contract type and people-involved rather than the sector. However, she recognises the size of the geographic area as a factor that could influence the perspective. Expert 2 recognises the importance of a fair risk allocation in the infrastructure sector and mentions the movement in which all the risks were shared to the market. Although expert 3 does not agree that a fair risk allocation is more important in the building sector, he recognises the impact of the Bouwfraude on the infrastructure sector and the suspicious attitude of Rijkswaterstaat: "The mistrust makes contractors very aware of the risks they take." (E3). Expert 4 agrees with expert 3 on the explanation, but he also argues that a fair risk allocation is very important in the building sector, since the impact of a fault in the design phase of a building project will be larger than in case of an infrastructure project.

It seems that the importance of a fair risk allocation is more caused by the relation between the client-contractor (especially public clients) rather than characteristics related to space or activity.

Therefore, there is no clear indication that the difference in valuation of this success factor is caused by a difference in nature of both projects.

Success factor 30: An equitable relation and respect for all

The final success factor that is classed as more essential by participants of the infrastructure sector is the *equitable relation and respect for all*. Several infrastructure participants claim this as the core value

(pi2, pi10) or the fundament of collaboration (pi1, pi19, pi20, pi21). Although an explanation of the building participants why they give this factor a lower value is missing, the observation fits the conclusion of chapter 5 that building participants focus more on process-related factors, while infrastructure emphasize the mutual relationship. This could be caused by the fact that the building sector has a number of different clients, while the infrastructure sector has one main client, the Dutch government (Rijkswaterstaat) and some other smaller clients (provinces, municipalities and private parties)(Visser & Nicolas, 2020). Therefore, for the infrastructure sector it is more important to build a relationship with his client than for the building sector. Next, especially large infrastructure projects take a long period of time, which will influence the importance of a good relationship. Therefore, both this aspects seems to be influenced by both the duration and location of the project.
Two of the experts (E2, E4) agree that an equitable relation and respect is more important in the infrastructure sector. Expert 2 agrees with the suggestion that this it influenced by the project duration and the dependence of infrastructure contractors on the client. Expert 4 argues that it should be equally important in both sectors, but gives the bad relationship between Rijkswaterstaat and contractors as a possible explanation why this factor is valued as more essential in the infrastructure sector. Expert 3 does not agree with the statement, but endorses the explanation of expert 4: "The factor trust is there (in the building sector) an essential part of collaboration, (…) while the relationship with Rijkswaterstaat is not based on trust." Expert 1 agrees that the relationship in public-private relationships is unequitable, but mentions that this is even important in public-private relationship in the building sector.
According to the experts, the higher valuation of an equitable relation and respect for all within the infrastructure sector, will be more related to public-private collaboration than to the nature of the sector. Since the results of the building sector are obtained from participants who are mainly involved in private-private collaboration, the different valuation of an equitable relation and respect for all within the infrastructure sector is not addressed as difference in collaboration caused by the nature of both sectors.

6.3 Conclusion

The goal of this chapter was to answer the fourth sub-question: *How do the differences in perspectives on collaboration relate to the differences between building and transportation infrastructure projects?* With the help of a literature review, Q-interviews and expert consultations, the following differences could be related to the nature of building and infrastructure sectors: the clear definition of roles and the early involvement of external stakeholders.
The higher importance of the clear definition of roles in the building sector is explained by the higher number of involved parties as well as the diversity of client types and experience level in the building sector. In case of more involved parties, it will be more essential to clearly define the roles of the participants. Moreover, in case of inexperienced clients, the contractor should monitor whether the roles are clearly defined, while in case of experienced clients this happens more naturally.
The higher importance of the early involvement of external stakeholders in the infrastructure sector is mainly explained by the larger geographic area of these projects, resulting in a higher number of involved stakeholders and a project location which is more intertwined with the surrounding area. Experts also mention that involved infrastructure stakeholders have more power compared to building stakeholders. Since these higher number and greater power of stakeholders could slow down the progress of projects, the early involvement is very important for successful collaboration. Therefore especially the activity and relation seems to influence the collaboration.

A clear defined scope of the process, the development of common tools and processes and regular meetings are valued as more essential among building participants, but could not be related to a difference in nature of the sectors. For the clear defined scope of the process and the regular meetings the experts are not unambiguous, both about their own explanations and the explanations found by

the researcher. For the development of common tools and processes a connection is supposed between the p-sets of both sectors: building participants (involved in Bouwteams) value this factor higher than infrastructure participants (involved in DBFM/D&C). Since the degree of collaboration in DBFM and D&C projects is lower compared to Bouwteam projects, the development of processes and tools will be a task for the contractor rather than a common task (which is the case in Bouwteam projects).

The fair risk allocation and an equitable relation and respect for all are valued as more essential among infrastructure participants. Since the level of agreement between experts on the existence of this difference and the possible explanation is low, there is no clear indication that these differences are caused by a difference in nature of the sectors. However, some of the experts mention the bad relationship between Dutch public organisations and contractors as a factor influencing this score.

Table 6-5 Final explanation of the differentiating statements

Building sector		
No.	**Statement**	**Explanation**
8.	Clear definition of roles before the project starts working (B:2, I:0)	Compared to the infrastructure sector, the building sector has a higher number of involved parties and the diversity in client types and expertise is higher. The number of parties involved for the realisation of the project, makes in more important to define the roles clearly.
12.	Defined scope of the process (B:3, I:1)	Although the higher diversity in client types and expertise in the building sector is assumed to be influencing this difference. However, due to the limited recognition of this aspect by the experts and the lack of unambiguous explanation, this factor could not be related to the nature of projects.
26.	Development of common processes and tools (B:-1, I:-3)	This factor is not essential in both sectors, but more important for building participants than for infrastructure participants. This is assumed to be influenced by the p-set of the participants (in DBFM and D&C projects the number of common processes and tools is low).
32.	Regular meetings (B:0,09, I:-0,96)	A clear explanation is missing. Infrastructure participants mention that inefficient meetings without a clear goal are meaningless. This could be related to the project size (more people involved – more meetings planned – harder to be efficient). However, experts lack agreement.
Infrastructure sector		
No.	**Statement**	**Explanation**
2.	Early involvement of external stakeholders (B:-1, I:1)	Infrastructure projects have a greater geographic area resulting in a higher number of external stakeholders and a project location which is more intertwined with the surrounding area. According to experts, the power of infrastructure participants is also higher.
9.	Fair risk allocation (B:0, I:2)	Infrastructure projects are horizontally oriented and spread over a wider geographic area and therefore more sensitive to technical and external risks than building projects which are more horizontally oriented and therefore less interacting with the surrounding area. However, since experts are not unambiguous about the explanation of this, a clear link between the characteristics and the valuation is missing.
30.	Equitable relation and respect for all (B:0, I:2)	A clear indication for the higher valuation of this aspect is missing, since experts mention that it is important in both sectors. However, it could be influenced by the bad relationship between public and private parties and therefore be a more public-private matter than sector related.

To conclude, although the building and infrastructure participants value a number of factors differently, for most of the factors there is no clear indication that this is the result of differences in nature of the projects. Therefore, based on the results of this chapter, the nature of projects is not indicated as a major factor influencing the perspectives on collaboration.

7. Lessons from the building sector to the infrastructure sector

In the previous chapter differences in perspectives in collaboration between the building and infrastructure sector were investigated. This chapter aims to formulate lessons of the building sector to the infrastructure sector. Therefore, in section 7.1 the similarities on success factor level of both sectors are explored. Next, the importance of learning and the goal of this research is discussed in section 7.2. Thereafter, in section 7.3 all the input is collected to formulate lessons to the infrastructure sector. Section 7.4 concludes by answering the fifth sub-question: *Which lessons can the transportation infrastructure sector learn from the building sector?*

7.1 Importance of learning

The concept of organisational learning and learning organisations is emerging since the 1980s, but its principles are rooted in many management theories (Garratt, 1999; Wang & Ahmed, 2003). The concept has evolved since then and today the concept has been flourished and defined in a wide range of literature (Argyris & Schön, 1997; Cohen & Sproull, 1991; Levitt & March, 1988; Wang & Ahmed, 2003). Although the concept is extremely broad (Cohen & Sproull, 1991; Saadat & Saadat, 2016), the main goal of organisational learning is not only to enhance the knowledge and skills of employee's but also the development and growth of the organization and the building of flexible relationships (Saadat & Saadat, 2016). It is one of the vital sources to achieve competitive advantage in strategic management (Mohsen Allameh & Moghaddami, 2010) and enables organisation to be more successful than their competitors (Saadat & Saadat, 2016). Research shows that contractors do not always implement lessons learnt from previous projects, often because a structure framework to apply these lessons is missing (Kululanga & Kuotcha, 2008). They even emphasize that a change of behaviour and cognition in the construction sector is of vital importance to experience organisational learning (Kululanga et al., 2001).

7.2 Exploring the similarities on success factor level

The similarities between both sectors are identified based on the matching characterising statements as defined in chapter 5.4.3 (table 7-1) (Appendix C-5). (33) Mutual trust, (21) Understanding each other's objectives, (23) Transparency and (35) Good communication are in both sectors mentioned as the most important factors for successful collaboration, while (3) Contractor's track record in terms of innovation, (10) Specified payment arrangements and (15) Performance management are mentioned as least contributing. This chapter aims to research the reason for these similarities in more detail.

Table 7-1 Most matching characterising statements (Van de Hoef, 2020)

No.	Description	Building sector	Infrastructure sector
3.	Contractor's track record in terms of innovation	*-3*	*-4*
10.	Specified payment arrangements	-4	-3
15.	Performance management	-3	-2
21.	Understanding each other's objectives	2	3
23.	Transparency	2	3
33.	Mutual trust	4	4
35.	Good communication	3	2

Mutual trust, transparency and good communication are soft aspects with a high score on both sectors. These factors are also mentioned by several authors as a mean to improve the project performance of engineering and construction projects (Bresnen & Marshall, 2000; M. M. Rahman & Kumaraswamy, 2005; Suprapto, Bakker, Mooi, et al., 2015). Cheung et al. (2009) found that good teamwork spirits is one of the important drivers for contracting parties to adopt cooperative behaviour. Laan et al. (2011) and Manu et al. (2015) assign the willingness to trust each other as the starting point for client-contractor collaboration, which is also mentioned by many of the participants when they claim that without trust it is impossible to reach anything (pi1, pi3, pi5, pi9, pi15, pi19, pi22, pi24, pi25 and (de Hoog, 2020, pb7, pb9, pb11, pb18, pb22, pb25)). However, participants of both the building and

infrastructure sector also mention that there is often a lack of mutual trust between the client and contractor (pi3, pi8, pi13, pi14, pi15, pi22 and (de Hoog, 2020, pb9, pb11, pb12, pb13, pb25)). According to the participants, good communication and transparency are the keys for a stable owner-contractor relationship, which is also confirmed by authors from several construction industries (Engström & Stehn, 2016; Senaratne & Ruwanpura, 2016; Suprapto, Bakker, Mooi, et al., 2015). The understanding of each other's objectives is another factor to improve the client-contractor relationship which is meant by both several authors (Liu et al., 2016; Ward et al., 1991) and the participants of the Q-research. Meaning that the opinion of the participants according to the most essential factors of collaboration is confirmed by several authors. It is not surprising that these factors are mentioned in both sectors, since they transcend the sector specific (Bresnen & Marshall, 2000). Or in the words of a participant: "Collaboration is collaboration, regardless of the setting in which it happens." (pi3).

As least contributing to successful collaboration, both sectors mention the contractor's track record in terms of innovation, the specified payment arrangements and performance management. The low score on innovation is also recognised by several authors (Arnoldussen, Groot, Halman, & Zwet, 2017; Maghsoudi et al., 2016) when they claim that advanced technology is lacking in construction projects. Although participants of the Q-research of both sectors recognise the growing importance of innovation, for most projects they deny a relation between the contractor's experience with innovation and collaboration, since collaboration is also possible without innovation (pi4 and (de Hoog, 2020, pb4)), innovation is not essential for successful project delivery / collaboration (pi11, pi13, pi20), the willingness to innovate is more important than the experience (pi14 and (de Hoog, 2020, pb11)) and it is a selection criteria rather than a condition for good collaboration. (pi3, pi19 and (de Hoog, 2020, pb12)). As a result, from the contractor's perspective of both sectors, the track-record in terms of innovation is a selection criterion rather than a factor influencing the collaboration qualities of the contractor. Despite the important role of specified payment arrangements in both building and infrastructure contracts (Suprapto, 2016), in this research they are low ranked by the participants of these sectors. Most of the participants agree on the importance of payment arrangements for the process, but deny a positive relation with collaboration (pi24 and (de Hoog, 2020, pb1, pb2, pb7, pb10, pb20, pb24, pb25)). Payment arrangements could even have a negative effect on collaboration, because the contractor is forced to reach a certain goal before payed, which is not always realistic (pi9, pi15).Most of the participants were confused about the actual meaning of the term 'performance management', which could explain the lower ranking of these factor. For some of the infrastructure respondents this was a reason for a low score, others see it as a helpful tool (pi21) or unnecessary pressure to perform, hindering collaboration (pi6). For the building sector an explanation for the low score is lacking.

To conclude, most of the participants of the building and infrastructure sector agree that experience with innovation, payment arrangements and performance management are important for the process, but not contributing to collaboration. Since the focus of the research is on important aspects for collaboration, these aspects will not be discussed further in the report.

Table 7-2 Explanation of the matching statements

No.	Description	Explanation
3.	Contractor's track record in terms of innovation (B:-3, I:-4)	A selection criterion for the client rather than a means to increase collaboration.
10.	Specified payment arrangements (B:-4, I:-3)	Important for the process, but not for good collaboration.
15.	Performance management (B:-3, I:-2)	Although it could be a helpful tool, it is not essential to achieve good collaboration.
21.	Understanding each other's objectives (B:2, I:3)	A key factor for (inter-organizational) collaboration, independent on the context in which the collaboration takes place.
23.	Transparency (B:2, I:3)	A key factor for collaboration, independent on the context in which the collaboration takes place.
33.	Mutual trust (B:4, I:4)	This factor is the fundament of good collaboration, independent on the context in which the collaboration takes place.
35.	Good communication (B:3, I:2)	A key factor for collaboration, independent on the context in which the collaboration takes place.

7.3 Lessons learnt from the building sector

The goal of this chapter is to apply some of the experiences of the building sector with (Bouwteam) collaboration to the infrastructure sector. Hereby the focus is on the success factors that are valued as essential in both sectors (Q-score +2/+3/+4): (21) Understanding each other's objectives, (23) Transparency, (33) Mutual trust and (35) Good communication. Thereby the factors that are essential for building participants and that cannot be related to differences in nature are also included, since the lower ranking of the infrastructure sector could be the result of the lack of experience of these sector with Bouwteams. There are two additional factors that are important to the building sector: the clear definition of roles before the project starts working and the defined scope of the process. Since the different valuation of the clear definition of roles is related to the characteristics of building projects (chapter 6.2), only (12) The defined scope of the process is indicated as an aspect on which the infrastructure sector could learn from the experiences of the building sector. The main input of these lessons is derived from the experiences of building participants (obtained during the Q-interviews of De Hoog (2020)) and the expert consultation of this research.

Mutual trust (B:4,I:4)

Mutual trust is valued as the most important success factor by both building and infrastructure participants (pi1, pi3, pi5, pi9, pi15, pi19, pi22, pi24, pi25 and (de Hoog, 2020, pb7, pb9, pb11, pb18, pb22, pb25)). This is also mentioned in several literature studies (Chiocchio et al., 2011; Laan et al., 2011; Manu et al., 2015) and validated by experts of this this research (E1, E2, E3, E4). According to participants, mutual trust is the fundament of good collaboration (pi1, pi3, pi5, pi14, pi20, pi22, pi23) and without trust it is impossible to reach anything (pi3, pi4, pi15, pi19, pi24, pi25). To build a relationship of mutual trust, it is essential to respect each other (pi1, pi3, pi9, pi22, pi25). Trust is that you trust the other person, as you trust yourself and if you act reliable yourself, the other will do the same (pi4, pi13, pi22). Whether people trust each other depends on how people fit together on personal level (pi1, pi5, pi14) and to trust each other it is important to agree about the goal of the project and participants (pi3, pi5, pi7 and pi23).

Despite this valuation, mutual trust is also assigned as a factor that is often lacking in Dutch infrastructure projects, both by participants (pi1, pi9, pi10, E3, E4) and researches (Kernteam Marktvisie, 2016; McKinsey & Company, 2019). From the contractor's perspective, mutual trust is harmed by old behaviour of the contractor: having the intention to earn as much as possible (pi1, pi3, pi7, pi8, pi25). Infrastructure participants indicate that they are sometimes forced by the management to do so (pi3, pi7, pi18). However, to be an appreciated partner in Bouwteams, it is important to act honestly and be a good partner for the client (which is also explicitly mentioned in the Modelovereenkomst Bouwteam DG 2020 (Duurzaam Gebouwd, 2020a)). Without this willingness Bouwteams are doomed to failure (E3, E4; (de Hoog, 2020, pb7, pb11, pb18, pb25)). Next, the answers of the infrastructure participants show some duality, by stating that mutual trust is important, but that the 'hard aspects' (contract and risk related aspects) are essential and will be even more important in case of Bouwteams (pi13, pi15, pi18, pi20, pi23, pi25). Thus, many of the infrastructure participants argue that mutual trust is the most essential element of successful collaboration, but at the other hand show a suspicious attitude towards the client by showing old behaviour and wanting to define everything contractually. If the level of mutual trust is high, contractual agreements are less important and could even hinder collaboration (e.g. payment arrangements) (pi9, pi19, pi21).

This suspicious attitude of infrastructure participants towards the client (and the client towards the contractor) is also recognised by the experts of this research (E2, E3, E4). According to Expert 3, the most essential aspect on which the infrastructure participants could learn from the building participants is the attitude towards collaboration: " (…) in the building sector, the sense of commonality is much more quicker, (…) while infra participants show a more cautious attitude.". According to the experts, mutual trust can be increased by mutual openness. Therefore it is advised to present an open budget, including a predefined margin, agreements on general costs and be transparent in the documents you present (E1; E3; E4; De Hoog, 2020, pb4, pb7, pb13, pb18, pb19).

Mutual trust is mainly an individual aspect. Therefore, as an individual it is important to trust the other team-members and to be trustworthy yourself (E2; E3; De Hoog, 2020, pb5, pb13, pb16, pb22). On a higher level, in case an organisation want's to be involved in a Bouwteam, the organisation should be aware that the Bouwteam will only succeed in case all the team members act trustworthy (E1; E2; E3). Therefore, contractors are advised to set fair goals and invest in a honest attitude and behaviour of their employees, e.g. by training and coaching.
To conclude, although the importance of mutual trust is mentioned by both building and infrastructure participants, they show a different attitude. Building participants focus more on their own responsibility: how do I ensure that I am a reliable partner, while infrastructure participants, despite appointing their own responsibility, more often blame the poor relationships or the old behaviour of the client.

Advice: To build a relationship of mutual trust, as a contractor it is important to be a reliable partner yourself. Transparency and an open budget are important ingredients for this. Acting reliable takes primarily place at the level of the individual, but is ultimately also a choice of the team and the organisation. Only if the contractor is a reliable partner at all levels, the collaboration could be successful.

Good communication (B:3, I:2)

In both sectors, communication is mentioned as an import factor to increase the successfulness of projects (pi4, pi6, pi9, pi12, pi16, pi17, pi23, pi25 and (de Hoog, 2020, pb2, pb4, pb7, pb8, pb11, pb12, pb16, pb17, pb23)). This is not surprising since communication is the most important tool to understand each other, both personal and work-related and is essential to achieve mutual trust (Engström & Stehn, 2016; Senaratne & Ruwanpura, 2016; Sun & Zhang, 2011). According to infrastructure participants, good communication entails the open and honest communication of everything in the project (pi4, pi9) including the objectives (pi4, pi16, pi17), the scope of the project (Pi9, pi23, pi25), the goal of the client (pi16, pi17) and the design decisions (pi12). Bad communication, which includes miscommunication, bad documentation, consciously withholding information and lack of communication is observed as a factor causing poor project performance (pi6, pi12, pi23). Although an indication that communication in the building sector is better is lacking, two of the experts (E1 and E3) argue that the communication is richer in case of building projects, due to the visually communication of architects. Although in most cases it would be meaningless to add an architect to an infrastructure team, a diverse team in terms of personality types is recommended (E3). To achieve good communication, a proactive attitude is essential: know how the participant works, what his preferences are and what is useful for them. A kick-off meeting could be useful to understand this. Informal meetings can improve the mutual relationship, what could be a factor influencing the mutual trust. (E1; E3; de Hoog, 2020, pb2, pb7, pb8, pb14, pb20). Next, a clear and structured communication, e.g. with the help of a communication platform will smoothen the start-up of the process. Moreover making an person responsible for the communication, who could intervene in case the communication is not clear or unstructured could prevent disturbances (E1; E4; de Hoog, 2020, pb2, pb4, pb6, pb7, pb8, pb12, pb16, pb17).
To conclude, good communication is for both building and infrastructure participants an essential factor to achieve successful collaboration. Although there is no indication that the communication in the building sector is better than in the infrastructure sector, a pro-active attitude and a structured communication could contribute to successful collaboration.

Advice: Good communication entails openness and honesty about the essential elements of the project (objectives, goal, scope and important decisions). A pro-active attitude and a clear structure are essential elements to reach better communication.

Defined scope of the process (B:3, I:1)

Although the defined scope is mentioned as a more important factor by the building participants, several experts experienced with Bouwteam collaboration in building and infrastructure projects argue that this is of equal importance in both sectors, but that it is more difficult in the building sector to define the scope (E1, E3, E4). Therefore, when participating in Bouwteams, infrastructure participants should be aware of the importance of a defined scope. According to building participants, a defined scope entails the clear definition of the starting point, the end-goal and the tasks that should be performed to reach the goal (De Hoog, 2020, pb1, pb3, pb6, pb20). It is essential that the scope (including the end-goal) is clear before the Bouwteam agreement is signed (E1; E3; De Hoog, 2020, pb1, pb3, pb6, pb20, pb22, pb25). Although this is mainly the responsibility of the client, as a contractor it is important to check whether the scope is clear enough before signing the contract. In case the end-goal changes, one-to-one meetings with the client are helpful to understand the implication for the project (De Hoog, 2020, pb1, pb20). Understanding the scope of the project makes it more easily to apply the contractor's experiences (and the employee's personal experiences and expertise) to the project, which is one of the main added values of a Bouwteam (De Hoog, 2020, pb3, pb20) (Chao-Duivis, 2012)[3]. Some of the infrastructure participants agree with the building participants on the importance of the scope (pi10, pi11, pi18, pi25 – participants who mainly represent perspective I1: Relation, clarity and communality). However, others mention that a too strict defined scope can negatively influence the project: in case the scope is clearly defined in the contract and the contract does not offer space for changes, this could lead to extremely high costs and poor project results (pi10, pi16, pi18). Thus, in fact infrastructure participants do not reject the importance of a defined scope, but a too strict definition of the scope in the contract. However, the aspects mentioned by the building participants are not about the practical implication, but more about the higher level. For infrastructure participants it could be helpful to focus on this higher level rather than the strict formulation of the practical implications in the contract.

To conclude, although the defined scope is valued as less essential by most of the infrastructure participants, in case of a Bouwteam the clear definition of the starting point, the end-goal and the tasks that should be performed to reach the goal could positively influence the project performance.

Advice: The scope including the clear definition of the starting point, the end-goal and the tasks that should be performed should be clear before the Bouwteam agreement is actually signed. During the Bouwteam it should be monitored whether the goal is achieved or not. However, space for scope changes is required.

Transparency (B:2, I:3)

According to both building and infrastructure participants, transparency is largely intertwined with mutual trust and communication and is explained as open and honest communication (pi9, pi10, pi15, pi17, pi20, pi23 and (De Hoog, 2020, pb4, pb11, pb23)). According to some of the participants, it is necessary to be transparent about everything in the project (pi9, pi20, pi24 and (De Hoog, 2020, pb4, pb12, pb18)) while some building participants argue that this is impossible (De Hoog, 2020, pb23, pb24). Although transparency is mentioned as a tool to build mutual trust (pi2, pi10, pi20 and (De Hoog, 2020, pb12, pb18), infrastructure participants also indicate the difficulty of being transparent about the costs because of the fear of not being profitable enough (pi9, pi10, pi20, pi24). This fear of infrastructure contractors of a low profitability is also recognised by experts (E3, E4). Although this fear is largely related to the business model of contractors (their profitability lies in the realisation of objects), this will likely be amplified because of their experiences in recent years, in which the relationship with the client has deteriorated and often great losses have been suffered (Kernteam Marktvisie, 2016; McKinsey & Company, 2019). Thus, there is a mutual trust between transparency and trust: at the one hand, a higher level of transparency could improve the mutual trust, but when

[3] This is also explicitly formulated in chapter 3 of the Modelovereenkomst Bouwteam DG 2020 (Duurzaam Gebouwd, 2020a)

trust is lacking, from a contractor's perspective it is difficult to share information, especially the budget-related information. This problem is recognised by building participants, but according to them transparency can be enforced by mutual arrangements, where it is important to agree on what aspects transparency is required (De Hoog, 2020, pb18, pb24). As a contractor, at this point it is of great importance to honestly discuss the fear of a low profitability with the client. At the other hand, as a client it is important to realize that this fear of the contractor can influence the degree of transparency since transparency is a fundamental aspect for Bouwteams (Duurzaam Gebouwd, 2020a). Making clear agreements about the profitability could increase the willingness of the contractor to be transparent (E1, E3, E4 and (De Hoog, 2020, pb18, pb24)). Once it is decided what information should be shared, as a contractor it is important to give the client as much as possible insights to your documents, budgets, figures and motivations (De Hoog, 2020, pb4, pb9, pb12, pb18, pb23) and approach people in case transparency is lacking (De Hoog, 2020, pb4, pb8, pb11).
To conclude, transparency is the open and honest communication, which requires a certain amount of trust between the client and contractor. Making financial agreements could improve the willingness of the contractor to be transparent.

Advice: Transparency is an essential tool to build mutual trust and improve communication. Therefore it is important to communicate open and honestly, without hidden agendas, especially about the costs and budgets. This can be forced by mutual agreements. Participants should report when transparency is lacking.

Understanding each other's objectives (B:2, I:3)

For participants of both sectors, understanding each other's objectives is of major importance (pi1, pi3, pi4, pi7, pi9, pi10, pi12, pi13, pi15, pi17, pi21, pi22 and (De Hoog, 2020, pb3, pb9, pb14, pb18, pb20, pb21, pb24). According to building participants, several aspects are important related to this aspect. Firstly, before participating in a project, as a contractor, it is important to define your own objectives (De Hoog, 2020, pb3, pb18, pb24). Many of the infrastructure participants indicate that the realisation of the project to make profit is the main objective of a contractor (pi3, pi7, pi9, pi15, pi21). However, in the first part of a Bouwteam, there is no realisation yet. According to several infrastructure participants, this makes a Bouwteam less attractive to contractors (pi2, pi7, pi14, E3, E4). Therefore as a contractor it is important to define your objectives and select only the projects that align with your objectives. Hereby it is essential to define the objectives of the organisation and announce them to the lower parts of the organisation, so that each team or individual can explain the objectives to the client and only projects will be selected that align with these objectives (E3; E4; de Hoog, 2020, pb3, pb20). Next, according to building participants, for both the client and contractor it is important to explain your objectives to the other party, putting yourself in the shoes of the other person/company and respect the objectives of the other party (De Hoog, 2020, pb3, pb9, pb14, pb18, pb20, pb21, pb24). Although many of the infrastructure participants agree with this, they focus more on the difference in objectives: the client wants a certain objective for a low price, the contractor wants to realise this objective with a fair profit margin (pi3, pi7, pi9, pi15, pi21). Thus, infrastructure participants emphasize difference more and seek less common objectives. However, although the objectives of the organisations could be different, in a project there are also some common objectives. Focusing on this will benefit collaboration. Therefore the honest expression of your interests and proactive asking of the client's objectives is essential. This can be forced by organising a meeting in which the participants are asked to write the objectives down (de Hoog, 2020, pb3, pb9, pb14, pb18, pb21, pb24).

Advice: For the understanding of each other's objectives, it is important to know the objectives of the own organisation and to be able to explain these to the client. Although the objectives of client and contractor could be different, it is important to try to understand the objectives of the other party and actively seek common objectives.

7.4 Conclusion

The aim of this chapter was to answer the fifth sub-question: *What lessons can the transportation infrastructure sector learn from the building sector?*. Therefore the aspects that are essential for both building and infrastructure projects as well as the aspects that are essential for building projects, but not related to characteristics of these projects are discussed: (12) a defined scope of the process, (21) understanding each other's objectives, (23) transparency, (33) mutual trust and (35) good communication.

Although mutual trust is valued as the most essential factor for successful collaboration, infrastructure participants show a suspicious attitude towards the client, especially on risks and financial aspects. Building participants at the other hand appoint their own responsibility: being a trustful partner for the client. Infrastructure participants recognise these reciprocity, but seem to give little attention to this. Transparency and an open budget are important ingredients for mutual trust and takes primarily place at the level of the individual, but is ultimately also a choice of the team and the organisation. Only if the contractor is a reliable partner at all levels, the collaboration could be successful. Both communication and transparency entails openness and honesty about the essential elements of the project (objectives, goal, scope and important decisions). Although there is no indication that the communication is better in case of building projects, a pro-active attitude and a clear structure are essential elements to reach better communication. Related to transparency, especially the costs and budgets are mentioned as elements that could harm collaboration. Participants indicate that, from a contractor's perspective it is difficult to be transparent about the financial aspects once there is no certainty that the profitability of the project will be guaranteed. Mutual agreements about what information will be shared and a fair profit margin will positively influence the mutual trust between parties. To improve mutual trust and collaboration, it is also essential to understand each other's objectives, since the objectives are the reason why a party participates in the project. For infrastructure participants, it is important to try to understand the objectives of the other party and actively seek common objectives, instead of focussing on the differences in objectives.

The final lesson is related to the clear definition of the scope. This aspect is lower valued by infrastructure participants because they are afraid for a too strict definition, which could harm the project performance and result in cost overruns. However, building participants show that the scope should be defined at a higher level by the clear definition of the starting point, the end-goal and the tasks that should be performed. Preferably this should be clear before the Bouwteam agreement is actually signed. However, space for scope changes is required. During the Bouwteam it should be monitored whether the goal is achieved or not.

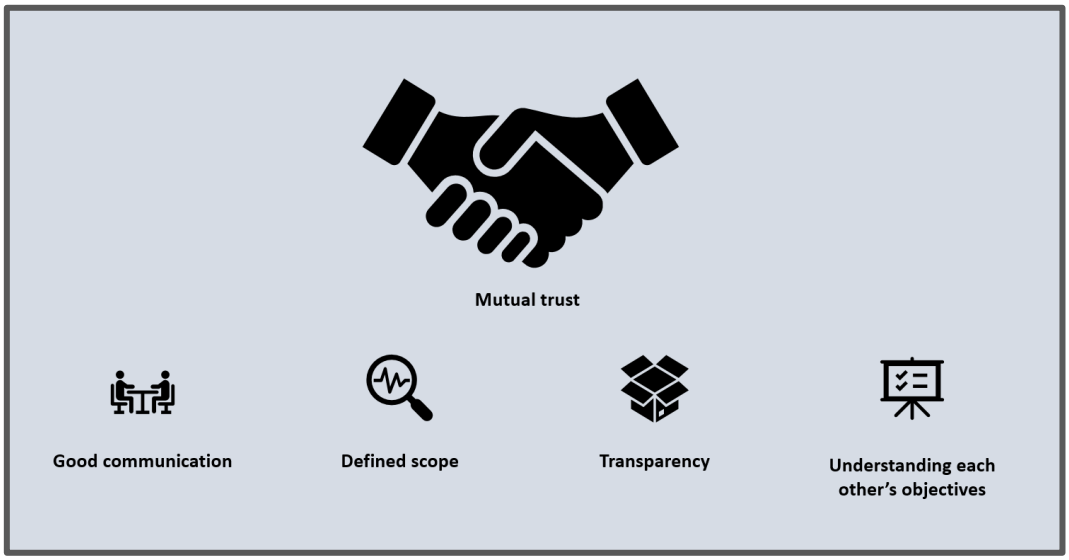

Figure 7-1 Essential elements of collaboration in Bouwteams

8. Discussion, limitations and validity

This chapter discusses the achieved results in the context of this research as well as in relation to aspects which are beyond the scope of this research but do influence the results. Therefore, in section 8.1 the most important parts of the research are discussed, where after the limitations are outlined in section 8.2. Finally, section 8.3 concludes by explaining the validity of the results.

8.1 Discussion

In this exploratory study the similarities and differences in collaboration in building and infrastructure projects are identified and the infrastructure sector is advised based on the experiences of the building sector with Bouwteams. Although Bouwteams are mentioned in both the building and infrastructure sector as a solution to increase the client-contractor collaboration (Chao, 2018; De Koning, 2018; Westhuis & Wals, 2019) a comparative research to collaboration in these sectors is non-existing in literature. This research provides insight to contractors on differences and similarities in collaboration in building and infrastructure projects as well as lessons to improve collaboration in infrastructure Bouwteams. The meaning of the obtained results are discussed on several aspects, including the differences and similarities between building and infrastructure projects, the perspectives of infrastructure participants, the comparison of the contractor's perspectives and the lessons learnt.

Differences and similarities between building and infrastructure projects

To investigate what the infrastructure sector could learn from the building sector; it was assumed of major importance to understand the differences and similarities of these sectors. The starting point of the research was that building and infrastructure projects have some similarities since they are often mentioned together within the existing literature with the term construction projects (Nasir & Hadikusumo, 2019; S. H. A. Rahman et al., 2014; Smith et al., 2014; Winch, 2009), they partly use the same contracts (Adelbäck & Johansson, 2013; Bundgaard et al., 2011; Dulaimi et al., 2007; Visser & Nicolas, 2020), and large contractors often carry out both types of projects. Besides, also some differences are indicated in project size, geographic area, number of involved parties and client types. To define these characteristics, a literature study is carried out on five aspects: project related, project participant related, procurement related, project management and external aspect. The results of this comparison largely correspond to the expectations of the researcher. However, it was not always clear whether the used studies are based on the same definitions, sector classifications, or periods of time. Therefore, sometimes it was difficult to understand the actual meaning and implications of the results. In general results of countries which are largely comparable in culture to the Dutch culture are used, since clear data of the Dutch sector was lacking. Although this process is done carefully and transparently, it could distort the picture. Moreover, comparing both sectors does not always justice to the diversity within both sectors (both in size and project type), which could have a major influence on the degree on which a specific building and infrastructure project correspond (e.g. the construction of a bridge and a building will have much more similarities than the construction of a highway and a building).

Perspectives of infrastructure participants

The perspectives of the infrastructure participants are identified based on a group of 25 participants involved in client-contractor collaboration during the design phase of infrastructure projects. The importance of a careful selection of participants is mentioned by Webler et al. (2009) by stating that "*Q-participants are selected to represent the breath of opinion in a target population, not the distribution of beliefs across the population*". Therefore, participants involved in diverse contract types and diverse reference projects are needed. However, in the final p-set most of the participants are involved in DFBM and D&C projects, and many participants are involved in three large reference projects: Blankenburgverbinding, A9 Gaasperdammerweg and N31 Traverse Harlingen. Since the third infrastructure perspective is mainly defined by participants involved in the Blankenburgverbinding, this perspective could also be project-related rather than sector-related. Moreover, the number of DBFM

and D&C contracts annually tendered in the Netherlands, is only a small part of the total tendered projects. Therefore, the p-set does not represent the diversity of the contract types within the infrastructure sector. However, in terms of budget, these projects largely represent the market since a large part of the annual budget of the Dutch government is selected for DBFM(O) projects (Ministerie van Financiën, 2017). Although it is not entirely clear to which differences the composition of the p-set leads, it must therefore be considered that the composition of the p-set influences the results.

Comparing the contractor's perspectives

In this research the perspectives of building and infrastructure participants are compared to each other. To draw conclusions out of comparative studies, it is important to change as low variables as possible, since every changed variable could influence the result (Keman, 2014; Rihoux & Ragin, 2008). In this research, the building participants were involved in Bouwteam projects, largely privately owned, with a budget of more than 50M (De Hoog, 2020) and infrastructure participants are mainly involved in large integrated contracts, with a budget of more than 500M and publicly owned. This means that two factors (contract-type and client-type), which are mentioned by both literature and experts as factors influencing the collaboration are changed. This makes it really challenging to understand if the differences in perspectives on collaboration really originate from the nature of projects, or that they are caused by the difference in contract-type and client-type. Therefore, the experts were consulted to verify whether they recognise the differences and what factors could cause these differences. Only in case the experts agree to the difference and the explanation, the differences were assigned as a different perspective on collaboration caused by the nature of projects. However, since the number of experts consulted is limited, especially compared to the number of participants involved in the Q-set, this does not completely justice to the results. Therefore, additional research is needed to investigate where the differences originate from.

Lessons learnt

Given the p-set of both the building and infrastructure participants, in fact the research is partly based on a comparison of a private-private collaboration in the building sector and a public-private collaboration in the infrastructure sector. This is emphasized by experts, when they state that also in the building sector private-public collaboration can be improved. Moreover, when asked for lessons, they often give a private-private relationship in the building sector as an example to improve the collaboration in the infrastructure sector. This feeds the notion that not only the infrastructure sector can learn from the experiences of the building sector, but that in projects of public clients the building sector also can learn from the experiences within their sector with private clients. Moreover, this observation feeds the notion that the perspective on collaboration is largely influenced by the client. Therefore, the client has a great responsibility to improve this relationship. However, the role of the client is beyond the scope of the research.

Finally, the learnt lessons of the building sector mentioned by the experts are relatively limited. Although this could be caused by the fact that this topic is discussed at the end of the interviews, when time was limited, the researcher also experienced that it was hard for the experts to formulate lessons. These observations feed the hypothesis that mutual learning is limited.

8.2 Limitations

Next, the limitations of the research are highlighted.

Characteristics of the Dutch building and infrastructure sector

Defining the characteristics of both sectors could be a research in itself. The main limitation of this aspect is the depth of the investigation. For many of the aspects on which both sectors are compared (e.g. risks, stakeholder management, failure costs, tender methods etc.), as already presented in chapter 8.1, the amount of information about the Dutch context was limited. Although an attempt has been made to approach the Dutch context as closely as possible, to get a detailed understanding of the similarities and differences of the sectors, additional research is needed. This research was only

exploratory and gives a first overview of the similarities and differences.

Q-set

The applied Q-set was developed by De Hoog (2020). The importance of a careful selection of the Q-set is mentioned by several researches (Jedeloo & van Staa, 2016; Van Exel & De Graaf, 2005; Webler et al., 2009). Although De Hoog (2020) explained the process in detail, personal interpretation could be part of the selection process. Next, during this research an additional check was done if all these statements also apply to client-contractor collaboration during the design phase of infrastructure projects, which was confirmed. Although an improvement of the Q-set could be valuable, it was not included in the scope of this research. The same Q-set has been used to avoid interpretation problems when comparing the results.

P-set

The aim was to select infrastructure participants that differ on as least as possible points from the building participants. Since there is no experience with Bouwteams in infrastructure projects within Ballast Nedam, participants are selected that correspond otherwise as much as possible, resulting in the requirement that people should be experienced with client-contractor involvement. This finally resulted in participants who are mainly involved in a few large DBFM or D&C projects. The main limitation of the research is that the infrastructure participants are not actually experienced with Bouwteam collaboration. However, most of the participants indicate that the contract type would not influence their view on collaboration, which is also mentioned by the building participants (De Hoog, 2020).

The Q-interview

Since the perspectives of the participants are determined by the interpretation of the success factors, the participants were asked to use their own interpretation of the statements. Some statements were not completely clear to the participants, including (15) Performance management, and (26) Development of common processes and tools. In case participants did not have any idea, an explanation was given by the researcher. However, since the concerning participants are spread over the perspectives, this is not addressed as a factor influencing the results.

Collaboration perspectives

For the identification of the building and infrastructure perspectives, only employees of Ballast Nedam are consulted. Although Ballast Nedam is a large construction company that enters in a lot of interaction with other market parties, it is not validated whether these perspectives are also recognizes by other contractors. This would require additional research.

Comparison on success factor level

The comparison of perspectives is largely based on the Q-interviews of this research and of De Hoog (2020). In both studies the respondents were asked to explain the most essential (+4/+3) and least essential (-3/-4) aspects. However, when comparing the sectors on success factor level, it stands out that also the explanation why a certain factor was neutrally valued could clarify the differences between building and infrastructure participants. Since this explanation was missing, it was not always possible to explain why a certain factor was lower valuable by one sector compared to the other. Moreover, the results of the building sector are second-hand, since they are based on an interpretation of the summary of the Q-interviews of De Hoog (2020). Although the results are literally rendered as much as possible, personal interpretation both from De Hoog (2020) and the researcher herself could be part of the process.

Expert consultations

Experts are consulted to verify the identified differences in collaboration between the building and infrastructure sector and the identified causes of these differences. Since experience in both sectors is essential to relate the characteristics and differences to each other, experience during the design phase of both building and infrastructure projects was a strict requirement. However, it became clear that the number of people that comply with this is relatively low. Therefore, only four experts are consulted in this research, which gives the outcomes an exploratory nature.

The contractor's perspective

In this research only the contractor's perspective is investigated. However, in client-contractor collaboration, the client also plays a large role, especially in the case of Bouwteams, were the client party is responsible for both the process and end-product. Therefore, the limitation of this research is that only one side of the problem is investigated.

Learning aspect

The goal of this research was to identify the similarities and differences in collaboration in building and infrastructure projects to advice the infrastructure sector based on the experiences of the building sector with Bouwteams. Thereby the assumption was that building and infrastructure projects share some common aspects, where lessons can be learnt. The idea that learning may also be possible on aspects where the two sectors differ from each other is not a part of this research. And although some lessons are formulated, the implementation of these lessons in practise (organisational learning) is not investigated.

Influence of sector characteristics on collaboration

Part of this research was to investigate how differences in collaboration could be related to the characteristics of both sectors. Conversely the characteristics of both sectors could also lead to differences and similarities in collaboration. This is not included in the scope of this research.

8.3 Validity

In this research, the mixed method approach (Abowitz & Toole, 2010; Creswell & Creswell, 2017) was applied to investigate the problem, although the focus was on qualitative research. The Q-method, used to identify the collaboration perspectives, is a quantitative method in which subjective results could be compared and analysed based on the interpretation of the post-sorting interviews (Watts & Stenner, 2005). Therefore, the quantitative collection and representation of data was followed by a qualitative analysis, using Q-interviews, literature reviews and expert meetings.

To understand the validity of this research, both the internal and external validity are discussed. External validity relates to the generalizability of the research, while internal validity refers to the extent to which a clausal conclusion based on the obtained results is justified (Abowitz & Toole, 2010; Creswell & Creswell, 2017; Noble & Smith, 2015).

Internal validity

The formulated lessons are based on a combination of both qualitative and quantitative and therefore researcher bias could occur. However, several steps are taken to limit these biases: the results are mainly based on reliable literature findings and the data collection processes (both Q-research and Expert meetings) are carefully designed. The lessons of the building sector to the infrastructure are not (yet) validated in practise, since they are based on an interpretation of the researcher of both the expert meetings and the results the Q-interviews of building participants obtained by De Hoog (2020).

External validity

The results in this research are based on a Q-study, which is suitable for research on beliefs, experiences and interpersonal relationship (Brown, 1980; Van Exel & De Graaf, 2005; Watts & Stenner,

2005). Due to the non-random recruitment and the small number of participants (25), the results cannot be transferred to groups with different experiences. Since only participants are involved who are working for Ballast Nedam, the results could not be generalised to the whole contractor population. However, Steelman & Maguire (1999) argue that a retest of the Q-set with a different P-set will lead to similar results (De Hoog, 2020). Although the organisation culture between contractors could vary, similar results are assumed with participants originating from other contractors. To confirm this, a retest with participants from other contractors is advised. The explanation of the differences and the formulation of lessons are largely based on expert meetings. Since only four experts are consulted, and only two of them are experienced with client-contractor collaboration during the design phase of building and infrastructure projects, the generalizability of these results is limited. However, since the results are supplemented with literature findings and the input of Q-studies the reliability is increased. The research is of exploratory nature and an in-depth investigation is recommended to verify whether these results also apply to the whole sector.

9. Conclusions and Recommendations

This chapter concludes this study by addressing an answer to the main problem of this research. First the five sub-questions and the main research question are answered in section 9.1, whereas recommendations for Ballast Nedam and future research are presented in section 9.2.

9.1 Conclusion

Bouwteams are increasingly mentioned as a way to improve client-contractor collaboration in infrastructure projects, by using the knowledge of the contractor in the design phase, resulting in lower costs and a design which is easier to realise (Chao-Duivis, 2012). This however requires a mind change from the contractor, since his traditional attitude is result-driven (De Koning, 2020). However, compared to the building industry the infrastructure sector lags behind in applying Bouwteams (De Koning, 2020). Therefore, the goal of this research was to understand differences and similarities in collaboration between the Dutch building and transportation infrastructure sector to provide lessons of the building sector to the infrastructure sector in the context of Bouwteams. Five sub-questions and a main question has been answered to achieve this goal.

9.1.1 Answers to the sub-questions

The answer to the first sub-question, *on which aspects do building projects and transportation infrastructure projects differ?,* is based on a literature study regarding the characteristics of the Dutch building and infrastructure sector related to five aspects: project-related aspects, project-participant related aspects, project procedures, project management aspects and external aspects. Building projects are vertically oriented point projects with a clear end-user, usually initiated by a private client, resulting in a great variation of client expertise. Moreover, they are tendered in more diverse ways, the return on equity is higher and there is less attention to sustainability and innovation. Transportation infrastructure projects at the other hand are horizontally oriented line projects, usually spread over a wider geographic area, resulting in more interaction with the surrounding, more stakeholders involved, more permits required and more sensitive to risks related to the underground, which makes the organisational complexity higher. They are usually initiated by public clients and mainly publicly or privately tendered. Just like building projects, the attention to sustainability and innovation is low.

The second sub-question*, does the list of success factors of collaboration in building projects also apply to transportation infrastructure projects?* was asked to check whether the existing Q-set of De Hoog (2020) could be applied to infrastructure projects. Therefore the Q-set of De Hoog (2020) was investigated on their applicability to client-contractor collaboration during the design phase of infrastructure projects. Research showed that each of the collected success factors also apply to client-contractor collaboration during the design phase of infrastructure projects. However, since in three of the statements the term 'Bouwteam' was explicitly used, a small reformulation was done. After this, the total Q-set turned out the be suitable to collaboration during the design phase of infrastructure projects.

The third sub-question, *what are the differences in perspectives of contractors on specified success factors of collaboration between building projects and transportation infrastructure projects?* aims to investigate the differences in opinions on collaboration between both sectors. Therefore a Q-study is done with 25 participants experienced with client-contractor collaboration during the design phase of infrastructure projects, resulting in the following perspectives: I1-Relation, clarity and communality, I2-Personal values above structure, I3-Strong relationship within the team. Next, these perspectives are compared with the perspectives of the building sector: B1-Relationship first, B2-Early involvement of the right people and B3-Structure first (defined by De Hoog (2020)).

Although the building and infrastructure participants largely agree about successful collaboration (there are no opposite perspectives), there are some differences between these sectors: infrastructure participants show more consensus within a certain perspective than building participants. Moreover, infrastructure participants are more unambiguous than building participants, because they show more similarities between the perspectives. Building participants however show more diverse perspectives and less agreement about what is needed for good collaboration. Due to a lack of overlap with infrastructure participants, perspective B2-Early involvement of the right people seems to be a typical building perspective. However, this perspective could also be related to Bouwteams or the reference projects of the involved participants. Perspective I1 (Relation, clarity and communality) shows little overlap with building participants and is therefore identified as an infrastructure perspective. Since this perspective entails a diverse group of participants, the influence of the P-set is classified as 'low'. Since the comparison of the different perspectives does not provide a detailed overview of the differences and similarities, an additional analysis of the Q-studies is done on success factor level, resulting in the differences outlined in table 9-1.

Table 9-1 Most differentiating statements between building and infrastructure participants (Van de Hoef, 2020)

No.	Description	Building sector	Infrastructure sector
2.	Early involvement of external stakeholders	*MF = -1*	*MF = 1*
8.	Clear definition of roles before the project starts working	*MF = 2*	*MF = 0*
9.	Fair risk allocation	*MF = 0*	*MF = 2*
12.	Defined scope of the process	*MF = 3*	*MF = 1*
26.	Development of common processes and tools	*MF = -1*	*MF = -3*
30.	Equitable relation and respect for all	*MF = 0*	*MF = 2*
32.	Regular meetings	*Z-score = 0.09*	*Z-score = -0.96*

The fourth sub-question, *how do the differences in perspectives on collaboration relate to the differences between building and transportation infrastructure projects?* aims explain the differences at success factor level with the help of the literature study and Q-interviews. Experts are interviewed to verify whether they agree with the explanation. As a result, for only two factors a clear relationship between the characteristics of the sectors and the collaboration perspectives was indicated. The higher importance of (2) Early involvement of external stakeholders is explained by the larger geographic area of these projects, resulting in a higher number of involved stakeholders and a project location which is more intertwined with the surrounding area. Experts also mention that involved infrastructure stakeholders have more power compared to building stakeholders. The higher importance of (8) The clear definition of roles before the project starts working is explained by the higher number of involved parties as well as the diversity of client types and experience level in the building sector. In case of more involved parties, it will be more essential to clearly define the roles of the participants. Moreover, in case of inexperienced clients, the contractor should monitor whether the roles are clearly defined, while in case of experienced clients this happens more naturally. For the other differences, a clear explanation is lacking, although there are some indications that they could be related to the client or contract type of the participants. Thus, based on these results, the nature of projects is not indicated as a major factor influencing the perspectives on collaboration.

Finally, the fifth sub-question, *which lessons can the transportation infrastructure sector learn from the building sector?* aims to understand what the infrastructure sector could learn from the experiences of the building sector. Therefore the aspects which are essential for both building and infrastructure projects as well as the aspects which are essential for building projects, but not related to characteristics of these projects are discussed: a defined scope of the process, understanding each other's objectives, transparency, mutual trust and good communication.
Mutual trust is indicated as the most essential element of successful collaboration, and although infrastructure participants emphasize the importance of this, they also show a suspicious attitude towards the client, especially on risks and financial aspects. While many infrastructure participants

place the problem to the client, building participants emphasize their own responsibility to ensure that they are a reliable partner. To do so, communication and transparency, which entails openness and honesty about the essential elements of the project (objectives, goal, scope and important decisions) are major factors. Related to transparency, especially the costs and budgets are mentioned as elements that could harm collaboration. Participants indicate that, from a contractor's perspective it is difficult to be transparent about the financial aspects once there is no certainty that the profitability of the project will be guaranteed. Mutual agreements about what information will be shared and a fair profit margin will positively influence the mutual trust between parties. To improve mutual trust and collaboration, it is also essential to understand each other's objectives, since the objectives are the reason why a party participates in the project. For infrastructure participants, it is important to try to understand the objectives of the other party and actively seek common objectives, instead of focussing on the differences in objectives. Finally, the suspicious attitude of infrastructure participants is also apparent from their fear of a too strict defined scope, which could harm the project performance and result in cost overruns. However, building participants show that the scope should be defined at a higher level by the clear definition of the starting point, the end-goal and the tasks that should be performed.

9.1.2 Answer to the main research question

The answers to these five sub-questions are used to answer the main research question:
In which way could the transportation infrastructure sector learn from the experience of the building sector with collaboration in Bouwteams?
The biggest advantage of Bouwteams is that the knowledge of the contractor about the realisation costs and the execution of the design can be used in the design phase, which could result in lower costs and a design which is easier to realise (Chao-Duivis, 2012). To utilize this advantage, a relationship based on mutual trust is essential. This research shows that although that is recognised by infrastructure participants, they also show a suspicious attitude towards the client, and the client sometimes shows a suspicious attitude towards the contractors (called 'old behaviour', which is also argued by (De Koning, 2020; Kernteam Marktvisie, 2016; McKinsey & Company, 2019)). To successfully participate in Bouwteams, as a contractor it is important to show confidence in the client and act reliable. Both building participants and experts indicate that the lack of mutual trust is a lower problem in the building sector. Compared to infrastructure participants, building participants emphasize more the own responsibility of the contractor to be a reliable partner. Therefore, the main advice to the infrastructure sector is to invest in the attitude towards the client. This should be done both on individual level (training, coaching etc) as well as on organisational level, since the vision of the contractor is related to their behaviour. Next, to stimulate mutual trust and collaboration within a Bouwteam, a defined scope of the process, understanding each other's objectives, transparency and good communication are essential elements.

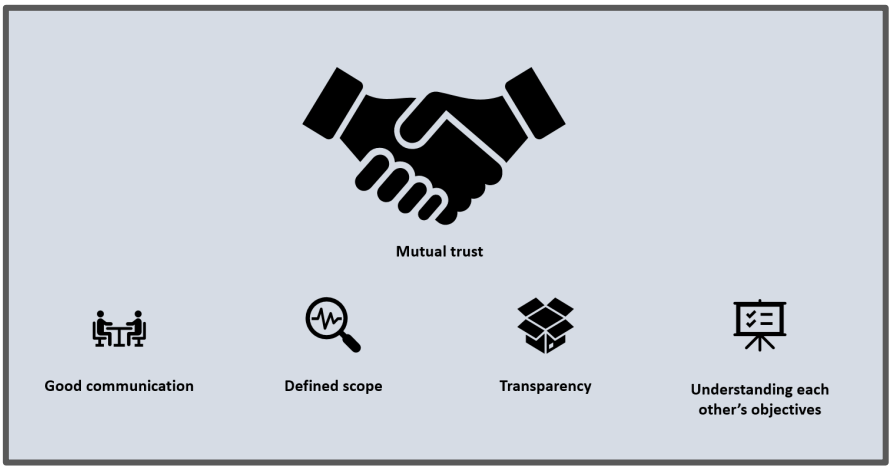

Figure 9-1 Essential elements of collaboration in Bouwteams

9.2 Recommendations

Based on the answer to the main research question, the discussion and the limitations of the research, several recommendations are formulated, both for practise and future research.

9.2.1 Recommendations for practice

- This research shows that the building and infrastructure department within Ballast Nedam are relatively stand-alone. However, the research also shows that the building and infrastructure sector have a lot in common. Therefore, more interaction between the different disciplines (e.g. by meetings across both discipline) is advised to expand knowledge and learn from each other's experiences.
- Although mutual trust and transparency are mentioned as the most essential success factors to establish collaboration, participants of the interviews also indicate that sometimes it is difficult to trust the client. Although a lack of trust is harmful in every collaborative relationship, a suspicious attitude will dramatically reduce the successfulness of a Bouwteam. Therefore, Ballast Nedam is advised in case of Bouwteams to select people who can act trustful and transparent with the client. On a higher level, the management of Ballast Nedam is advised to research the underlying causes of this lack of trust and to invest in a more trustful and transparent organisation.
- When selecting participants during the research it became clear that calculators and cost engineers within the infrastructure sector are less experienced with client-contractor collaboration. In case of Bouwteam agreements, these people are also expected to directly interact .with the client. A lack of collaboration experience with clients could negatively influence the total client-contractor collaboration in Bouwteams. Therefore, in case of Bouwteams Ballast Nedam is advised to select participants who are experienced with client-contractor collaboration. Moreover, they are advised to invest in the collaborative skills of cost engineers, specifically on client-collaboration.

9.2.2 Recommendations for future research

- The aim of this research was to compare the collaboration in the building and infrastructure sector with each other. Research shows that the amount of literature in which both sectors are compared with each other is limited. However, this research also shows that there are some major differences between both sectors. Therefore, it would be interesting to do a comparative research on other aspects which are important in both sectors, like risk management, budget-control, tendering etc.
- In this research, the building and infrastructure sector are compared based on a huge amount of (foreign) literature. However, to get a more total overview of both sectors, it would also be interesting to research the perspectives of people working within one of the two sectors related to the main characteristics of both sectors.
- This research is limited to collaboration during the design phase. However, it would also be valuable to research the contractor's attitude towards collaboration during other stages of the project, including the tender phase, price negotiation phase or execution phase.
- In this research, the client-contractor collaboration is investigated in relation to each other. However, it would also be meaningful to research the degree to which collaboration within the organisation influences the relationship between client and contractor and whether there is a relationship between good intraorganizational and good interorganisational collaboration.
- Although it is common good that a team with a diverse scale of personalities positively influences the team performance and this is applied more and more within the infrastructure sector, currently it is not clear whether there is a relationship between the personality types of people and the perspectives on collaboration. Although some of the participants of the Q-

research did the suggestion that there is a relationship, currently this is not proven and requires further investigation.

- Although this research identifies some aspects in which the infrastructure sector could learn from the experiences of the building sector, the implementation of these aspects is out of scope of this research. Therefore, additional research is recommended for strategies to apply these lessons both within the organisation of the contractor as well as in relationship with the client.

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Appendices

Appendix A: Comparison of Dutch building and infrastructure projects
Appendix B: Design of the Q-method
Appendix C: Perspectives of the building and infrastructure sector
Appendix D: Q-interviews
Appendix E: Expert interviews

A. Comparison of Dutch building and infrastructure projects

Several articles are investigated on their suitability for comparing the Dutch building and infrastructure sector. After a first critical round, eight studies are selected and investigated on their suitability. These studies are presented in table A-1.

Table A-1 Overview of the obtained articles

No.	Author(s)	Titel	Goal of the research	Gives the article an overview of sector related aspects?
1.	(Schöttle & Gehbauer, 2012)	Incentive systems to support collaboration in construction projects	The paper focus on managing an incentive system to support the collaboration in a construction project in order to realize the optimal delivery of the project.	No, the article is only focused on incentive systems and mentions only aspects related to this topic.
2.	(Bresnen & Marshall, 2000)	Building partnerships: case studies of client contractor collaboration in the UK construction industry	This paper sets out to add to the growing literature an empirical database on partnering by reporting the findings of a research project designed to explore the economic, organizational and technological factors that encourage or inhibit collaboration in practice.	Yes, including frameworks, contracts & incentives, contractor selection, teambuilding, organizing and managing the project team, managing internal and external organizational interfaces and performance outcome.
3.	(Dewulf & Kadefors, 2012)	Collaboration in public construction—contractual incentives, partnering schemes and trust	Based on two case studies the authors investigate how the formalized context, including formal partnering models to support relationship management, influences relational development in public sector construction contracts.	No, the article is focussed on formal contract arrangements and collaborative arrangements and a more detailed overview is missing.
4.	(Chan, Scott, et al., 2004)	Factors affecting the Success of a Construction Project	The paper aims to present a conceptual framework on critical success factors, by identifying five main groups, namely project-related factors, project procedures, project management actions, human-related factors and external environment.	Yes, project-related factors, procurement-related factors, project management factors, project participant-related factors, external factors.
5.	(Chan, Chan, et al., 2004)	Exploring critical success factors for partnering in construction projects	The paper presents a review of the development of the partnering concept in general and identifies critical success factors for partnering projects from the Hong Kong perspective in particular.	No, although several project related factors are mentioned (project, consortium and the environment), the main purpose is to present success factors, including support from top management, mutual trust, long-term commitment, effective communication, efficient co-ordination, productive conflict resolution and adequate resources, which are mainly soft factors which are already included in the Q sort.
6.	(L. D. Nguyen et al., 2004)	A study on project success factors in large construction projects in Vietnam	The paper aims to present a guideline to successfully handle construction projects.	No, although several project related factors are mentioned (project, consortium and the environment), the main focus is on soft skills (comfort, competence, commitment, communication) which are already included in the Q sort.
7.	(Cho et al., 2009)	Effect of project characteristics on project performance in construction projects based on structural equation model	This study aims to analyse the overall relationship between project performance and a project's characteristics. This study deduced the overall causal relationship and the degree of influence between 17 project characteristics and five project performance indices.	Yes, the article makes a distinction between project environment characteristics and project participant characteristics.
8.	(Shehu et al., 2015)	Analysis of characteristics affecting completion time for Malaysian construction projects	The paper aims to investigate Malaysian project characteristics in relation to time overruns.	Yes, the article mentioned five categories, including type of project, nature of works, sector, procurement, tendering methods.

Research 1 (Schöttle & Gehbauer, 2012) and 3 (Dewulf & Kadefors, 2012) are focused on incentives rather than on characteristics of construction projects. Although some characteristics related to the sector are mentioned in research 5 (Chan, Chan, et al., 2004) and 6 (L. D. Nguyen et al., 2004) the main focus is on the soft skill in collaborative relationships (which are already included in the Q-sort). As a result of this, study 2,4,7 and 8 are further investigated.

B. Design of the Q-method

This appendix aims to present the set-up and application of the Q-method to identify the perspectives at the contractors' side about client-contractor collaboration in the design phase of infrastructure projects, which is largely based on the Q-method developed by De Hoog (2020). In chapter B.1 it is described what approach is used to transform the De Hoog's Q-research on success factors of building projects (2020) to a Q-research on success factors of infrastructure projects. Next in chapter B.2 the Q-method for infrastructure projects is described, while in chapter B.3 the second sub-question *Does the list of success factors of collaboration in building projects also apply to collaboration in the design phase of transportation infrastructure projects?* is answered.

B.1 Explanation of used method

As described earlier in the report, the Q-study is used to determine the different perspectives of respondents on collaboration in building projects and infrastructure projects. Therefore De Hoog (2020) has designed a Q-study in order to research the perspectives of respondents on collaboration in *building projects*. In order to find the perspectives of respondents on *infrastructure projects* the same Q-study will be applied. However, there are some differences because the research of De Hoog (2020) was focused on building projects and this research is focused on infrastructure projects. Therefore it should be checked wether the founded success factors also apply to infrastructure projects. Secondly, the research of De Hoog (2020) was specifically focused on Bouwteams, while this research is more broadly about client-contractor collaboration in the design phase of a project (which could be in a Bouwteam, but also in other types of contract including D&C, Alliances, DBFM etcetera). Therefore for each step of the Q-method the following two aspects will be checked:

1. Does this procedure also apply to infrastructure projects?
2. Can this procedure also be applied to general client-contractor collaboration during the design phase of a project?

If any changes in the existing Q-method are needed according to these aspects, it will be explained why and how it is changed. Besides possible consequences for the interpretation of the results will be explained.

B.2 Design of the Q-method

The Q-method is a research method which aims to present qualitative research results in a quantitative way (Watts & Stenner, 2012). De Hoog (2020) chosed to follow the approach of Van Exel & De Graaf (2005), which is presented in figure B-1.

Figure B-1 Steps of the Q methodology (De Hoog, 2020)

Step 1: Collection of statements

When setting up a Q-research, the first step is the broad and diverse gathering of statements about the subject of research (Watts & Stenner, 2012). The aim of this research is to define the differences and similarities in perspectives on success factors of collaboration in building and infrastructure projects. Therefore, the statements should represent success factors of collaboration in infrastructure projects. De Hoog (2020) collected statements that represent factors of collaboration in the context of building projects. In order to check whether they also apply to infrastructure projects, it is important to know from which sources the factors originate.

De Hoog (2020) derived statements from two types of sources: articles and interviews. The following approach was used in order to determine whether a success factor (derived from an article) used by De Hoog also applies to transport infrastructure.

1. If an article clearly presents that it is about success factors for infrastructure projects, or in case the results are (partly) based on infrastructure projects, it is valid to use the success factors in the context of infrastructure projects.
2. If the article is more generally about construction projects, without any further definition and there is no reason to assume that the article is applicable to the building sector and not to the infrastructure sector, it is also valid to use the success factors in the context of infrastructure projects.
3. In case the origin of the success factor is unclear and it could not be excluded that the factor is only applicable to the building sector, further research is required. this only applies to article 7 (Suprapto, 2016). Therefore, for each success factor obtained from this source it will be checked wether the factor also applies to infrastructur projects.

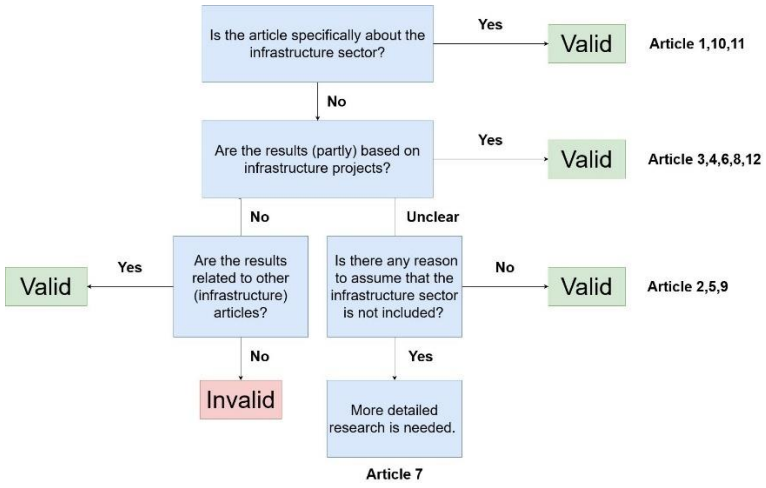

Figure B-2 Overview of the used methodology to determine whether the source applies to infrastructure projects

Besides articles, De Hoog (2020) also used interviews to collect statements. Therefore, she interviewed two persons: the head of the architectural department of Building, Design and Engineering and the director of asset management of Ballast Nedam. Since the head of the architectural department represents the building sector, an additional check will be done whether these statements also apply to the infrastructure sector. Since within the asset management department the building sector and infrastructure sector are united, the statements derived from the asset management director will also apply to the infrastructure sector.

Table B-1 Explanation whether the references used by De Hoog (2020) also apply to infrastructure projects

No.	Reference	Related to	Valid for infra projects	Motivation
1.	Adelback & Johansson (2013)	Large infrastructure projects	Yes	The article is focused on success factors of collaboration within infrastructure projects.
2.	Akintoye & Main (2007)	Construction projects	Yes	The paper describes the UK's contractor perception on collaborative relationships in the construction industry and makes no distinction between building and infrastructure projects.
3.	Chan et al. (2006)	Construction projects	Yes	The research is focused on three categories, including infrastructure projects. The scores of the founded success factors differ only minimally per type of project.
4.	Nasir & Hadikusumo (2018)	Construction projects	Yes	The term 'construction project' is not clearly defined in the article. However, the model which is developed in the paper is tested on an irrigation project including bridges.
5.	Rahman & Kumaraswamy (2005)	Construction projects	Yes	The article is about Collaborative Working Agreements (CWA's) in the construction sector. It is not explained which to which sector the term 'construction sector' refers. However, both authors are working at the department of Civil Engineering of the University of Hong Kong, which makes it plausible to assume that infrastructure projects are involved in the research.
6.	Rahman et al. (2014)	Construction industry	Yes	The results of the article are based on a survey held with 160 delegates of the National Forum of the Malaysian Malay Contractors (2011). Visitors of this conference are from both the building and infrastructure sector.

7.	Suprapto (2016) p. 28; p. 62	Capital projects	Unclear	p. 28: the results are based on interviews with an owner company of the oil & gas industry and a contractor of the engineering and construction industry. No further definition. p. 62: the results are based on a literature review in which articles from several backgrounds are used. More details about the origin of the success factors are needed.
8.	Suprapto et al. (2016)	Capital projects	Yes	The researchers analysed 113 capital projects, including 10.6% infrastructure, power and utilities and 8% civil industry. There are no differences in outcomes between the various sub-sectors discussed.
9.	Thompson & Sanders (1998)	Construction projects	Yes	The paper shows the different degrees of partnering and is focused on the construction industry (no further definition). The authors are both from the Civil Engineering Department of Clemson University.
10.	Wondimu et al. (2016)	Infrastructure projects	Yes	The findings are based on a literature study and semi-structured-in-depth interviews with key informants of Norwegian bridge projects.
11.	Van Riggelen (2019)	Infrastructure projects	Yes	The research is focused on infrastructure projects (all the case projects are infrastructure projects).
12.	Xue et al. (2010)	Construction projects	Yes	The definition used for construction projects can refer to both building and infrastructure projects. Moreover, the article is a literature-review and uses literature from both sectors.

Step 2: Defining the Q set

Based on the selected articles and interviews, De Hoog (2020) obtained a final Q-concourse of 192 statements. Next, out of this list a selection of statements is made that represent the complete subject of interest, which is called the Q-set. According to Watts & Stenner (2005) it is important that the factors represent all the relevant perspectives, but also that each statement contributes to the subject of interest. Gaps and overlaps should be avoided to obtain a balanced Q-set, but it is impossible to obtain a perfect Q-set (Watts & Stenner, 2012) (De Hoog, 2020). According to Kampen&Tamás (2014) there are two ways to select the final Q-set: by structured and unstructured sample. De Hoog (2020) applies structured sampling, using the six categories of Supprapto (2016): teamworking, capability, relational attitude, team integration, joint working an contract. For each of the 192 statements De Hoog (2020) determined to which category the statements belongs, based on the examples given by Suprapto (2016).

Since the literature is inconclusive about the number of statements the Q-set should contain, De Hoog (2020) choses to apply the guidelines of Van Exel & De Graaf (2005), who stated that approximately 40 statements are necessary for a good Q-set (De Hoog, 2020). In order to obtain a balanced Q-set, De Hoog (2020) chooses to apply the same number of statements per category. This finally results in a Q-set of 38 statements with the sorting question: “Essential for collaboration in a Bouwteam to achieve successful project delivery is …” (De Hoog, 2020).

Infrastructure projects

In order to apply these Q-method to infrastructure projects, the sorting question is reformulated to “Essential for collaboration *during the design phase* to achieve successful project delivery is …”. Next, for the statements obtained from Suprapto (2016) it is checked whether they originate from an article about the infrastructure sector, whereby the same procedure (figure B-2) is applied. This study shows that all statements obtained from Suprapto (2016) apply to the infrastructure sector.

Next, this check is also done for the statements obtained from interview one. Hereby only the statements which have not yet been confirmed by other sources to apply to infrastructure projects are investigated, namely ‘financial range is agreed upfront by client and contractor’ and ‘propose solutions when raising problems’ (table x-3). For these two statements an additional literature research is done. Grimsey & Lewis (2004) emphasize the importance of discussing the financial conditions in the context of Public Private Partnerships in the infrastructure sector. This is agreed by Xue et al. (2010) when they state that agreement on several important aspects, including financial resources is key to project success. Walker et al. (2017) mentioned that especially in projects with a huge degree of uncertainty a joint approach of finding solutions is important. Ahren et al. (2014) describes this by stating that continuous learning within complex projects occurs when problems are jointly solved. Thus, both statements are also subscribed by literature. Therefore, it can be concluded that the whole Q-set applies to the infrastructure sector.

Client-contractor collaboration in the design phase

Next, a check is done whether these aspects apply to client-contractor collaboration during the design phase in general, instead of specifically to Bouwteams. Since all the articles from which the statements originated, with exception of Van Riggelen (2019), are about client-contractor collaboration in general, it can be concluded that the statements meet this condition.

In the original Q-set three statements contain the term 'Bouwteam'. For these three terms an additional check is done whether and how they apply to general client-contractor collaboration during the design phase. Since statement 8 and 12 are based on articles about client-contractor collaboration in general, they can be easily reformulated. Statement 38 however is based on an article specifically on Bouwteams (Van Riggelen, 2019) and the second interview, which was done in the context of a Bouwteam. Therefore, an additional literature research have been done whether the evaluation of the collaboration (agreement) contributes to the success of infrastructure projects. Since several articles emphasizes the importance of regularly evaluation (Bowe & Lun Lee, 2004) (Videira, Antunes, Santos, & Lobo, 2006) (Samset & Christensen, 2017) statement 38 is also concluded into the final Q-set.

The reformulation (table B-2) is dependent on which aspect of the Bouwteam is intended in the original statement, which can be the project itself, the process or the collaboration with the client.

Table B-2 Overview of original statements (De Hoog, 2020) and their reformulation for this research.

No.	Original statement	Reformulated statement
8.	Clear definition of roles before the Bouwteam starts working.	Clear definition of roles before the process starts.
12.	Defined scope of the Bouwteam.	Defined scope of the project.
38.	Evaluate the Bouwteam during the project.	Evaluate the collaboration during the project.

Step 3: Selection of the P-set

The third step in the Q-methodology is the selection of a set of participants that will conduct the Q-sorting. These set of participants is called the 'P-set' and should be a well selected limited number of participants (Watts & Stenner, 2012). Just as with the research of De Hoog (2020) the participants in this research are employees of Ballast Nedam. In order to find suitable participants, De Hoog (2020) has defined four criteria. Based on the two aspects mentioned in chapter x.1 these criteria are redefined, which leads to the following criteria's:

- The participant is currently involved or has been directly involved in the design phase of an **infrastructure project**;
- The participant is currently or has been in contact with the client and therefore experienced client-contractor collaboration **in the design phase of an infrastructure project**;
- The participant is or has been present at client-contractor meetings **during the design phase of an infrastructure project**;
- The participant has at least five years of experience in the construction industry, **in particular the infrastructure sector**.

Next, the number of participants is determined. In literature, several approaches are mentioned to determine the appropriate number of participants (Danielson, 2009) (Watts & Stenner, 2012) (Shinebourne, 2009) (Webler, Danielson, & Tuler, 2009). De Hoog (2020) has chosen to select a P-set of approximately 25 respondents, based on the redundancy rule from Webler et al. (2009). For this study a P-set with the same size will be used.

For the collection of the necessary participants the structured approach is used. The head of the infrastructure department of Ballast Nedam and the company director of Ballast Nedam Leerdam were asked to give the names of people who could met the criteria. Next, the involved persons are contacted whether they actually met the set of criteria.

Based on the criteria mentioned, De Hoog (2020) got a P-set in which the following three groups of respondents were involved.

- Process managers: employees acting as tender managers or plan developers. This group of people oversees the overall collaboration in the design process and are the connection between the client and the engineers.
- Design managers: employees acting as designers or engineers. This group of people have construction knowledge and expertise that is used to improve and optimise the design.
- Cost managers: employees acting as calculators or scheduling and logistics experts. This group of people is an expert in the field of calculating a price for the project and making optimal planning's and building sites.

This defines the next criteria: the participant should be a process, design of cost manager.

Table B-3 Final Q-set of success factors of collaboration in infrastructure projects (De Hoog, 2020)

No.	Success factor	Adelback & Johansson (2013)	Akintoye & Main (2007)	Chan et al. (2006)	Nasir & Hadikusumo (2018)	Rahman & Kumaraswamy (2005)	Rahman et al. (2014)	Suprapto (2016) p. 28; p. 62	Suprapto et al. (2016)	Thompson & Sanders (1998)	Van Riggelen (2019)	Wondimu et al. (2016)	Xue et al. (2010)	Interview 1	Interview 2	Total
Capability																
1.	Sufficient resources for collaboration	X	X	X												3
2.	Early involvement of internal stakeholders							X						X		3
3.	Contractor's track-record in terms of innovation				X											1
4.	A continued involved project team leader	X		X				X								3
5.	Early involvement of contractors	X										X		X		3
6.	Team leader's capability	X		X		X										3
Contract																
7.	Contractual incentives (positive and negative)							X					X		X	3
8.	Clear definition of roles before the process starts	X						X							X	3
9.	Fair risk allocation					X		X				X				3
10.	Specified payment arrangements							X							X	2
11.	Financial range is agreed upfront by client and contractor													X		1
12.	Defined scope of the project							X						X	X	3
Joint working																
13.	Shared risks	X										X				2
14.	Agreed process for dispute resolution					X		X	X							3
15.	Performance management		X					X								2
16.	Joint planning with all participants	X									X					2
17.	Joint problem solving					X		X	X				X			4
18.	Propose solutions when raising problems													X		1
Relational attitude																
19.	Support of senior management from both sides		X					X	X					X		4
20.	Long-term orientation of the contractor		X			X	X	X								4
21.	Understanding each other's objectives					X		X							X	3
22.	Project team leader's adaptability to changes in the project			X				X					X			2
23.	Transparency							X					X			2
24.	Win-win attitude				X			X				X		X	X	5
25.	Strive for equality in behaviour and duties for client and contractor										X				X	2
Team integration																
26.	Development of common processes and tools	X										X	X			3
27.	Integrated project teams				X			X					X			3
28.	Separate conversations in small groups per discipline											X		X		2
29.	Unrestricted cross-sharing in the project						X	X	X					X	X	5
30.	Equitable relation and respect for all							X						X		2
31.	Involving the right people at the right moment										X			X		2
Team working																
32.	Regular meetings					X					X			X		3
33.	Mutual trust					X		X					X			3
34.	High level of commitment		X				X	X					X			4
35.	Good communication		X					X	X				X			4
36.	Alignment of objectives					X		X							X	3
37.	Have an elaborated project start-up										X				X	2
38.	Evaluate the collaboration during the project										X				X	2

Step 4: Collection of the Q-sorts

The fourth step of the Q-method is the actual collection of the data, called the collection of the Q-sort. For this, the scheme presented in figure B-3 is used.

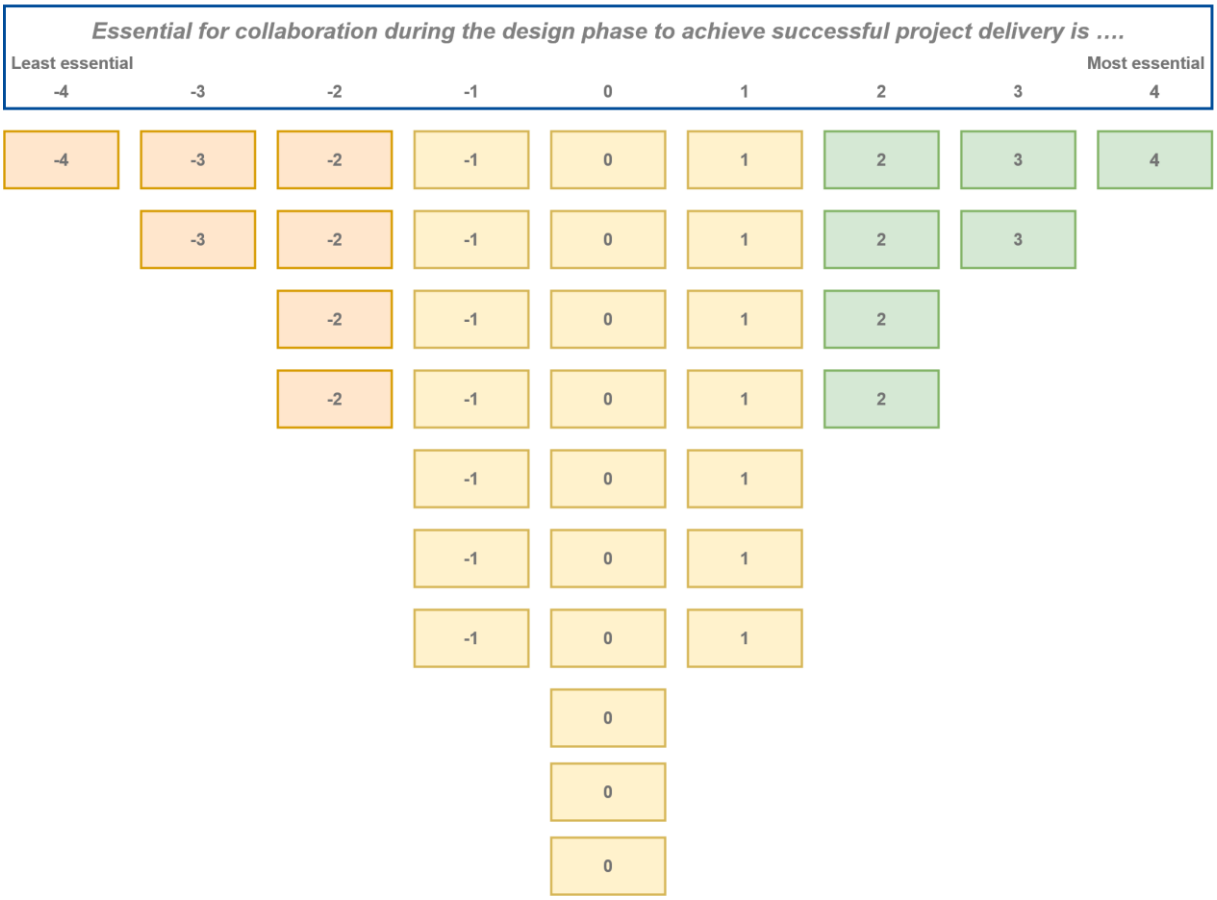

Figure B-3 Q-sorting scheme for success factors of collaboration in infrastructure projects (De Hoog, 2020)

B.3 Conclusion

The aim of this appendix was to investigate to which extent the Q-method developed by De Hoog (2020) can be applied to client-contractor collaboration during the design phase of infrastructure projects. Therefore, the whole Q-procedure (in particular the Q-set and P-set) was investigated on its validity for this type of collaboration. Out of the sources from which the Q-set originates, it can be concluded that the set is also valid for infrastructure projects. In order to make the Q-set suitable for a broader context than Bouwteam projects, three statements are reformulated. In addition, the criteria's that the participants must meet have also been adjusted to collaboration during the design phase of infrastructure projects. Taking into account these minor changes, the Q-method developed by De Hoog (2020) can be applied to the infrastructure sector.

C. Perspectives of the building and infrastructure sector

This appendix aims to show the underlying data according to the formulation of the building and infrastructure perspectives, as well as the comparison of these perspectives.

C.1 Q-analysis infrastructure sector

P-set infrastructure

In total 26 participants were involved in the Q-sorting procedure. Unfortunately, participant 26 was not experienced with direct client-contractor collaboration in the design phase of infrastructure projects and therefore excluded of the final P-set.

Table C-1 Total P-set infrastructure sector

No.	*Group*	*Function*	*Experience (years)*	*Experience (projects)*	*Experience (contract types)*	*Reference project*	*Budget reference project*	*Contract type reference project*
1.	Process management	Senior Advisor	Over 20 years	Over 20 projects	DBFM, D&C	Blankenburgverbinding Baak	700 million	DBFM
2.	Process management	Project Manager	15-20 years	15-20 projects	DBFM, D&C, E&C	Blankenburgverbinding Baak	6 million	DBFM
3.	Process management	Project leader GWW	5-10 years	0-5 projects	DBFM	A9 Gaasperdammerweg	900 million	DBFM
4.	Process management	Company director	10-15 years	5-10 projects	D&C, E&C	Blankenburgverbinding Baak	6 million	D&C
5.	Process management	Process and Information manager	Over 20 years	Over 20 projects	DBFM, D&C	A9 Gaasperdammerweg	650 million	DBFM
6.	Process management	Project manager	Over 20 years	Over 20 projects	DBFM, D&C, E&C	N31 Traverse Harlingen	100 million	D&C
7.	Process management	Tender manager	10-15 years	5-10 projects	Bouwteam, D&C, E&C	N207C	3.5 million	D&C
8.	Process management	Project manager	Over 20 years	10-15 projects	DBFM, D&C	Blankenburgverbinding Baak	85 million	DBFM
9.	Process management	Process and Information manager	10-15 years	0-5 projects	D&C, E&C	N31 Traverse Harlingen	100 million	D&C
10.	Process management	Project manager	5-10 years	5-10 projects	DBM, DBFM, D&C	Maastricht Groene loper	3 million	D&C
11.	Process management	Project coordinator	10-15 years	5-10 projects	DBFM, D&C	P+R Kralingse Zoom	40 million	D&C
12.	Process management	Adjunct director BAAK	Over 20 years	5-10 projects	DBFM, D&C, E&C	Blankenburgverbinding Baak	1 billion	DBFM
13.	Design management	Designer GWW	10-15 years	Over 20 projects	DBFM, D&C	A9 Gaasperdammerweg	1 billion	DBFM
14.	Design management	Design manager	Over 20 years	Over 20 projects	Bouwteam, DBM, D&C	Stena Line RoRo Terminal	24 million	D&C
15.	Design management	Design manager	Over 20 years	Over 20 projects	DBFM, D&C, E&C	Blankenburgverbinding Baak	1 billion	DBFM
16.	Design management	Design manager	Over 20 years	Over 20 projects	Bouwteam, D&C	N31 Traverse Harlingen	100 million	D&C
17.	Design management	Project manager design	Over 20 years	Over 20 projects	Alliance, Bouwteam, DBFM, D&C, DBM, E&C	Geluidsscherm N210	1 million	1-op-1
18.	Design management	Design coordinator GWW	5-10 years	5-10 projects	DBFM, D&C	A9 Gaasperdammerweg	1 billion	DBFM
19.	Specialist	Engineer	15-20 years	Over 20 projects	Bouwteam, DBM, DBFM, D&C	N31 Traverse Harlingen	100 million	D&C
20.	Specialist	S&L Engineer	Over 20 years	10-15 projects	DBFM, D&C, E&C	N31 Traverse Harlingen	100 million	D&C
21.	Specialist	Systems architect	15-20 years	15-20 projects	Bouwteam, DBFM, D&C, E&C	A9 Gaasperdammerweg	700 million	DBFM
22.	Specialist	Manager VVTI	15-20 years	5-10 projects	DBFM, D&C, E&C	A9 Gaasperdammerweg	1,5 billion	DBFM
23.	Specialist	Stakeholder manager	Over 20 years	5-10 projects	DBFM, D&C	Blankenburgverbinding Baak	700 million	DBFM
24.	Cost management	Senior Advisor of costs	Over 20 years	0-5 projects	DBFM, D&C	Blankenburgverbinding Baak	600 million	DFBM
25.	Cost management	Plan developer	15-20 years	0-5 projects	Alliance, Bouwteam, D&C	De Markermeerdijk	500 million	Alliance
26.	Cost management	Head of the budget department Infra	Over 20 years	Over 20 projects	Alliance, Bouwteam, DBM, DBFM, D&C, E&C, DBFMO	A9 Gaasperdammerweg	600 million	DBFM

Correlation matrix

The viewpoints produced by the participants during the Q-sort are plotted against each other. The height of the correlation indicates whether there is a high degree of consensus of contradiction, while a negative correlation indicates that participants have a contradicting view. All contradicting relations are low, indicating that there is a minimal contradiction between the participants. Many of the correlations are between 0.30 and 0.55, indicating that there is some degree of consensus between the participants.

Table C-2 Correlation Matrix infrastructure sector

		pi1	pi2	pi3	pi4	pi5	pi6	pi7	pi8	pi9	pi10	pi11	pi12	pi13	pi14	pi15	pi16	pi17	pi18	pi19	pi20	pi21	pi22	pi23	pi24	pi25
pi1	Senior Advisor	1.00	0.37	0.34	0.38	0.39	0.22	0.39	0.37	0.55	0.39	0.56	0.30	0.36	0.19	0.06	0.32	0.46	0.25	0.21	0.62	0.35	0.40	0.62	0.17	0.37
pi2	Project Manager		1.00	0.37	0.43	0.43	0.12	0.44	0.25	0.64	0.51	0.46	0.14	0.38	0.50	0.14	0.42	0.18	0.11	0.20	0.34	0.67	0.56	0.54	0.38	0.33
pi3	Project leader GWW			1.00	0.53	0.25	0.21	0.63	0.25	0.37	0.32	0.25	0.33	0.51	0.41	0.19	0.25	0.30	0.26	0.27	0.58	0.30	0.48	0.60	0.33	0.54
pi4	Company director				1.00	0.46	0.47	0.60	0.37	0.43	0.29	0.54	0.46	0.48	0.42	0.05	0.36	0.36	0.09	0.44	0.50	0.54	0.57	0.46	0.46	0.44
pi5	P&I manager					1.00	0.21	0.46	0.41	0.47	0.33	0.46	0.41	0.48	0.54	0.34	0.40	0.18	0.18	0.46	0.37	0.52	0.47	0.38	0.39	0.39
pi6	Project manager						1.00	0.53	0.36	0.32	0.11	0.25	0.52	0.16	0.14	-0.02	0.26	0.22	0.07	0.37	0.29	0.03	0.45	0.28	0.24	0.35
pi7	Tender manager							1.00	0.43	0.57	0.42	0.32	0.61	0.48	0.55	0.22	0.39	0.38	0.33	0.47	0.58	0.40	0.65	0.54	0.44	0.63
pi8	Project manager								1.00	0.38	0.30	0.35	0.43	0.24	0.32	0.30	0.40	0.18	0.02	0.29	0.27	0.39	0.46	0.37	0.40	0.42
pi9	P&I manager									1.00	0.54	0.46	0.47	0.51	0.58	0.20	0.42	0.36	0.30	0.30	0.59	0.53	0.54	0.54	0.48	0.42
pi10	Project manager										1.00	0.54	0.31	0.41	0.65	0.19	0.49	0.31	0.04	0.50	0.44	0.56	0.30	0.59	0.46	0.44
pi11	Project coordinator											1.00	0.33	0.41	0.48	0.10	0.42	0.56	0.20	0.62	0.54	0.59	0.32	0.62	0.43	0.39
pi12	Adjunct director BAAK												1.00	0.46	0.51	0.11	0.25	0.47	0.41	0.52	0.61	0.17	0.54	0.18	0.54	0.43
pi13	Designer GWW													1.00	0.53	0.16	0.36	0.39	0.45	0.49	0.49	0.29	0.39	0.35	0.38	0.34
pi14	Design manager														1.00	0.39	0.39	0.39	0.18	0.46	0.45	0.47	0.39	0.46	0.50	0.51
pi15	Design manager															1.00	0.10	0.13	0.04	0.26	0.15	0.18	-0.02	0.18	0.01	-0.00
pi16	Design manager																1.00	0.03	0.11	0.22	0.20	0.56	0.35	0.50	0.50	0.28
pi17	Project manager design																	1.00	0.20	0.62	0.56	0.09	0.45	0.37	0.29	0.32
pi18	Design coordinator GWW																		1.00	0.27	0.38	0.01	0.22	0.01	0.21	0.34
pi19	Engineer																			1.00	0.48	0.25	0.46	0.39	0.47	0.37
pi20	S&L Engineer																				1.00	0.26	0.43	0.54	0.39	0.54
pi21	Systems architect																					1.00	0.34	0.66	0.43	0.32
pi22	Manager VVTI																						1.00	0.42	0.52	0.60
pi23	Stakeholder manager																							1.00	0.32	0.48
pi24	Senior Advisor of costs																								1.00	0.42
pi25	Plan developer																									1.00

Next, the correlations between factor scores, i.e. the correlations between the different infrastructure perspectives are presented. Since the correlations are relatively high (>0.59), the degree of consensus between the perspectives is big, but there are also some descending factors.

Table C-3 Correlations between factor scores infrastructure sector

	Factor 1	Factor 2	Factor 3
Factor 1	1.000	0.5943	0.7040
Factor 2		1.000	0.6349
Factor 3			1.000

Consensus statements

The consensus statements show the success factors which score relatively the same among the three perspectives.

Table C-4 Consensus statements infrastructure

No.	Success factor	Factor 1		Factor 2		Factor 3	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
5.	Early involvement of contractors	0	-0.24	0	-0.02	-1	-0.54
6.	Team leader's capability	1	0.47	0	-0.12	1	0.30
14.*	Agreed process for dispute resolution	-1	-0.42	0	-0.25	0	0.02
22.*	Project team leader's adaptability to changes in the project	0	-0.14	0	0.13	0	0.13
23.	Transparency	2	1.19	3	1.74	2	1.51
24.	Win-win attitude	0	-0.07	0	0.08	1	0.61
29.	Unrestricted cross-sharing in the project	-1	-0.31	-1	-0.28	-2	-0.85
30.*	Equitable relation and respect for all	3	1.53	2	1.66	2	1.26
31.*	Involving the right people at the right moment	1	0.47	1	0.48	0	0.11
33.*	Mutual trust	4	2.48	4	2.18	4	2.21
37.	Have an elaborated project start-up	-1	-0.52	0	0.05	0	-0.07
38.*	Evaluate the collaboration during the project	0	0.02	0	0.05	1	0.16

Factor arrays

The factor arrays present the ideal Q-sort of that perspective.

Table C-5 Factor array of the three-factor solution of the infrastructure sector

No.	Success factor	Average score	Factor 1	Factor 2	Factor 3
1.	Sufficient resources for collaboration	*0*	*1*	*-1*	*1*
2.	Early involvement of internal stakeholders	*0*	*2*	*0*	*0*
3.	Contractor's track-record in terms of innovation	*-3*	*-4*	*-2*	*-4*
4.	A continued involved project team leader	*0*	*0*	*-1*	*1*
5.	Early involvement of contractors	*0*	*0*	*0*	*-1*
6.	Team leader's capability	*0*	*1*	*0*	*-1*
7.	Contractual incentives (positive and negative)	*-1*	*-2*	*-1*	*-2*
8.	Clear definition of roles before the process starts	*0*	*1*	*1*	*-1*
9.	Fair risk allocation	*1*	*3*	*1*	*0*
10.	Specified payment arrangements	*-2*	*-3*	*-2*	*-3*
11.	Financial range is agreed upfront by client and contractor	*1*	*-2*	*1*	*-2*
12.	Defined scope of the project	*1*	*2*	*1*	*-1*
13.	Shared risks	*0*	*0*	*1*	*-1*
14.	Agreed process for dispute resolution	*0*	*-1*	*0*	*0*
15.	Performance management	*-2*	*-1*	*-1*	*-3*
16.	Joint planning with all participants	*0*	*1*	*-1*	*-1*
17.	Joint problem solving	*1*	*0*	*2*	*1*
18.	Propose solutions when raising problems	*0*	*-2*	*0*	*0*
19.	Support of senior management from both sides	*-1*	*1*	*-3*	*1*
20.	Long-term orientation of the contractor	*-1*	*0*	*-1*	*0*
21.	Understanding each other's objectives	*3*	*2*	*3*	*3*
22.	Project team leader's adaptability to changes in the project	*0*	*0*	*0*	*0*
23.	Transparency	*3*	*2*	*3*	*2*
24.	Win-win attitude	*0*	*0*	*0*	*1*
25.	Strive for equality in behaviour and duties for client and contractor	*-2*	*-1*	*-2*	*-1*
26.	Development of common processes and tools	*-3*	*-3*	*-3*	*-2*
27.	Integrated project teams	*0*	*-2*	*0*	*0*
28.	Separate conversations in small groups per discipline	*-1*	*-1*	*-2*	*0*
29.	Unrestricted cross-sharing in the project	*-1*	*-1*	*-1*	*-2*
30.	Equitable relation and respect for all	*2*	*3*	*2*	*2*
31.	Involving the right people at the right moment	*1*	*1*	*1*	*0*
32.	Regular meetings	*2*	*-1*	*-4*	*1*
33.	Mutual trust	*4*	*4*	*4*	*4*
34.	High level of commitment	*1*	*0*	*1*	*2*
35.	Good communication	*2*	*1*	*2*	*3*
36.	Alignment of objectives	*2*	*0*	*2*	*2*
37.	Have an elaborated project start-up	*0*	*-1*	*0*	*0*
38.	Evaluate the collaboration during the project	*0*	*0*	*0*	*1*

C.2 Q-analysis building sector

The perspectives of the building sector are identified by (De Hoog, 2020). A detailed overview of the steps taken can be found in her report. The participants involved in the research are presented below. In contrary to the Q-research of the infrastructure sector, the participants are not asked to give the name and budget of the reference project. Therefore, it cannot be excluded that differences occur as a result of the reference project.

Table C-6 Total P-set of the building sector (De Hoog, 2020)

No.	Group	Function	Experience
pb1	Process management	Tender manager	over 20 years
pb2	Process management	Tender manager	5 - 10 years
pb3	Process management	Tender manager	10-15 years
pb4	Process management	Plan developer	5-10 years
pb5	Process management	Plan developer	over 20 years
pb6	Process management	Tender manager	10-15 years
pb7	Process management	Project manager	10-15 years
pb8	Process management	Plan developer	over 20 years
pb9	Process management	Project manager	10 - 15 years
pb10	Process management	Plan developer	15-20 years
pb11	Design management	MEP	15 - 20 years
pb12	Design management	MEP	5-10 years
pb13	Design management	MEP	10-15 years
pb14	Design management	MEP	10-15 years
pb15	Design management	Design & Engineering	15-20 years
pb16	Design management	Design & Engineering	15 - 20 years
pb17	Design management	Design & Engineering	10 - 15 years
pb18	Cost management	Calculator	15-20 years
pb19	Cost management	Scheduling & Logistics	15-20 years
pb20	Cost management	Scheduling & Logistics	15-20 years
pb21	Cost management	Procurement	15-20 years
pb22	Cost management	Calculator	Over 20 years
pb23	Cost management	Calculator	over 20 years
pb24	Cost management	Calculator	15 - 20 years
pb25	Cost management	Scheduling & Logistics	over 20 years
pb26	Cost management	Calculator	over 20 years

Next, the correlations between the factor scores are presented (table C-7). The correlations are round 0.500, which indicates that the participants value collaboration in the same way, but there are some descending factors as well.

Table C-7 Correlations between the factor scores of the building sector

	Factor 1	Factor 2	Factor 3
Factor 1	1.000	0.5714	0.5746
Factor 2		1.000	0.4685
Factor 3			1.000

C.3 Comparison between the building and infrastructure perspectives

Justification of comparison

To compare the results of the building and infrastructure, first a research is done if the results of the infrastructure sector will be the same in case of a Bouwteam agreement. Therefore, the participants are asked whether they would prioritise the factors in the same way in case of a Bouwteam agreement. Although none of the respondents would change the essential factors, some of them indicate some minor changes which are outlined in table C-6.

Table C-8 Overview of changes respondents of the infrastructure sector will make for Bouwteam agreements

Perspective	Participant	Changes in case of a Bouwteam agreement
I2	1.	An integrated project team (sf27) will be more important since a joint development is important and therefore an integrated project team is needed.
I1	3.	The importance of a clear formulated contract will increase (to be sure that you also can construct the project), the fair risk allocation (sf9) will decrease because that is related to the execution phase.
I2	9.	Striving for equalities in behaviour and duties for client and contractor (sf25) will be more important, to avoid envy about time invested in the project (due to different payment rules at the mother company).
I1	11.	The soft skills will be more important (trust (sf33), transparency (sf23), good communication (sf35)).
I3	13.	Payment arrangements (sf10) and a fair risk allocation (sf9) will be more important, because that are the biggest differences between a Bouwteam and a DBFM.
I2	15.	The risk allocation (sf9) and the win-win attitude will be more important than in case of a DBFM agreement because of the joint process of a Bouwteam.
I1	18.	The risk allocation (sf9) and the shared risks (sf13) will be more important in a Bouwteam, because you can exert more influence on it than in case of a DBFM.
I1	20.	The financial range (sf11) and the shared risks (sf13) will be more important, because the formulation of the contract prior to the Bouwteam phase will be important.
I3	23.	A fair risk allocation (sf9), the payment arrangements (sf10) and the financial range (sf11) will be more important because it is more important to formulate contractual arrangements since the parties are independently represented in the team.
I2	25.	Hard aspects will be prioritised above the soft aspects: tasks and roles should be clearly defined at the start of the process, so that mutual trust can grow.

Quantitative comparison of single P-sets

Next the perspectives are quantitatively compared on the factor arrays. The factor array is chosen because this shows the ideal Q-sort of that perspective, what can be easily compared to another P-set. By comparing the factor arrays similarities in prioritisation can be found, what gives the degree in which participants in both sectors sort the cards in the same way. The Z-scores are used because they show the mean score of a certain success factor within a perspective, which shows de degree in which a factor got the same value. Figure C-1 shows the factor arrays of all perspectives. Although there are some large differences at certain success factors (e.g. sf 2 and 29), the mainly the perspectives follow the same trend.

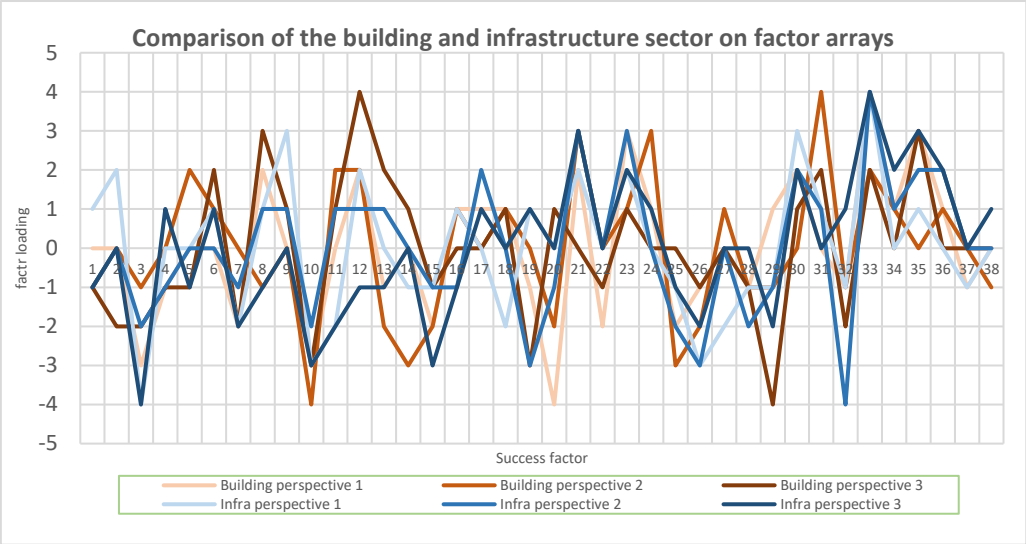

Figure C-1 Factor loadings of the several perspectives

Especially perspective B1 and I2 show great overlap according to the factor loadings (figure C-2). The largest differences occur at success factor 13, 16, 19, 20, 22, 26 and 32.

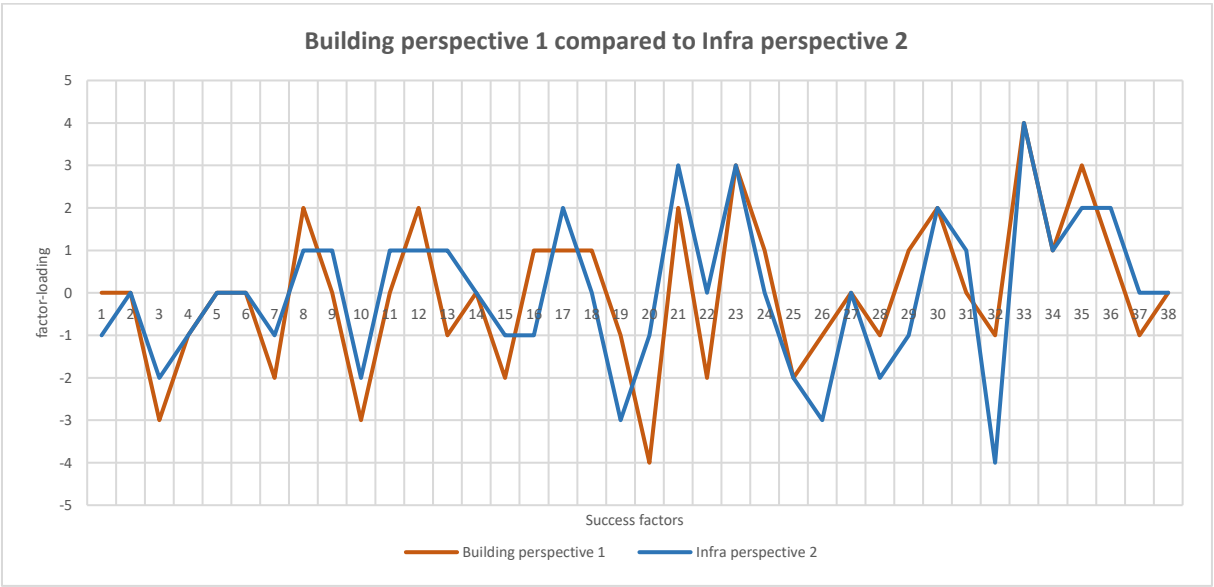

Figure C-2 Comparison of the building sector perspective 1 and the infrastructure sector perspective 2, based on the factor arrays of each factor

Next, the same is applied to the Z-scores (figure C-3). This figure indicates the same as figure C-1: although the perspectives share the same trend, for some success factors they largely disagree. In table C-9 the Z-scores are presented, to give the reader a more detailed overview of the differences in scores.

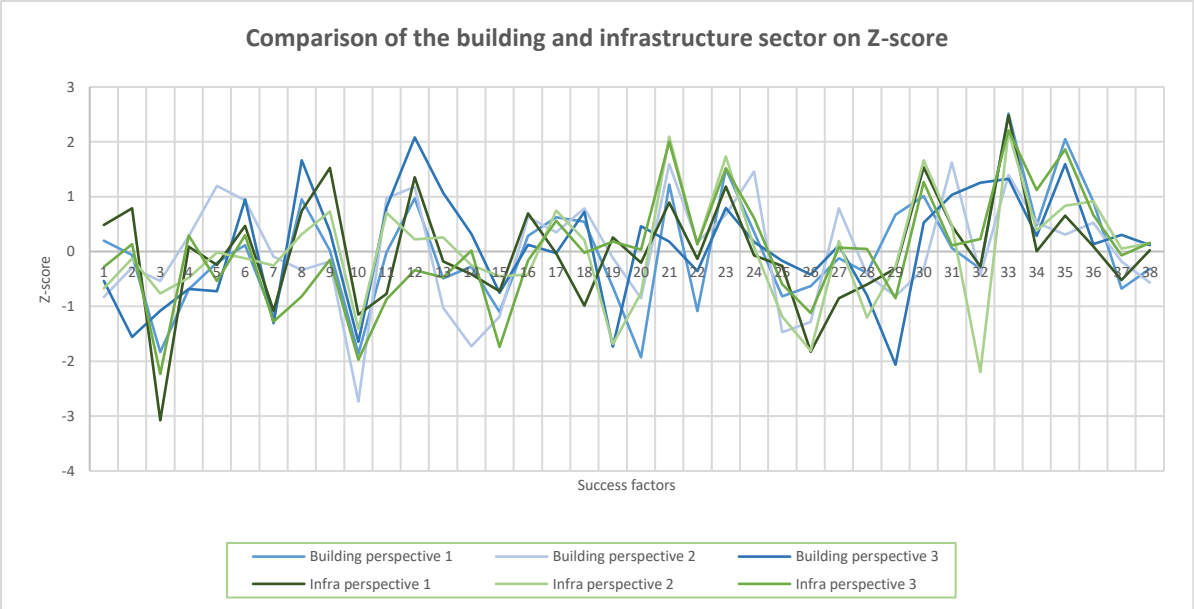

Figure C-3 Z-scores of the several perspectives

Table C-9 Z-score of the perspectives

Success factor	Building perspective 1	Building perspective 2	Building perspective 3	Infra perspective 1	Infra perspective 2	Infra perspective 3
1	0,196	-0,828	-0,539	0,482	-0,669	-0,278
2	-0,065	-0,29	-1,559	0,787	-0,127	0,132
3	-1,832	-0,537	-1,079	-3,076	-0,766	-2,232
4	-0,691	0,28	-0,684	0,086	-0,479	0,293
5	-0,203	1,194	-0,725	-0,244	-0,016	-0,538
6	0,118	0,935	0,951	0,468	-0,12	0,297
7	-1,194	-0,093	-1,31	-1,082	-0,258	-1,278
8	0,951	-0,339	1,663	0,741	0,317	-0,817
9	0,015	-0,18	0,368	1,521	0,73	-0,15
10	-1,859	-2,734	-1,648	-1,147	-1,414	-1,971
11	-0,013	0,973	0,803	-0,769	0,707	-0,869
12	0,97	1,181	2,08	1,354	0,219	-0,337
13	-0,492	-1,028	1,068	-0,181	0,254	-0,475
14	-0,275	-1,725	0,32	-0,417	-0,252	0,019
15	-1,103	-1,184	-0,754	-0,725	-0,45	-1,738
16	0,285	0,63	0,124	0,695	-0,419	-0,166
17	0,625	0,352	-0,031	-0,034	0,748	0,56
18	0,541	0,788	0,724	-0,985	0,212	-0,022
19	-0,65	-0,115	-1,734	0,256	-1,687	0,179
20	-1,927	-0,855	0,462	-0,207	-0,757	0,033
21	1,218	1,593	0,181	0,893	2,092	2,003
22	-1,085	0,167	-0,359	-0,137	0,127	0,134
23	1,506	0,67	0,792	1,186	1,735	1,514
24	0,355	1,461	0,176	-0,073	0,084	0,611
25	-0,816	-1,472	-0,171	-0,26	-1,187	-0,595
26	-0,628	-1,282	-0,423	-1,827	-1,809	-1,121
27	-0,124	0,787	0,109	-0,855	0,193	0,07
28	-0,39	-0,422	-0,799	-0,604	-1,2	0,047
29	0,668	-0,815	-2,064	-0,312	-0,275	-0,85
30	1,012	-0,316	0,523	1,534	1,66	1,265
31	0,064	1,622	1,033	0,469	0,48	0,113
32	-0,313	-0,425	1,253	-0,275	-2,196	0,225
33	2,515	1,393	1,325	2,481	2,185	2,209
34	0,477	0,525	0,284	0,007	0,386	1,12
35	2,047	0,309	1,592	0,651	0,832	1,86
36	0,911	0,527	0,132	0,094	0,914	0,667
37	-0,678	-0,179	0,301	-0,518	0,053	-0,068
38	-0,317	-0,567	0,116	0,024	0,153	0,156

Comparison on category level

Finally, both sectors are also compared at category-level (figure C-4). Due to the large variation in scores within a certain category it is difficult to draw conclusions regarding differences between the building and infrastructure sector. However, it can be concluded that infrastructure perspective 3 scores much lower on contract-related aspects than the other perspectives (including building and infrastructure).

De Hoog (2020) used to categories of Suprapto (2016) to compile the Q-set. This categorisation can be found in table B-3. To compare the building and infrastructure sector, the total Z-scores per category are used. Due to the enormous range of scores within a category, little conclusions can be drawn on this. However, the contract category shows an interesting picture: the third infrastructure perspective gives a low value to success factors of this category according to other perspectives.

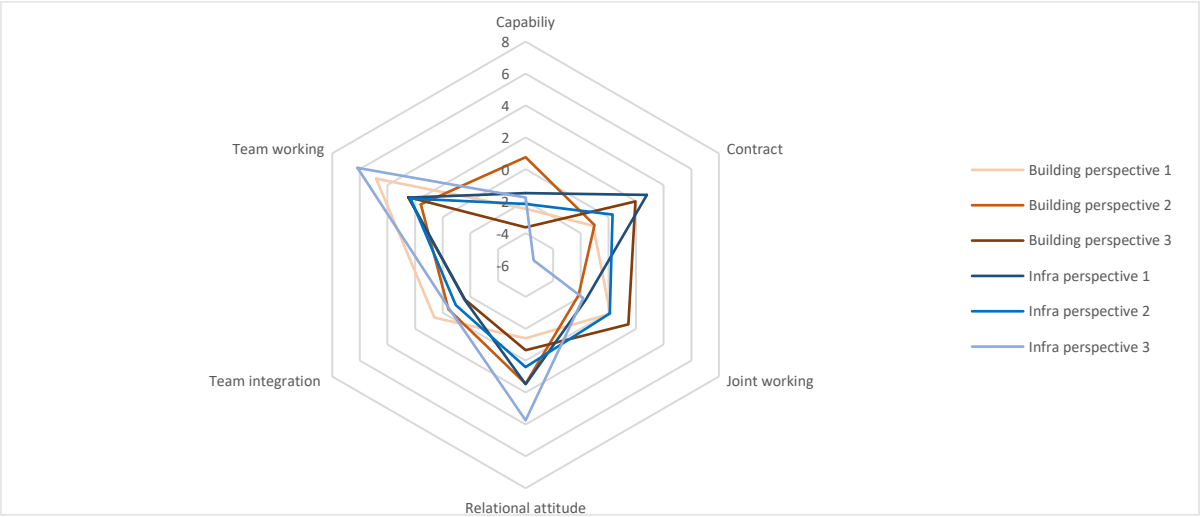

Figure C-4 Z-scores per perspective on six categories

C.4 Comparison: combined P-set

Next, the Q-sorts of the building and infrastructure participants are combined to one set and analysed with PQMethod. Table C-10 gives an overview of the several solutions. The fourth-factor solution is chosen, because of the high number of defining sorts compared to other solutions.

Table C-10 Overview of factor characteristics (combined P-set)

	2-Factor	3-Factor	4-Factor	5-Factor	6-Factor	7-Factor
Cumulative explained variance	43%	49%	54%	58%	62%	66%
Acceptable factors	48	41	36	30	28	24
Defining sorts	2	3	4	5	5	5

The total P-set (including 25 building participants and 25 infrastructure participants) is analysed in PQMethod. The factor extraction is based on the rules of thumb presented in chapter 5.2.1 (table C-8). The fourth factor is selected, since this factor conforms most to the rules (the number of distinguishing statements is low, but high compared to other factors (table C-10)). A rotation of +5 degree of factor 1 and 4 is chosen for the final factor solution in order to include more infrastructure participants. This finally results in a loading of 11 participants (22%) on factor A, 9 (18%) participants on factor B, 6 (12%) participants on factor C, 10 participants (20%) at factor D and 14 participants (28%) without a loading on a factor (non-loaders) (table 5-3). The non-loaders are mainly originating from the infrastructure sector (20%).

Table C-11 Composition of the combined P-set

	B1	B2	B3	Non-loader B	I1	I2	I3	Non-loader I	Total
Factor A	4	0	0	0	2	1	4	0	11
Factor B	1	7	0	0	0	1	0	0	9
Factor C	3	0	0	0	2	0	1	0	6
Factor D	0	0	6	0	0	4	0	0	10
Non-loaders	2	0	1	1	2	5	3	0	14
Total	10	7	7	1	6	11	8	0	50

Perspective A is presented by the three infrastructure perspectives, supplemented with four participants of the first building perspective. Perspective B is mainly presented by the second building perspective (supplemented with another building participant and one infrastructure participant). Perspective C is only presented by six participants (including three participants of building perspective 1 and three infrastructure participants), while perspective D is presented by six participants of the third building perspective and four participants of the second infrastructure perspective (figure 5-10). Next, these new perspectives (A, B, C and D) are compared with the initial building and infrastructure perspectives. Hereby the focus is on the differences and similarities of both sectors rather than on the description of the perspectives.

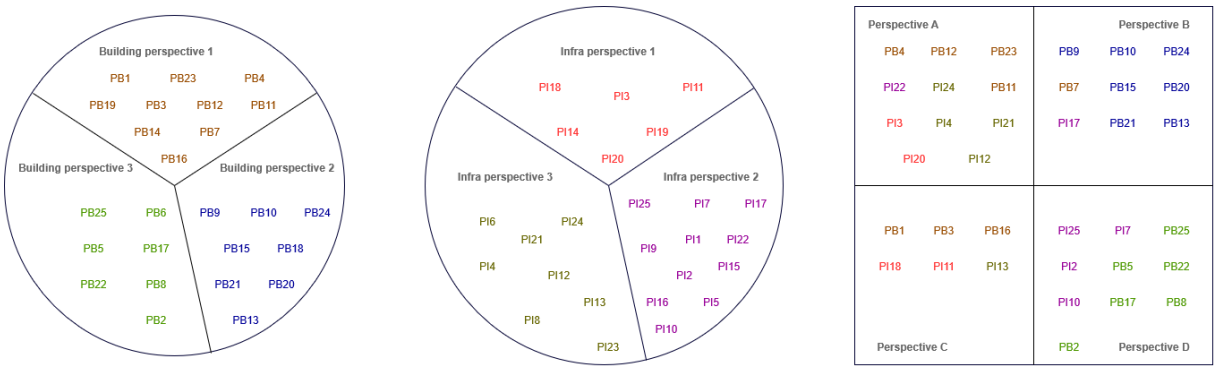

Figure C-5 Classification of the participants under the different perspectives

Perspective A: Strong relationship through understanding mutual objectives and risks

Although this perspective is presented by the same amount of respondents of perspective B1 (relationship first) and perspective I3 (strong relationship within the team), the factor scores show the greatest overlap with the third infrastructure perspective, which is mainly caused by the high score of success factor 21: Understanding each other's objectives. In contrary to the initial perspectives B1 and I3 the fair risk allocation is high valued (0 vs +2). Next, this group of respondents shows a larger overlap according to the least essential factor (Z-score of -2,439 vs -1,826 (B1) and -2,232 (B2)). The perspective of this participants can be summarised by a focus on relationship in which the understanding of the objectives of each other and a fair risk allocation are essential to achieve this relationship. This perspective is largely presented (64%) by infrastructure participants.

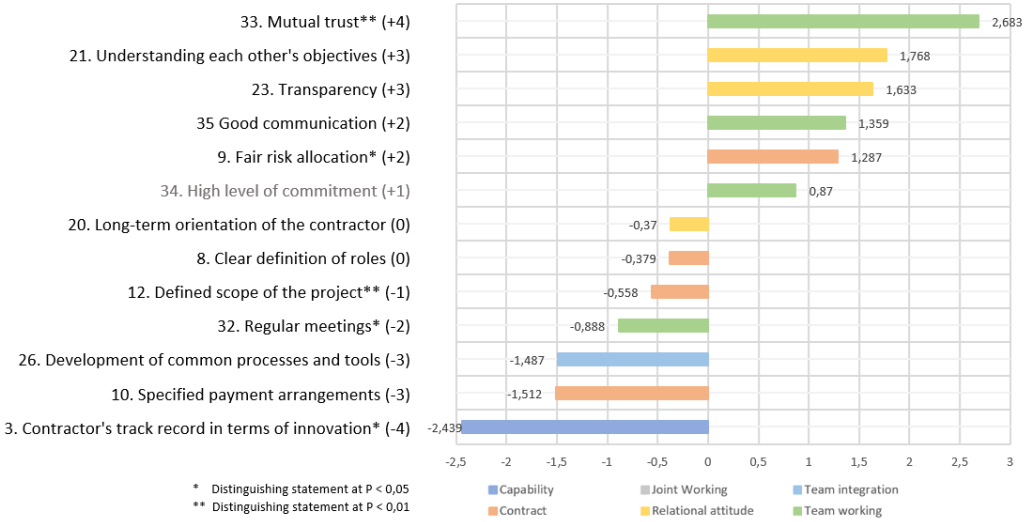

Figure C-6 Factor scores of perspective A (the consensus statements are grey-coloured)

Perspective B: Early involvement of right people

This perspective is largely represented by participants of perspective B2 (78%) and shows the same ideal Q-sort as perspective B2: Involving the right competent people early in the project of which senior management and the project leam leader can be part is essential to this perspective. The people involved want to understand each other and define common goals in order to create a win-win attitude. It is desirable to be involved early to influence and steer the project, but at the same time, it is less essential to exchange much information and work together through joint processes. Since this perspective is mainly represented by building participants (89%) it is classified as a building perspective rather than an infrastructure perspective.

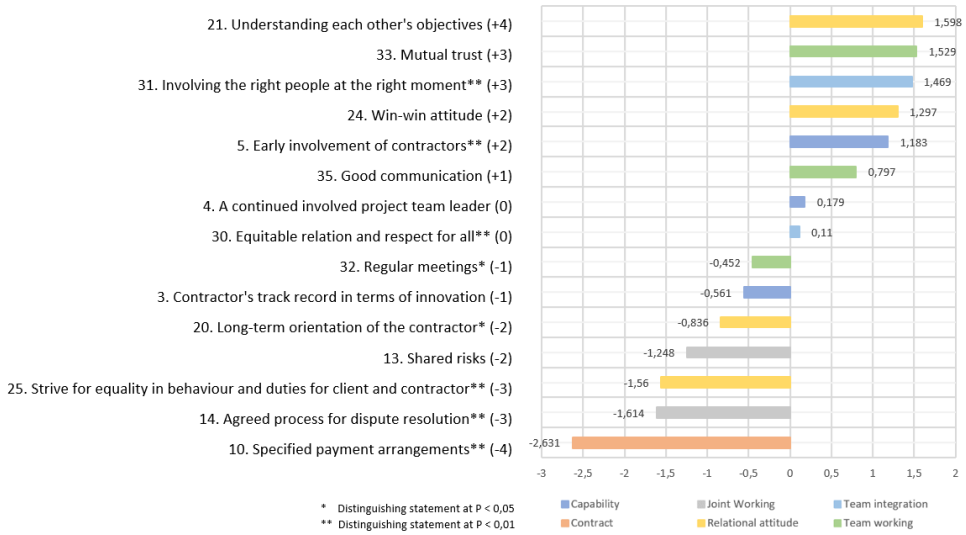

Figure C-7 Factor scores of perspective B

Perspective C: Scope & Relation

This perspective is defined by only six participants (12% of the total P-set) and is represented by an equal amount of building and infrastructure participants (3xB1, 2xI1, 1xI3). It shows little overlap with the original perspectives: the definition of the scope of the project is the most essential factor according to this perspective (which is the same for B3), while it is valued neutral (+1) in the original statements. While the risk allocation was originally high valued for I1 (+3), now it is less essential (-2). All of the infrastructure participants in this perspective would make changes in case of a Bouwteam agreement. Two of them would make the risk allocation (sf9) more important, while one of them would prioritise the soft skills.

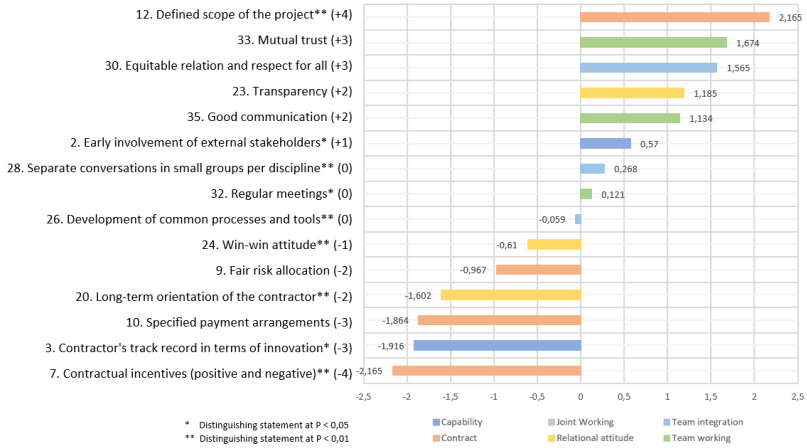

Figure C-8 Factor scores of perspective C

Perspective D: Relation and clarity above structuring the process

This perspective is the most surprising, since it is represented by participants of perspective B3 (Structure first) and I2 (Personal values above structure). Partly this is a question of definition since perspective B3 is in favour of identifying and determining the variables of the process, while perspective I2 attach little value to the design of the process (including regular meetings, development of common processes and tools, separate conversations and the support of the senior management). Moreover, on the positive values the perspective shows large similarities with perspective I1, but none of them is involved in this perspective. This can be explained by the fact that the distinguishing statements of perspective D are mostly negative, while the of I1 are mostly positive. Although the perspective is largely represented by participants of the building sector, the relational aspects score high (which is more a characteristic of the infrastructure sector).

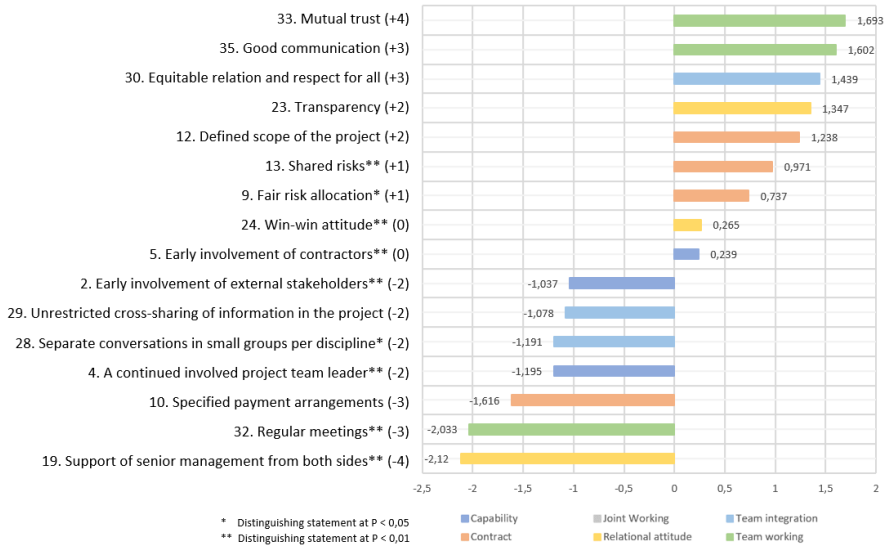

Figure C-9 Factor scores of perspective D

C.5 Comparison on success factor level

To compare the result of the building and infrastructure sector on success factor level, both the Z-scores and the mean factor arrays are compared.

Comparing the Z-scores

Comparing the Z-scores of the building and infrastructure sectors shows that the infrastructure sector scores higher than the building sector (table C-12, Z-scores > abs (1,5) are blue shaded). Therefore, it can be concluded that the infrastructure shows more mutual agreement about the characterising statements than the building sector (which is also confirmed by the correlation matrixes of both sectors, table C-3 and C-7). The statements with the largest difference between the building and infrastructure sector (ΔZ > 1,0; orange shaded) are: defined scope of the process (sf12, building sector scores higher), equitable relation and respect for all (sf30, infra sector scores higher) and regular meetings (sf32, building scores higher). Moreover, there are also a lot of similarities (ΔZ < 0,2; green shaded).

Table C-12 Comparison of the average Z-scores of the building and infrastructure sector

Success factor	Average Z-score Building	Average Z-score Infra	Δ Z-score
1	-0,33748	-0,26764	0,06984
2	-0,55532	0,17524	0,73056
3	-1,20676	-1,78952	0,58276
4	-0,37832	-0,09636	0,28196
5	0,09788	-0,23776	0,33564
6	0,61268	0,15456	0,45812
7	-0,87416	-0,78216	0,09200
8	0,73756	0,05588	0,68168
9	0,05144	0,63824	0,58680
10	-2,07992	-1,52816	0,55176
11	0,53100	-0,15156	0,68256
12	1,34832	0,31348	1,03484
13	-0,22672	-0,08368	0,14304
14	-0,57240	-0,20488	0,36752
15	-1,03120	-0,92816	0,10304
16	0,35032	-0,07068	0,42100
17	0,35396	0,50016	0,14620
18	0,67128	-0,15016	0,82144
19	-0,78232	-0,62356	0,15876
20	-0,91504	-0,37220	0,54284
21	1,04764	1,77576	0,72812
22	-0,48108	0,06588	0,54696
23	1,03856	1,53252	0,49396
24	0,65880	0,21496	0,44384
25	-0,84532	-0,77508	0,07024
26	-0,77988	-1,59316	0,81328
27	0,23276	-0,09788	0,33064
28	-0,51476	-0,65792	0,14316
29	-0,57152	-0,46788	0,10364
30	0,45012	1,50336	1,05324
31	0,83388	0,35992	0,47396
32	0,08964	-0,96024	1,04988
33	1,82276	2,26372	0,44096
34	0,43832	0,52992	0,09160
35	1,36344	1,11752	0,24592
36	0,57000	0,63816	0,06816
37	-0,24420	-0,12276	0,12144
38	-0,27576	0,12300	0,39876

Comparing the mean factor arrays

Next, the mean factor arrays (MFA) are observed (table C-13). The factor array shows the ideal Q-sort of a factor (McKeown & Thomas, 2013). Hypothetically this is the Q-sort of a participant that loads 100% on a factor. Out of this table, the factors with a difference of two are extracted (blue shaded).

Table C-13 Mean factor arrays of the building and infrastructure sector

Success factor	Building sector	Infrastructure sector	Δ Score
1	0	-1	1
2	-1	1	2
3	-3	-4	1
4	-1	0	1
5	0	-1	1
6	1	1	0
7	-2	-2	0
8	2	0	2
9	0	2	2
10	-4	-3	1
11	1	0	1
12	3	1	2
13	0	0	0
14	-1	-1	0
15	-3	-2	1
16	0	0	0
17	1	1	0
18	1	0	1
19	-2	-1	1
20	-2	-1	1
21	2	3	1
22	-1	0	1
23	2	3	1
24	1	1	0
25	-2	-2	0
26	-1	-3	2
27	0	0	0
28	-1	-1	0
29	0	-1	1
30	0	2	2
31	2	1	1
32	-1	-2	1
33	4	4	0
34	1	1	0
35	3	2	1
36	1	2	1
37	0	0	0
38	0	0	0

Differentiating statements

Next the factors with a Z-score > abs (1,5) and a ΔMFA of 2 are used as the main differentiating statements. These statements are presented in table C-14. The factors on which the building sector scores higher (8, 12, 26) are process-related, while the factors on which the infrastructure sector scores higher (2, 9, 30) show more diverse topics: external stakeholders, risks and relationship. Especially the high score of the infrastructure sector on risks is striking, because 28% of the infrastructure respondents would rank these success factor higher in case of a Bouwteam, which will make the potential difference higher. Moreover, three factors are related to the contract (8, 9, 12) and two factors are related to team integration (26, 30).

Table C-14 Most differentiating statements in the mean factor arrays

No.	Description	Building sector	Infrastructure sector
2.	Early involvement of external stakeholders	-1	1
8.	Clear definition of roles before the project starts working	2	0
9.	Fair risk allocation	0	2
12.	Defined scope of the process	3	1
26.	Development of common processes and tools	-1	-3
30.	Equitable relation and respect for all	0	2

Matching statements

When determining the similarities, the characterising statements (-4, -3, -2 and +2, +3, +4) are observed. Hereby stands out that the positive values are indicated by the infrastructure sector, while the negative values are indicated by the building sector.

Table C-15 Most matching characterising statements

No.	Description	Building sector	Infrastructure sector
3.	Contractor's track record in terms of innovation	*-3*	*-4*
10.	Specified payment arrangements	-4	-3
15.	Performance management	-3	-2
21.	Understanding each other's objectives	2	3
23.	Transparency	2	3
33.	Mutual trust	4	4
35.	Good communication	3	2

Comparison of factor arrays and Z-scores shows the differences and similarities at success factor level. The most differentiating statements are: (2) Early involvement of external stakeholders, (8) Clear definition of roles before the project starts working, (9) Fair risk allocation, (12) Defined scope of the process, (26) Development of common processes and tools, (30) Equitable relation and respect for all and (32) Regular meetings. The similarities are identified based on the matching characterising statements (-4, -3, -2 and +2, +3, +4), namely: (3) Contractor's track record in terms of innovation, (10) Specified payment arrangements, (15) Performance management, (21) Understanding each other's objectives, (23) Transparency, (33) Mutual trust and (35) Good communication.

D. Q-interviews

This appendix aims to present the procedure used to collect the Q-statements and explanation of the respondents (post-sorting questions). Therefore, in appendix D.1 the whole online Q-procedure is presented. This procedure was originally set up in Dutch but translated for this report. In appendix D.2 the summaries of the answers on the post-sorting questions are presented.

D.1 Q-procedure

The whole Q-procedure includes three steps: the collection of general information about the client and project, the sorting of the success factors and the post sorting question. The first step, was executed online, using google-docs. The second and third step are done with Skype for business (except of four persons, who are interviewed at location, using the same procedure).

Step 1: collection of participant and reference project related information

This form contains the first part of the Q-study to collaboration during the design phase of infrastructure projects. First some general questions are asked, then some project related questions. For the project related questions, I would like to ask you to consider the last (completed) infrastructure project that involved collaboration in the design phase. Use this project as a reference when answering project-related questions.

General questions

1. What is your name?
2. For what organisation do you work?
3. What is your function within the organisation?
4. What is your gender?
5. What is your highest education degree obtained?
6. How many years of relevant work experience do you have in the infrastructure sector?
   - ☐ 0-5 years
   - ☐ 5-10 years
   - ☐ 10-15 years
   - ☐ 15-20 years
   - ☐ Over 20 years
7. In how many infrastructure projects are you involved in the design phase of the project (including the project you are currently involved in, if that is the case)?
   - ☐ 0-5 projects
   - ☐ 5-10 projects
   - ☐ 10-15 projects
   - ☐ 15-20 projects
   - ☐ Over 20 projects

8. With what type of contracts involving client-contractor collaboration in the design phase are you experienced?

    ☐ Alliance

    ☐ Bouwteam

    ☐ DBM

    ☐ DBFM

    ☐ D&C

    ☐ Two-phase contracts

    ☐ E&C

    ☐ Other: …….

Project-specific questions

9. What is the name of the project?
10. What is the total budget of the project?
11. Under what contract form is the reference project carried out?
12. Have you / are you directly involved with client-contractor collaboration in the design phase?

    - Yes
    - No
    - Other: …….

13. Were you present at project meetings between the client and contractor during the design phase of the project?

    - Yes
    - No
    - Other: ……

Step 2: Q-sorting

In this document the second step of the Q-research is explained: the sorting of the success factors. The meeting will be carried out by Skype for business. The researcher will share her screen (including editing), in order to enable you to make changes.

1. When the test begins, you will see 38 success factors on the left of the screen. An overview of the success factors printed on the cards can be found on page 2.

2. Read a card and ask yourself:
   'Essential for collaboration during the design phase to achieve a successful project delivery is:'
   For each success factor, determine whether you think the success factor is essential, neutral or not essential. Sort the cards into three groups: "essential for cooperation", "not essential for cooperation" and "neutral". You can do this by dragging the cards to the appropriate box on the right side of the screen.
   Before proceeding to step 3, the researcher notes the number of individual tickets per section.

3. After all cards are divided into 3 groups, you will see the sorting scheme on your screen. Then you will organize the cards from the “essential for cooperation” box. Select from this group the success factor that is most essential for collaboration and put this in the column “+4”. Then select from the remaining cards the two success factors that are most essential for cooperation and put these cards in the column “+3”. Continue until all tickets have run out (even if you end up on the left side of the score sheet).
   Please respect the format indicated; cards can only be placed on marked boxes.
4. Repeat step 3 for the pile “not essential”, starting at the “-4” side.
5. Take the group “neutral” and put the cards in the remaining empty boxes.
6. After placing all cards, take a look at the sorting scheme. If desirable, rearrange the success factors until satisfactory.
7. When you are finished with the sorting process, the researcher will save the file.

Step 3: Post-sorting questions

For the characterising statements, the following questions are asked:

1. Can you explain how you interpreted the success factors placed in the box of +3/+4/-4?
2. Can you explain why you placed the success factor in those boxes?
3. Is this success factor in your opinion related to other participants in the collaboration?
4. What resources are required to implement these success factors?
5. What are potential obstacles for implementing these obstacles?
6. In what phase should the success factor be implemented?

Additionally, the same questions are asked for two more success factors. First, the question is asked for one success factor chosen by the participant from the Q-set, and secondly for one additional success factor not yet included in the Q-set.
Next, the definition of the Bouwteam used in this research is shown to the interviewee:
The Bouwteam is a temporary collaboration agreement during the design phase in which the participants – including at least client, contractor and designer – cooperate towards a feasible design with an associated risk log and building contract. To this end, each of the participants performs the tasks related to their experience and expertise while retaining their independence and responsibility.

7. How do you expect your choice of “most essential” (+3/+4) would be in case of a Bouwteam agreement?

The Q-interview is concluded by giving the participant the opportunity to give additional information or additions to the interview if desired.

D.2 Summary of Q-interviews

Participant 1

Success factor 33: Mutual trust (+4)
If there is no trust between the client and contractor, the project will fail. It is the fundament of the relationship. Whether people trust each other depends on how people fit together on a personal level. Building a team is essential for trust. When putting a team together it is important to notice this aspect. Currently at the contractor’s side this happens already, but it is also important to match the client’s team with the contractor’s team.
An obstacle that can hinder mutual trust is ‘old behaviour’: the client opinions that the contractor

prices to high, resulting in high profit margins and the contractor feels like the client gives the whole responsibility, including for the risks to the contractor. Fortunately, this behaviour is on its way out.
Success factor 30: Equitable relation and respect for all (+3)
For a good relationship, you also need to respect each other.
Success factor 21: Understanding each other's objectives (+3)
It is important to understand each other's objectives, although most of them are already clear: the contractor wants to realise a certain project with a fair profit margin, the client wants the realisation of a certain project.
Success factor 25: Strive for equality in behaviour and duties for client and contractor (-4)
Equality in behaviour is possible, but equality in tasks not. In case of a DBFM-agreement the client has completely different tasks than the contractor. Each party should act within their own role and execute the tasks they are good at.
This are the fundamental aspects of a good collaboration. A fair risk allocation (+2) is also important and should be formulated in a contract and can promote the understanding of each other's objectives (+3). But a fair risk allocation without trust brings nothing.
The most important aspects are the 'soft aspects', which can't be prescribed or defined. The participant gave a relatively low priority to transparency (-1). This is because he opinions that there are different layers in transparency. The client and contractor should be transparent to each other about the aspects they are doing together. But transparency about the aspects they are not doing together is not needed.
The participant argues that in case of a Bouwteam agreement an 'integrated project team' (sf 27) will be more important, than in case of a DBFM agreement. In a Bouwteam a joint development is important and therefore an integrated project team is needed. The three most essential success factors will be the same as in a DBFM agreement, but more difficult to realise because more parties are involved. A DBFM agreement is a two-party collaboration, a Bouwteam however is multiparty collaboration.

Participant 2

Success factor 30: Equitable relation and respect for all (+4)
This factor is mentioned as a human value of the respondent, independent of the environment (private / work related). The respondent mentioned that he always tries to treat people with respect. If you treat someone with respect, you will get the same.
Success factor 23: Transparency (+3)
Transparency is closely intertwined with the alignment of objectives. For transparency it is important to be as honest as possible at the start of je project.
One of the key factors to achieve a good relationship is 'vulnerability'. If you are vulnerable, then someone else will be to. People who wants to take advantage of your honesty are betraying themselves at that time. From that moment you can start to build on a transparent relationship.
Success factor 36: Alignment of objectives (+3)
Collaboration is important, but both client and contractor have their own objectives. The contractor wants to make profit, the client's goal is the realisation of a nice project, with as little worries as possible. It is important to be transparent about these objectives at the beginning of the project because that makes the rest of the project easier. According to the respondent it is important to implement these success factors as early as possible (depending on the contract type).
Success factor 32: Regular meetings (-4)
The respondent has the opinion that often meetings are planned without a goal, just because they promised in the plan to have regular meetings. In the opinion of the respondent a meeting has only added value if the goal of the meeting is clear for each participant. It is not about the frequency of the meetings, but about the content.

The respondent believes that the biggest obstacle for collaboration is a lack of knowledge at the client side. In his experience it is very hard to collaborate with people who have no substantive knowledge. He also mentioned the 'problem of the specialists. Most specialist are very good in their discipline, but do not understand the impact of their actions on the work of another discipline.
In case of a Bouwteam agreement, the respondent would prioritise the success factors in the same way. He believes that the contract type should not affect the way of collaboration. For collaboration, a certain behaviour and framework is needed, and the respondent always prioritise behaviour above frameworks. He also mentioned the relation with his personal values: "The most essential factors reflect my personal values."

Participant 3

Success factor 33: Mutual trust (+4)
For the respondent it is important that both the client and contractor have the same intentions at the start of the collaboration. According to the respondent this entails the best for the project as well as a fair profit margin for the contractor. If one of the parties does not agree with this, there is no ground for collaboration. In that case both parties will rely on the contract, and the collaboration is gone. Trust is the basis for a good relationship, if you do not trust each other, it is impossible to cooperate.
Success factor 21: Understanding each other's objectives (+3)
For both parties it is important to understand the objectives of the other party. If the contractor is not able to understand the objective of the client, it will be difficult to search for the best solution for the problem.
Success factor 9: Fair risk allocation (+3)
"If the risk allocation is not fair, it is impossible to collaborate." If the risk allocation is not fair, one of the parties will pay for the risks. This risk allocation should be clearly formulated in the contract. In the past, the risk allocation for Rijkswaterstaat was not fair according to the respondent and in that case, it is impossible to collaborate.
Success factor 3: Contractors track-record in terms of innovation (-4)
The respondent argues that experience with innovation is not a condition for good collaboration. Also, a company who is not experienced with innovation can be a good partner.
The most essential factors are only secondary related to other parties. The primary relation between the client and contractor is sufficient for good collaboration. However, it is important to know what the needs of other parties are because that enables you to act in line with that type of needs.
As important factors to stimulate collaboration, the respondent mentioned several aspects. In the first place the 'support of senior management from both sides' (+2). He argues that collaboration should be promoted from the top of both client and contractor. Next, it is important that the people who cooperate are also authorised; that they get a mandate to take decisions.
Besides, he mentions the importance that the people who speak to each other have sufficient soft skills. There should be no bias and 'old behaviour' should be avoided. One of the obstacles for collaboration is a lack of trust, often caused by prejudices. From the contractor's side the thought could be present that the client does not have the required expertise and from the client's side that the contractor wants to make irresponsible profit.
The respondent mentioned the importance of an early fundament of collaboration. If the collaboration starts if the problems already occur, then it will be difficult to find each other. Especially the process related aspects should be implemented as early as possible, where after the process can be completed.
In case of a Bouwteam agreement, the importance of a clear formulated contract increase, mainly to have the security that you will also be the company who may carry out the project. A fair risk allocation will decrease because that is more related to the execution phase.
The respondent mentioned that the revenue model of the contractor contradicts to the Bouwteam model. The contractor wants to accept a certain project, including the risks and opportunities. In a Bouwteam agreement in the design phase however, the contractor will be paid per working hour (which is the revenue model of a consultancy). Only if the chance to be the final contractor is huge,

the contractor will join to the Bouwteam.
The respondent mentioned that the design phase of a Bouwteam does not meet the objectives of the contractor if it is cost effective. The client does not always take this into account.

Participant 4

Success factor 33: Mutual trust (+4)
Without mutual trust it is impossible to collaborate. In the ideal situation every participant will be open and honest. If there is no trust in a team it is better to stop the collaboration or look for another contract. If there is no trust, people will check and control the actions of other participants.
Success factor 21: Understanding each other's objectives (+3)
People who trust each other are willing to achieve the best possible end-result. The understand of each other's objectives it thereby of great importance. By knowing the objectives of the participants, you also know why they make a certain choice.
Success factor 35: Good communication (+3)
In order to understand each other's objectives, communication plays an important role. It is important to communicate clearly, whereby the understanding of the language / choices of words of other participants is of great importance.
Success factor 3: Contractors track-record in terms of innovation (-4)
Innovation is not always necessary for collaboration but depends on what the client asks of the contractor.
For a successful collaboration is important that all parties within the team agree with these most essential values. Besides, it is also important that all participants have 100% commitment to the project and show that they trust each other. Other important tools are a kick-off at the start of the project and a mix of different personalities within a team. Reserved confidence is one of the most important obstacles for collaboration mentioned by the participant. In the ideal situation the participant would implement these essential factors straight after the client have put the project on the market.
In case of a Bouwteam agreement the participant would not change the sorting of the cards. He believes that with these three core values it always will be possible to collaborate, independent of the type of contract, payment arrangements and risk allocations.

Participant 5

Success factor 33: Mutual trust (+4)
Collaboration is only possible if there is mutual trust. If there is no trust, the process will be very difficult, because every single action will lead to extra discussions.
Success factor 36: Alignment of objectives (+3)
If the objectives are not discussed at the start of the project, then during the process it will be unclear why certain choices are made, or certain behaviour occurs .
The collaboration must really lead to something. Therefore, the final result should also be good, which is only possible if the objectives are clear from the start of the project. It is of great importance that the participants are familiar with the final goal of the project.
Success factor 37: Have an elaborated project start up with the participants (+3)
It is important to know who people are and which type of persons are involved in the project, because that enables you to act in line with that. Therefore, an elaborated joint start up is important.
Success factor 1: Sufficient resources for collaboration (-4)
The participant mentioned the vagueness of the term 'recourses. Next, he argues that the willingness to collaborate is more important than the resources. If people have the willingness to cooperate, the resources are of minor importance.
The essential aspects are important for both internal and external stakeholders. A good coordination positively influences the collaboration. Hereby it is also important to know the objectives of each party, even if they contradict to the client's objectives.

The respondent noticed that three of the aspects are related to the project leader. That suggests that one person influences the whole project. The respondent argues that this depends on the size of the project. In case of large project, it is an illusion to attribute such a great influence on a single person. However, he sees a large role for the team manager who initiates the project. It is important that these managers emphasize the factors mentioned under +3/+4, mainly by the organisation of project start-ups.
In case of a Bouwteam agreement, the respondent would not change the Q sort. He argues that the most essential aspects are always important to achieve a successful collaboration. The type of team (type of collaboration) has no influence on that.

Participant 6

Success factor 6: Team leader's leadership ability (technical, organisational, coordination, motivational, experienced) (+4)
The right people at the right place. The respondent experienced that the team leader's ability to anticipate at the project environment is very important to achieve a successful project delivery. As a team leader it is important to know how to connect to the client; how the open the door and get cooperation again.
Success factor 35: Good communication (+3)
The respondent observed that bad communication is often the cause of poor project presentations. Bad communication can include miscommunication, bad documentation, consciously withholding information and lack of communication. In communication there is always a sender and receiver. Therefore, it is also important that the client shows a flexible attitude and adapt to the situation.
Success factor 4: A continued involved project team leader (+3)
It is impossible to fully delegate tasks to other people in the project. Even project participants who are very experienced and able to work independent needs compliments and feedback. Therefore, as a project team leader it is important to be available and actively engage conversations with the team members. In the past the respondent worked for a company which was used to take 30% of the people of a project to a next project. A project team leader in that case knows already a part of the team, what makes the team much more stable and makes it also easier for the manager to manage the team.
Success factor 15: Performance management (-4)
Although the respondent noticed the importance of measuring the performance, he opinions that the management of performance hinders collaboration. Often performance management leads to an obligation to perform in terms of profit or progress. This pressure of obligation negatively influences the collaboration. However, it is important to know the end point: what should be reached finally and how do we perform. The respondent argues that good management is more important than expressing a certain ambition.
As one of the obstacles for the most essential factors for collaboration the respondent mentioned the lack of experience and skills at the client's side. As a result, discussions are not conducted during meetings, but by mails and documents. That makes it much harder and time consuming to take decisions.
In case of a Bouwteam agreement, the respondent would not change the Q sort. He opinions that the type of contract is not decisive for collaboration. It is more important to take the client with you in the process. If the client knows what to expect at a certain point in the process, that will benefit both the collaboration and progress of the project.

Participant 7

Success factor 21: Understanding each other's objectives (+4)
One of the most essential elements of collaboration is the understanding of the objectives of other participants. Therefore, it is important to understand why the client wants to realise a certain project. By knowing why, you want to achieve a certain end result and how that can be reached, it will be easier to perform this jointly.

Success factor 33: Mutual trust (+3)
Both transparency and mutual trust are essential for collaboration. Trust is fulfilling the promises without hidden agendas.
Success factor 23: Transparency (+3)
As the contractor promises to realise the project for a certain budget, he should fulfil this. If it becomes clear during the project that this is impossible, the contractor should communicate this openly to the client.
Success factor 32: Regular Meetings (+4)
Meetings and consultations are valuable. However, the respondent currently noticed a culture in which there are many meetings without a clear goal. Participants are waiting till the next meeting instead of discussing aspects when it is needed. According to the respondent it is important to meet each other at the moment you need to discuss something rather than meeting on regular basis.
A clear formulation of the goal of the project at the start of the project stimulates the most essential factors. This attitude is especially important for the client's side: they would like to realise a certain project. Additionally, the contractor can have an additional reason to realise the project within a certain period of time in case of subsidy schemes. If the contractor knows this, he can be able to act on this. As a client it is important to know that the contractor does not want to take an unreasonable advantage of this.
As obstacles a hidden agenda and old behaviour are mentioned by the respondent. It is important that both client and contractor dare to expose their worries. Even in case of a contractual agreement, as a contractor it is important to indicate if you are going to make a loss.
The respondent noticed that factors which are mentioned as less essential by the respondent are mainly tools for collaboration. He argues that it is important that the tool suits the collaboration. The goal is more important than the tool. The abilities of the project team leader are also low ranked, because the respondent opinions that the capacities of the whole team are important, rather than the of one person.
In case of a Bouwteam agreement the participant would not change the Q-sort because he believes that these elements are always essential for collaboration.

Participant 8

Success factor 33: Mutual trust (+4)
In collaboration the most important is to trust and respect each other.
The respondent mentioned that the circumstances due to Corona have a negative effect on trust. Trust comes during physical meetings, where non-verbal communication plays a big role. During digital meetings it is more difficult to see the non-verbal communication. Moreover, it is difficult to give everyone the same possibility to participate.
Success factor 34: High level of commitment (+3)
It is important that all of the team members show their commitment to the project.
Success factor 36: Alignment of objectives (+3)
Mutual trust, commitment and alignment of objectives are essential ingredients for a successful team, which is needed to achieve a successful project delivery. The respondent noticed that he prioritised human factors. The project manager (+2) plays an important role in the stimulation of these aspects. It is important that all the team members have these intrinsic values, otherwise it will harm the project. In some cases, this can lead to a change of the project team.
Success factor 7: Contractual incentives (positive and negative) (-4)
The respondent experienced that contractual incentives can negatively influence the collaboration. It gives a pressure in time/quality/money on the team. This can result in a lower degree of collaboration because the focus will be on something different than on collaboration.

Mistrust is the most important obstacle for good collaboration. Next it is important that the project team manager facilitates as much as possible. “Old behaviour” and a lack of mutual objectives can also be an obstacle.
The respondent mentioned also the long-term orientation of the contractor (+1). For the contractor it is important that the team successfully finished the process and the client positively experiences the collaboration. This is especially important because of the few clients of an infrastructure company.
The respondent argues that he does not agree with the current idea of a Bouwteam. It gives the client the opportunity to choose a different contractor for the construction phase. The respondent mentions it as important for the contractor to know that he also will be the party who will construct the final project. Only if the contractor is sure about this, the collaboration will be successful.
In case of a Bouwteam agreement the respondent would prioritise the factors in the same way, because it will be even more important to be aligned as a team.

Participant 9

Success factor 23: Transparency (+4)
Transparency is the open and honest communication about everything in the project.
Success factor 21: Understanding each other’s objectives (+3)
As a contractor you always have prejudices about the client: what he wants and what he expects. However, you are not sure whether it is the truth and therefore the verification of these prejudices is an important aspect in collaboration. Hereby it is important to communicate transparently what you are planning to make and ask the client whether it fulfils his requirements.
Success factor 33: Mutual trust (+3)
The respondent mentioned that the absence of a basis for collaboration will lead to nothing. Sometimes it is required to actively force this basis. Thereby it is important to be vulnerable, otherwise you would not get what you want to achieve.
Success factor 10: Specified payment arrangements (-4)
The respondent experiences that payment arrangements have a negative impact on the collaboration. It ultimately works against the contractor, because the legality of payment at the client side cannot always be demonstrated. If the contractor understands this problem of the client, he can ensure that the payment is properly substantiated.
As obstacles for collaboration the respondent mentioned payment arrangements, schedules and requirements. If the contractor gets paid at a certain progress rate, the contractor will act less transparent, because he is afraid of not getting paid in time. At both sides there are many control mechanisms which hinder collaboration.
The respondent experiences that discussing the risks of the project is a suitable medium to stimulate the most essential factors.
In case of a Bouwteam agreement, the participant would sort the Q-set in the same way, because these aspects are always important for collaboration. He also argues that striving for equalities in behaviour and duties for client and contractor will be more important, to avoid envy. In a Bouwteam people from the client, consultant and contractor will work together, often investing the same amount of time in the project, while the payment will be different (yes or gene overtime).

Participant 10

Success factor 30: Equitable relation and respect for all (+4)
Openness and respect from both the client and contractor’s side are very important. The respondent mentions that this is a core value for him.
Success factor 23: Transparency (+3)
Honesty is the best policy. The respondent experiences that the client often wants to shift all the responsibilities to the contractor.
Success factor 21: Understanding each other’s objectives (+3)
A contractor wants to make profit; a client wants to achieve the best quality.

Success factor 19: Support of senior management from both sides (-4)
The respondent interpreted it like he should support the senior management and has no idea how he should do that.
According to the respondent it is almost impossible to stimulate the most essential factors. It depends who is involved from the client's side, whether he wants to collaborate or not, whether he has another interest or not and past experiences with contractors. Entering into an open conversation would be helpful, but a client never will show all the cards. As a result, the contractor also will be less transparent. As possible obstacles for collaboration, the client mentioned the client's attitude and knowledge level. If the client is qualified, the contractor will almost always fully agree with the contract. If the client is less experienced, the client will fear that the contractor will change the design and ask for extra money.
The respondent mentions the innovative developments in the asphalt industry. However, it is almost impossible to apply the innovative asphalt because the clients are afraid of the long-term effects and would not assign locations as testing grounds. Without test locations there is also no progress in the innovation process. Therefore, the respondent argues that a fair risk allocation, joint problem solving and a clearly defined scope are needed. In the end innovation is only possible if both client and contractor are willing to innovate. Therefore, the right people at the right moment are needed.
Contractor's track-record in terms of innovation (-1): according to the respondent every contractor with innovative ideas should get the possibility to develop the idea. Sometimes the subcontractor of a main contractor has experiences with innovation. In that case according to the respondent it is important that the experiences of these subcontractor can count as experience for the main contractor.
The respondent does not agree with the part of the definition that states: "while retaining their independence and responsibility", because the actions taken are the joint actions of the Bouwteam members instead of independent actions of the different companies. The responsibility is also shared in his opinion. In case of a Bouwteam agreement the respondent would not change the prioritisation of the factors, because "this is the foundation for collaboration".

Participant 11

Success factor 12: Defined scope of the project (+4)
A clear definition of the scope at the start of the process is important because it prevents design changes during the process. However, at the start of the project it is often impossible to define the precise scope because many aspects are unclear.
Next it is also important that the client put's a clear question on the market: what is included in the project and what not. In case the project is awarded to the contractor, the contractor should check whether the scope is clearly defined. This can be done by a verification of the requirements with the client and external stakeholders.
Success factor 2: Early involvement of external stakeholders (+3)
The respondent is experienced with a project in which in a later stage of the process all the involved stakeholders and their interests were clear. This resulted in much more requirements and conditions than known at the start of the of the project. Therefore, he argues for an early involvement of external stakeholders, because that helps to define the scope. A stakeholder analysis is a helpful tool for this.
Success factor 6: Team leader's leadership ability (technical, organizational, coordination, motivational, experienced) (+3)
Because many things are unclear at the start of the process it is important that the team leader is able to manage these uncertainty.
Success factor 3: Contractors track-record in terms of innovation (-4)
The respondent argues that experience with innovation is not essential for a successful project delivery. Often innovative ideas are just a small part of the total project.

The respondent noticed that he placed a lot of 'soft skills' in the column +2. He opinions that the factors at +3/+4 are the fundament for what should be done (there should be no discussion about this). The aspects mentioned at +2 explain how the collaboration should be managed.
In case of a Bouwteam agreement the respondent argues that the soft skills will be more important. He experienced that in a project team it is important to totally trust each other and act transparently. In a client-contractor collaboration it is impossible to totally trust each other, because they both have their own objectives. The participant suggests that this will be different in case of a Bouwteam, because the Bouwteam is meant to jointly execute the project.

Participant 12

Success factor 21: Understanding each other's objectives (+4)
The client and contractor have different objectives (RWS: timely project delivery, less struggles with external stakeholders; contractor: make profit) and for a successful project delivery the understanding of these objectives is important. By knowing the objectives of each other, a solution can be sought which is optimal for both parties.
Success factor 36: Alignment of objectives (+3)
If both parties are aware of the objectives of the other party, they are also able to help each other to achieve the objectives. For example, the client can help the contractor with the biggest risks as well as the opportunities with additional work. Not all aspects are formulated in the contract, it is important as client and contractor to help each other in the grey-zones of the project.
The respondent argues that the alignment of objectives is not very difficult, but the objectives are not always compatible. Therefore, understanding the objectives is not a guarantee for a successful project delivery.
Success factor 35: Good communication (+3)
Collaboration will go well if you know where to find each other on personal level. Good communication is a key in finding each other on personal level. If it is possible to communicate honestly, much more can be achieved in the project context.
Success factor 29: Unrestricted cross-sharing of information in the project (-4)
In a large project there are many information documents. According to the respondent, the sharing of information is not desirable, because it does not add value to the collaboration.
The respondent placed 'regular meetings'(sf 32, +1) relatively high. He is not in favour of frequent consultation. However, frequent communication is necessary, which is not tied to meetings. 'Contractor's track-record in terms of innovation' (sf 3, -3) is low-ranked because the respondent does not see any relation between innovation and collaboration. The 'support of senior management from both sides' (sf 19, +1) is also important according to the respondent: "In order to work well together, you must be able to escalate.". In discussions it is important to have the opportunity to put the problem to a higher level in the organisation, because that prevents escalation at a lower level.
In case of a Bouwteam agreement, the respondent would not bring changes to the most essential factors. However, the sharing of information (sf 29, -4) would be more important, both client and contractor are part of the same project team. A fair risk allocation (sf 9, +2) will be less important, because the risks are allocated at the end of the Bouwteam phase. The financial range (sf 11, -2) will be much more important, because of the large influence on the project.

Participant 13

Success factor 21: Understanding each other's objectives (+4)
The understanding of the objectives of other parties is important to achieve project results. By knowing the objectives of the other, meeting wills be more efficient. If the contractor understands the objectives of the client and other stakeholders, you can add value for them and win trust. The respondent speaks a lot with water authorities and experienced that knowing their objectives smoothens the process of obtaining permits.
The contractor can stimulate this success factor by organisation start-up meetings in which the process

of realisation (what and how) is explained, as well as the financial aspects. Next, the contractor also explains by the project is complex and how they will mitigate that, which helps to get trust. Finally, they will speak about the list of requirements with the client in order to know exactly what they mean.
Success factor 33: Mutual trust (+3)
The respondent has a lot of conversations will clients and stakeholders and experiences that mutual trust helps to achieve the objectives.
Success factor 23: Transparency (+3)
The respondent has a lot of conversations will clients and stakeholders and experiences that transparency helps to achieve the objectives.
Success factor 3: Contractors track-record in terms of innovation (-4)
The respondent has no experience that these success factor has proved the collaboration. Besides for the respondent it is hard to determine what 'innovation' exactly entails. He notices that some aspects which are normal for the contractor are experienced as innovative for the client. Next, he mentioned that in case of infrastructure projects, the time pressure is high and therefore the use of proven techniques is preferred.
As obstacles for collaboration, caustic objectives and a lack of openness and trust were mentioned. Caustic objectives can for example occur between Rijkswaterstaat and the Water agency. In that case it is important to make use of the higher management layers.
Regular meetings (+2) are also important according to the client. In a design process the time pressure is high. Then it is important to discuss things immediately at the moment they occur to improve the efficiency of the project. The respondent experienced also that, in relationship to stakeholders, it is important to have regular meetings. The more you meet with stakeholders, the more they will do for you. Finally, meetings are a good tool to stimulate the aspects mentioned under +3/+4.
In case of a Bouwteam agreement, the respondent would not change the most essential elements. He noticed that the financial aspects and the risk sharing the biggest differences are between a Bouwteam and DBFM agreement. Therefore, he suggests that payment arrangements (sf 10) and a fair risk allocation (sf 9) will be more important.

Participant 14

Success factor 33: Mutual trust (+4)
In collaboration the most important is to trust and respect each other. Speaking open and honest about a certain aspect enables the participants to solve the problems jointly.
Success factor 36: Alignment of objectives (+3)
It is also important to know what the problem actually is and what should be achieved. What is expected from what participant? The client wants to realise a certain artefact, the contractor wants to make some profit.
Success factor 1: Sufficient resources for collaboration (+3)
People with the right education, experience and attitude are needed to achieve a successful project delivery. Next a good accommodation and ICT-infrastructure are also important.
Success factor 3: Contractors track-record in terms of innovation (-4)
According to the respondent it is more important to have the willingness to innovate than the experience. If experience with innovation is a requirement, it is impossible to become a contractor with innovation experience, because you never get the opportunity to get experienced.
The board of both client and contractor play an important role in the stimulation of collaboration. They should provide sufficient resources for collaboration as well as the mandate to take decisions. Next it is important to make a clear overview of responsibilities within the team.
As an obstacle for collaboration the respondent mentioned expectations that cannot be met, like to high profit margin expectations at the contractors' side and to high project-requirements at the clients side. It is important to notice these problems as early as possible. Next the problem should be clearly defined and solved. In order to convince other participants, mutual trust and respect are important.

The respondent also mentioned the fair risk allocation (+2). He argues that it is important that each party is responsible for the risks he can influence.
In case of a Bouwteam agreement, the participant would sort the Q set in the same way. In both a DBFM and Bouwteam it is important to find the solution which is best for the project and to bear the risks you can influence. Too strict contractual agreements negatively influence the collaboration.

Participant 15

Success factor 23: Transparency (+4)
Transparency means openness about the own objectives and aspects you want to achieve. In case a problem occurs, this openness will help solving the problem. Thereby it is also important to explain why you do not agree with a certain solution if that is the case.
It is also important to think about the moment you want to communicate a certain aspect. Especially in the design process, a lot of problems will be discussed. Therefore, it is important to think about the ideal moment to communicate a certain aspect. It is important to be open and timely about design decisions.
Success factor 33: Mutual trust (+3)
The respondent mentions the importance of trust because mistrust will make the collaboration to a disaster.
Success factor 21: Understanding each other's objectives (+3)
The objective of the client is different than the objective of the contractor (make profit). In infrastructure projects, the client is often a government (local, provincial or national), which finances the projects with money of the citizen (taxes). It is important to be transparent about these differences.
Success factor 19: Support of senior management from both sides (-4)
The respondent interprets this aspect as external advisors who stimulate the collaboration with a special program. He prefers meetings about content (project, design solutions, risks, problems) above special teambuilding meetings (including games). He wonders whether playing games is really effective and prefers small meetings with experienced people. He argues the importance of experienced people, because if you find each other on the content, the collaboration will also be successful.
The respondent does not have negative experiences with the most essential factors. It is important to be the person who is transparent, clear about the objectives and trustworthy, because that will stimulate the client to be so too.
The factors placed on the middle of the sort are factors which are the factors who are more related to internal aspects and less to the relationship with the client. The respondent also mentions the team leader leaderships ability (0). He argues that a team leader can have bad leadership skills but be a good connector in collaboration with the client.
In case of a Bouwteam agreement, the respondent would not change the most essential factors. However, the risk allocation and win-win attitude will be more important. In a DBFM agreement the contractor is obliged to explain how to deal with the client's risks. In a Bouwteam agreement the sharing of risks and risk allocation will be more important, because that will be a mutual process.

Participant 16

Success factor 37: Have an elaborated project start up with the participants (+4)
The respondent mentions the hands-on mentality of the contractor. Often the work is already started, before the goal of the project is communicated with the participants. The respondent argues the importance of a good plan, which helps to define the actual problem, the goal of the project and the intended end-result. Such a plan can help involving people in the project.
Success factor 8: Clear definition of roles before the project starts working (+3)
It is also important to formulate the roles of the project participants in this document: what is expected from a certain person and when should it be finished. For a manager it is also important to ask the participants whether they will be able to complete a task in the given period of time.

Success factor 38: Evaluate the collaboration during the project (+3)
The respondent experiences that in practise the evaluation is done if the project is finished. However, such evaluation brings nothing, because nobody will look in the documentation before a new project starts. Although in the meantime of the project it is valuable to evaluate, because there is the possibility to act on this. It is also important to include these evaluation sessions in the planning.
Success factor 24: Win-win attitude (-4)
This success factor is perceived as a container concept by the respondent. He experiences that this has no positive effect on collaboration. It is not a goal in itself, but it should be a result of a good plan.
The lack of money and time and the contractor's 'hands-on' attitude are mentioned as obstacles by the respondent.
In case of a Bouwteam agreement, the participant would prioritise the factors in the same way. He is experienced with a Bouwteam years ago and in that context, collaboration was important too.

Participant 17

Success factor 21: Understanding each other's objectives (+4)
If the parties are not aware of the objectives of each other, then there is no point in talking to each other, because it would not have any result.
Success factor 36: Alignment of objectives (+3)
In order to understand each other's objectives, alignment is key. There is tension between the objectives of the client and contractor, and it is important to handle this well. Thereby it helps to put yourself in the other and promote an open and honest discussion.
Success factor 30: Equitable relation and respect for all (+3)
The alignment of objectives should be done with respect for all involved parties.
Success factor 26: Development of common processes and tools (-4)
The respondent opinions that the contractor should not adjust his business processes to the client. As a contractor it is important to mark your own identity and communicate this identity clearly to the market. Stick to your own identity is also important to get a clear overview of the processes.
In order to stimulate the most essential element, an open, honest and transparent attitude is important. However, the respondent mentioned that 'transparent' is not always the case at the contractor's side, because the consequence is that you also should be satisfied with less profit as a contractor. However, at the long-term this is more profitable both for the company and the person involved.
The long-term orientation of the contractor is very important from the perspective of the contractor according to the respondent. He opinions the importance of a clear goal and the open and honest communication of this with the client. However, regarding to the reference project it is less important, since the realisation phase will be short (2-3 weeks).
In case of a Bouwteam agreement the respondent would not change the prioritisation of the Q-sort since the collaboration will always be the same.

Participant 18 – Tom van Dam

Success factor 8: Clear definition of roles before the project starts working (+4)
The roles within a project are important and determines essential aspects: what are the communication lines, how to escalate discussions, how to work in a structured way.
Success factor 1: Sufficient resources for collaboration (+3)
Without sufficient resources for collaboration it is impossible to collaborate. How much resources are needed is dependent on the situation.
Success factor 12: Defined scope of the process (+3)
The scope of the project is very important, since it determines the budget and the planning.
Success factor 3: Contractors track-record in terms of innovation (-4)
According to the respondent, innovation is not a topic in the GWW-sector. Moreover, the respondent

has no personal experience with innovation. He mentions that innovation is a topic which is more related to the management team than to the people who are working in the field.
The participant opinions that collaboration is going well. Optimisation is possible by smoothening the process. Also, the scope can sometimes be unclear, due to a bad formulated contract (specifications too general, issues that come up during design that have not been thought about). It can be both a technical issue as an interpretation issue (stakeholder and contractor have a different interpretation). Mutual trust (33), High level of commitment (34), equitable relation (30) and transparency (23) are less essential than the scope and resources for collaboration. The participant experienced that the scope and resources have a large influence on the soft skills: the lesser the possibility to use politics: the less it will be done. A focus on hard things creates space to implement the soft stuff. By focusing on these hard things, you actually enforce that people get a common goal, whereby you force transparency. This is important because people say they want to be transparent, but actually only do it if there is no other option.
The support of senior management (+2, sf19) is also important, because it enables participants in the project to delegate to a higher level. In large projects, the risks are in particular relevant at the higher levels within the organisation. In a smaller project with more responsibilities the risks will play a larger role.
In case of a Bouwteam, the respondent would not change the Q-sort, but the essential values will be even more important: in case of a joint collaboration with own responsibilities it is extra important that the contractor is bathed in the solution. Shared risks (sf13) and a fair risk allocation (sf9) will be more important, because you can exert more influence on it.

Participant 19 – Mark van der Wolf

Success factor 33: Mutual trust (+4)
If you don't trust each other, it is better to end the project. That is a false setting for your collaboration.
Success factor 30: Equitable relation and respect for all (+3)
You should always be next to each other and respect each other. Allow each other time to explain something and take the time to understand what the other person means. That is the basis of collaboration.
Success factor 9: Fair risk allocation (+3)
In the tender phase most times it is impossible to estimate the implications of the risks. Therefore, after the start of the project (and during the project) it is important to discuss the risk distribution and make an honest decision about it. The participant believes that some risks are too heavy for a private company.
Success factor 3: Contractors track-record in terms of innovation (-4)
The realisation of an innovative idea in a certain project does not mean that this innovative idea will suit another project. Moreover, the respondent mentions that product-related innovations are difficult to realise in the infrastructure sector, since it will be difficult to guarantee the long-term quality. A process-related innovation however is easier to realise. The respondent also mentions that innovation is not an end in itself, but it is important that you stick with your product.
The respondents believes that sensible people and an honest business model to the contract can stimulate collaboration. The fact that the contractor with the lowest price will get the order is an obstacle according to the client, since a focus on money has a bad influence on collaboration. On the other hand, the contractor should take his responsibility to realise a reliable project instead of a realisation to earn as much money as possible. Keeping the infrastructure sector healthy is the most important, which can be realised by interacting normally.
In case of a Bouwteam agreement, the respondent would not change the Q-sort. He believes that the independent of the contract type, the goal of collaboration is always the same: the realisation of a reliable product and a fair amount of profit for the contractor.

Participant 20 - Rik van der Laan

Success factor 33: Mutual trust (+4)

In order to make a project successful it is important to trust each other.

Success factor 23: Transparency (+3)

It is important to be open and honest. A double agenda (which is a lack of transparency) will harm the collaboration. Next, it is also important to acknowledge your mistakes when something goes wrong and pronounce it honestly to the client.

Success factor 30: Equitable relation and respect for all (+3)

It is important to take people seriously and be yourself. A project will be finished successfully if everyone does what they are good at and respects that of the others.

Success factor 3: Contractors track-record in terms of innovation (-4)

The experience with innovation does not affect how well a contractor can work together in a design process.

To stimulate collaboration it is important to establish project teams based on suitability rather than availability. This is already partly happening within Ballast Nedam, but in order to implement it really, the support of the senior management (sf25) is essential. The attitude of the senior management can even be an obstacle for collaboration in case they have a rigid attitude and are not willing to change. The respondent mentions that it is important to realise that the project is often the dream of a person/group at the clients side (who are working for years on the project). As a contractor it is important to appreciate / respect that, because that will result in a more successful collaboration.

The respondent believes that regular meetings (sf32) are important, but not a goal in itself. The same applies to evaluation (sf38). The request from the client has a major influence on the extent to which cooperation is possible. When the tender is very much delineated and offers little challenge to the contractor to, cooperation also becomes complicated. According to the equality in tasks and behaviour (sf25) the client believes that expertise on a certain aspect is more important than an equal distribution of tasks.

In case of a Bouwteam agreement, the participant would not change the most essential elements, but recognises that it will be more important to determine the financial range upfront (sf11) in order to avoid discussions during the project and at the end of the project.

Participant 21 – André van de Velde

Success factor 30: Equitable relation and respect for all (+4)

An equitable relation is important. If the participants are able to respect and trust each other, then the substantive agreement will follow.

Success factor 21: Understanding each other's objectives (+3)

If there is a relationship with respect and trust, then it will be easier to understand each other's objectives.

Success factor 33: Mutual trust (+3)

In case of a good relationship with mutual trust, a contract is unnecessary.

Success factor 15: Performance management (-4)

The measuring and monitoring of performance is important, as well as regular adjustments. It is an instrument that can help, but in case the rest of the collaboration is not good it would not contribute to collaboration. It is more a tool to intervene.

The reciprocity of the most essential elements (+3/+4) is important, especially between the client and contractor. For other parties (stakeholders and subcontractors) it is important for the project success but less for the collaboration between the client and contractor.

As stimulants for the most essential elements, the respondent mentioned the support of senior management (0) and good communication (2). Next, the conflicts of interest between planning and budget should be minimal. It is also important to look for mutual interests. An aspect which is not included in the Q set are aspects related to teambuilding: the respondent mentions the importance of different personality types in a team.

As obstacles the respondent mentions different interests, a too strict contract or lack of budget or time. Also the own interests of mother companies or stakeholders could hinder the collaboration, just like changes in the organisation. In respondent mentioned a case in which the client would help the contractor when he was in financial problems due to the project, but was hindered by the contractual agreements.
According to the risk allocation, the respondent mentioned the importance of a fair risk allocation (1) over shared risks (-2). He argues that the problem of shared risks is that, in case the risk occurs both parties will try to slip the risks. Therefore it is important to decompose the risks and let the party be responsible for that part of the risk which je can influence.
Next, the respondent argues that it is important to define the scope and process at the start, but that a too strict formulation will hinder the collaboration, because it, especially in case of contractual agreements, will be very hard to deviate from the agreements. Moreover, strict agreements will stimulate people to do the formulated task instead of stimulate them to cooperate.
In case of a Bouwteam agreement, the respondent would maintain the most essential elements. In a DBFM contract there are some strict factors (contractual agreements), but within that context they are looking for maximal collaboration. A Bouwteam stimulates this, without hinder by a contract for the participants. In case of a Bouwteam the shared risks and joint problem solving are part of the deal.

Participant 22 – Reijer van der Eijk

Success factor 33: Mutual trust (+4)
Whatever you do to stimulate cooperation, if there is no trust, it is the death blow to cooperation. Once you have gained that trust, so much has already gone well and you have earned so many points. Mutual trust is a kind of end result of many things that are well arranged.
Success factor 9: Fair risk allocation (+3)
You are willing to gain that trust and to be vulnerable if you know that there is an honest risk distribution. The risk distribution has already been established in advance in the case of DBFM. However, if there is trust and you understand each other's goals, it offers the opportunity to discuss how best to deal with a certain risk.
Success factor 21: Understanding each other's objectives (+3)
It is important to understand each other's objectives and thereby defend each other's interests. The objectives are not always the same, but if you have an eye for that and are willing to take a step for it, it is possible to gain trust.
Success factor 32: Regular meetings (-4)
Having meetings regularly is not an end in itself. Meet when needed.
The respondent believes that these success factors can be stimulated by attitude and behaviour. Therefore you should not act defensive, but vulnerable, willing to give confidence and that will result in receiving trust. The respondent mentions that receiving trust often takes more time than giving trust. Therefore it is very important to have patience to let the mutual trust grow.
In case of a Bouwteam agreement, the most essential values will remain the same.

Participant 23 – Anne Peters

Success factor 35: Good communication (+4)
In collaboration the most important it that participants contact each other when needed, which is the essence of good communication.
Success factor 23: Transparency (+3)
Transparency is the open and honest attitude. Thereby it is important to be transparent about your own objective and the different objective of the client.
Success factor 33: Mutual trust (+3)
Trust is essential to collaborate.

Success factor 3: Contractors track-record in terms of innovation (-4)
The experience with innovation is a criteria based on which a contractor is selected rather than a condition for good collaboration.
The participant believes that it is important for the contractor to act according to the most essential values, because that will stimulate the client to do so. Therefore it is important to be transparent and show that you trust each other. That is only possible with good communication and therefore arrangements should be made. A double agenda, lack of confidence and not acting fair to each other are obstacles for collaboration.
A continued involved project team leader (-3) is important for the realisation of the project, but less important for collaboration. For the project itself it is not only important that the project team leader is involved, but also that participants who are involved in the earliest stage of the project are involved during the whole project. The early involvement of external stakeholders (+2) is important: involve the external stakeholders from the start and include them in the decisions, so that they understand the situation.
In case of a Bouwteam agreement, the participant would not change the most essential values in the Q-sort since these factors are always important to the respondent, independent of the type of contract. The respondent interpreted the definition of a Bouwteam as two independent parties and in that case the fair risk distribution (sf9) and specified payment arrangements (sf10) will be more important.

Participant 24 – Kees Vermeij
Success factor 33: Mutual trust (+4)
If mutual trust is lacking, it is impossible to collaborate.
Success factor 9: Fair risk allocation (+3)
In order to make a project successful a fair risk allocation is essential: the party who can influence the risk, takes the risk. In order to reach a fair risk allocation transparent discussions are essential.
Success factor 23: Transparency (+3)
Transparency is an essential element for successful collaboration. The respondent also favours full transparency on the costs. If this is possible depends on the phase of the project: in the tender phase it is impossible, but in the construction phase is it possible. However, it also depends on the attitude of the client: in case the client is not transparent and reliable, the respondent would not be transparent about the costs. Moreover, in case the client does not agree with the percentages on profit and overheads, the contractor will shift indirect costs to the direct costs. The reverse also occurs: the contractor wants to make an unfair percentage of profit.
Success factor 10: Specified payment arrangements (-4)
The respondent argues the importance of good payment arrangements rather than specified payment arrangements. In case the risk allocation is fair, there is mutual trust and transparency, the payment arrangements will always good. It is not important whether this is specified in advance. Moreover, a specified payment arrangement is not always beneficial for the contractor, because it does not always turn out the way the contractor would like.
In order to stimulate collaboration the respondent argues to live the values that you consider to be important: give as much confidence as possible and be transparent yourself.
Innovation (sf3, -3) is also low valued. Although the respondent would support new, creative ideas, he also mentioned that the budget is too low within the infrastructure sector to actually innovate. The evaluation of the collaboration during the project (sf38, -3) is also low ranked by the client, because he believes that the evaluation should be part of every project. In case of a good team, the evaluation goes automatic during the project.
In case of a Bouwteam agreement, the respondent would not change the most essential values since they are the key to good collaboration. Dependent on the wishes of the client the experience of the contractor with innovation (-3) could be more important.

Participant 25 – Dennis van Steenderen

Success factor 33: Mutual trust (+4)

The participant mentioned 'mutual trust' as the most essential factor for collaboration. "If there is no mutual trust, you will reach nothing."

Success factor 12: Defined scope of the project (+3)

Before starting the project, it is important to have a clear overview of the aspects of the project and what is asked by the client.

Success factor 35: Good communication (+3)

Good communication is an important factor to get a clearer overview of the scope of the project and the objectives of the client.

Success factor 26: Development of common processes and tools (-4)

According to the respondent, "first it is important to know the goal of the process, the design of the process is of secondary importance". Focusing on the development of common processes before a clear overview of the content of the project will lead to losses.

Success factor 25: Strive for equality in behaviour and duties for client and contractor (-3)

The participant mentioned that this is not always possible and moreover undesirable. Both the client and contractor have their own role and expertise. By focusing on 'equality' you will expect aspects which people are not experienced with. Both the client and the contractor should act out of their own expertise.

Success factor 32: Regular meetings (-3)

If the goal of the project is clearly defined at the start of the project, less meetings are needed at later stages of the project.

The most essential aspects are values which are important for each party/participant in the project. These values should be present to achieve a successful project delivery. Good communication (+3) and Transparency (+2) are of great importance for both client and contractor. Therefore, the contractor should avoid 'old behaviour' and the client should give the contractor the opportunity to make a profit. If one of the party's acts in a different way, the relationship will be damaged. From the contractors side the effect can bet that the costs will be regarded in a different way.

Although the participant gives a low classification to the 'support of senior management from both sides' (-2), he mentioned the importance of quick decisions of the senior management. Due to the organisational structure of the client's organisation, sometimes a lot of time is lost before the senior management has decided. The respondent also mentioned the negative financial consequence of this aspect. Decisiveness and speed would benefit the process, both in terms of time and costs.

Related to a defined scope, the participant mentioned the importance of a specified request (including requirements and wishes of the client). If a clear definition is lacking, the process will continuously change, which will increase both the final time and costs of the project.

In case of a Bouwteam agreement, the participant would prioritise the 'hard aspects' over de 'soft aspects': tasks and roles should be clearly defined at the start of the process, so that mutual trust can grow.

E. Expert consultation

This appendix aims to present the results of the expert consultation.

E.1 Procedure

Prior to the interview, the following mail was send to the

Accompanying e-mail

Beste (naam participant),
Nogmaals hartelijk dank dat u mee wilt werken aan dit onderzoek naar verschillen en overeenkomsten in samenwerking tussen opdrachtgever en opdrachtnemer in de ontwerpfase van bouw en infrastructuurprojecten. In de eerste fase van dit onderzoek zijn de verschillen en overeenkomsten tussen bouw en infraprojecten middels een literatuurstudie in kaart gebracht.
In de tweede fase van het onderzoek zijn 38 succesfactoren van samenwerking voorgelegd aan 25 respondenten uit de bouw en 25 respondenten uit de infra. Zij hebben deze factoren geprioriteerd ten opzichte van elkaar. Vervolgens zijn de resultaten van de bouw en de infra met elkaar vergeleken en is gepoogd deze verschillen en overeenkomsten in perspectieven op samenwerking te verklaren. Dit brengt mij bij de laatste fase van dit onderzoek, wat dient om de resultaten te valideren en te adviseren op welke wijze de sectoren van elkaar kunnen leren tijdens de samenwerking in de ontwerpfase. Het interview met u maakt deel uit van de laatste fase van het onderzoek.
Deze interviewronde bestaat uit twee delen. Het eerste deel is een online vragenlijst, ter voorbereiding op het tweede deel, wat uit een individueel interview bestaat.
Ik zou u willen vragen de online vragenlijst voorafgaand aan het één op één interview in te vullen. Deze vragenlijst zal ongeveer 10-15 min in beslag nemen. U kunt de lijst hier vinden. Graag ontvang ik de antwoorden uiterlijk 24h voor het interview (dus voor 10-10-2020 om 16:00u).
Tot ziens bij het interview. Mocht u vooraf nog vragen hebben, dan hoor ik graag van u.
Met vriendelijke groet,

Part 1: Online questionnaire

Participants were asked to answer the following questions.

Deze vragenlijst gaat over samenwerking in bouw- en infraprojecten. Een deel van de onderwerpen zullen tijdens het interview verder uitgediept worden. De gegevens die middels deze vragenlijst en het interview verzameld worden, worden anoniem behandeld. In een eventuele toekomstige publicatie zijn de resultaten nooit te herleiden tot personen die aan het onderzoek hebben deelgenomen. Eerst worden aan aantal algemene vragen gesteld om uw ervaring in kaart te brengen, vervolgens wordt specifiek ingegaan op de belangrijkste aspecten van mijn onderzoek.

Algemene vragen persoonlijk

1. Wat is uw naam?
2. Voor welke organisatie werkt u?
3. Wat is uw geslacht?
4. Wat is uw hoogst genoten opleiding en welke opleiding is dit?
5. Heeft u ervaring met samenwerking tussen de opdrachtgever en de opdrachtnemer tijdens de ontwerpfase van infrastructuurprojecten en bouwprojecten?

    ☐ Ja, vanuit de opdrachtgever

- ☐ Ja, vanuit de opdrachtnemer
- ☐ Nee
- ☐ Anders, nl.

6. Bent u tijdens de ontwerpfase van het project aanwezig geweest bij projectbesprekingen tussen de opdrachtgever en opdrachtnemer?
   - ☐ Ja, bij bouwprojecten
   - ☐ Ja, bij infraprojecten
   - ☐ Nee
   - ☐ Anders, nl.

Algemene vragen ervaring bouwsector

De volgende vragen gaan over uw ervaring in de Nederlandse bouwsector. In dit onderzoek wordt met de bouwsector zowel de utiliteitsbouw als de woningbouw bedoeld. Hierna volgen exact dezelfde vragen, maar dan voor de infra sector.

7. Gedurende welke periode (jaar tot jaar) bent u ongeveer werkzaam geweest in de bouwsector in Nederland?
8. Bij hoeveel bouwprojecten bent u betrokken geweest tijdens de ontwerpfase van het project?
9. Met welke typen contracten waarbij sprake is van samenwerking tijdens de ontwerpfase van bouwprojecten tussen de OG-ON heeft u ervaring?
   - ☐ Alliantie
   - ☐ Bouwteam
   - ☐ DBFM
   - ☐ DBM
   - ☐ D&C
   - ☐ Twee-fasen contract
   - ☐ Anders, nl…..
10. Wat was de aanneemsom van de bouwprojecten waarbij u betrokken was (een grove indicatie volstaat, bijv. 50-250 miljoen)?
11. Voor welk type opdrachtgever heeft u projecten uitgevoerd?
    - ☐ Publiek
    - ☐ Privaat
    - ☐ Anders, nl……

Algemene vragen ervaring infrastructuursector

12. Gedurende welke periode (jaar tot jaar) bent u ongeveer werkzaam geweest in de infrasector in Nederland?
13. Bij hoeveel infraprojecten bent u betrokken geweest tijdens de ontwerpfase van het project?

14. Met welke typen contracten waarbij sprake is van samenwerking tijdens de ontwerpfase van infraprojecten tussen de OG-ON heeft u ervaring?

    ☐ Alliantie

    ☐ Bouwteam

    ☐ DBFM

    ☐ DBM

    ☐ D&C

    ☐ Twee-fasen contract

    ☐ Anders, nl…..

15. Wat was de aanneemsom van de infraprojecten waarbij u betrokken was (een grove indicatie volstaat, bijv. 50-250 miljoen)?

16. Voor welk type opdrachtgever heeft u projecten uitgevoerd?

    ☐ Publiek

    ☐ Privaat

    ☐ Anders, nl……

Dit waren de algemene vragen. Hierna volgen de specifieke vragen, waarbij ingegaan wordt op een aantal onderzoeksresultaten.

Specifieke vragen: vergelijking bouw en infra sector
Zoals aangegeven richt dit onderzoek zich op het vergelijken van de samenwerking binnen Nederlandse bouw en infraprojecten.

17. Welke drie belangrijkste overeenkomsten ziet u tussen projecten in de Nederlandse bouw en infrastructuursector?

18. Welke drie belangrijkste verschillen ziet u tussen projecten in de Nederlandse bouw en infrastructuursector?

Specifieke vragen: samenwerking binnen de bouw en infra sector
Uit onderzoek is gebleken dat de bouw en infra van mening verschillen over de mate waarin bepaalde factoren van samenwerking van belang zijn tijdens de ontwerpfase om uiteindelijk tot een succesvolle projectoplevering te komen.

De volgende factoren worden in de bouw belangrijker gevonden dan in de infrasector. Geef steeds aan of u deze mening deelt en of u het eens bent met de gevonden verklaring voor de verschillen. Tijdens de interviews krijgt u de gelegenheid om uw keus nader toe te lichten.

19. De duidelijke definitie van rollen voordat het project start
    a. De duidelijke definitie van rollen voordat het project start wordt in de bouwsector als een belangrijker factor voor succesvolle samenwerking gezien dan in de infrasector. Deelt u deze mening?
        ○ Ja
        ○ Nee

b. Dit kan verklaard worden doordat bij de bouwsector meer verschillende type klanten met een verschillend ervaringsniveau betrokken zijn dan bij de infrasector. Bent u het eens of oneens met de gevonden verklaring?
    - ○ Eens
    - ○ Oneens

20. Een gedefinieerde scope van het proces
    a. Een gedefinieerde scope van het proces wordt in de bouwsector als een belangrijker factor voor succesvolle samenwerking gezien dan in de infrasector.
    Deelt u deze mening?
        - ○ Ja
        - ○ Nee
    b. Dit kan verklaard worden doordat bij de bouwsector meer verschillende type klanten met een verschillend ervaringsniveau betrokken zijn dan bij de infrasector.
    Bent u het eens of oneens met de gevonden verklaring?
        - ○ Eens
        - ○ Oneens
21. De ontwikkeling van gemeenschappelijke processen en instrumenten
    a. De ontwikkeling van gemeenschappelijke processen en instrumenten wordt in beide sectoren als een essentiële factor voor samenwerking wordt gezien, maar de infrasector hecht hier minder waarde aan dan de bouwsector.
    Deelt u deze mening?
        - ○ Ja
        - ○ Nee

    b. 20B. Dit kan verklaard worden doordat de infrasector een kleinere klantenkring heeft dan de bouwsector.
    Bent u het eens of oneens met de gevonden verklaring?
        - ○ Eens
        - ○ Oneens
22. Regelmatig vergaderen
    a. Het regelmatig vergaderen wordt in de bouwsector als een belangrijker factor voor succesvolle samenwerking gezien dan in de infrasector.
    Deelt u deze mening?
        - ○ Ja
        - ○ Nee
    b. 21B. Infra participanten geven hierbij als verklaring dat het niet gaat om de regelmaat, maar om de effectiviteit. Dit kan verklaard worden door de verschillende projectgrootte.
    Bent u het eens of oneens met de gevonden verklaring?
        - ○ Eens
        - ○ Oneens

De volgende factoren worden in de infrasector belangrijker gevonden dan in de bouwsector. Geef steeds aan of u deze mening deelt en of u het eens bent met de gevonden verklaring voor de verschillen. Tijdens de interviews krijgt u de gelegenheid om uw keus nader toe te lichten.

23. De vroegtijdige betrokkenheid van externe stakeholders
    a. De vroegtijdige betrokkenheid van externe stakeholders wordt in de infrasector als een belangrijker factor voor succesvolle samenwerking gezien dan in de bouw.
    Deelt u deze mening?
        - ○ Ja
        - ○ Nee

b. Dit kan verklaard worden doordat infraprojecten een groter geografisch oppervlak in beslag nemen, resulterend in meer betrokken stakeholders en een werklocatie die meer verweven is met de omgeving.
   Bent u het eens of oneens met de gevonden verklaring?
   - ○ Eens
   - ○ Oneens

c. Een andere verklaring is dat infraprojecten een minder eenduidige eindgebruiker hebben dan bouwprojecten.
   Bent u het eens of oneens met de gevonden verklaring?
   - ○ Eens
   - ○ Oneens

24. Een eerlijke risicoverdeling
    a. Een eerlijke risicoverdeling wordt in de infrasector als een belangrijker factor voor succesvolle samenwerking gezien dan in de bouw.
       Deelt u deze mening?
       - ○ Ja
       - ○ Nee

    b. Dit kan verklaard worden door de horizontale oriëntatie van infrastructuurprojecten.
       Bent u het eens of oneens met de gevonden verklaring?
       - ○ Eens
       - ○ Oneens

    c. Een andere verklaring wordt gevonden in het grotere geografisch oppervlak van infraprojecten in vergelijking tot bouwprojecten.
       Bent u het eens of oneens met deze verklaring?
       - ○ Eens
       - ○ Oneens

25. Een gelijkwaardige relatie en respect voor elkaar
    a. Het hebben van een gelijkwaardige relatie en respect voor elkaar wordt in de infrasector als een belangrijker factor voor succesvolle samenwerking gezien dan in de bouw.
       Deelt u deze mening?
       - ○ Ja
       - ○ Nee

    b. Deze factor is belangrijker in de infra dan in de bouw omdat de infrasector in vergelijking met de bouwsector een veel kleinere klantenkring heeft.
       Bent u het eens of oneens met de gevonden verklaring?
       - ○ Eens
       - ○ Oneens

    c. Een andere verklaring is dat infraprojecten een veel langere doorlooptijd hebben dan bouwprojecten.
       Bent u het eens of oneens met de gevonden verklaring?
       - ○ Eens
       - ○ Oneens

Dit is het einde van deze online vragenlijst. Hartelijk dank voor het invullen. In het één-op-één interview zullen we nader ingaan op de verschillen in samenwerking tussen de bouw en infrasector. Mocht u vooraf al iets kwijt willen, dan kunt u dat in onderstaand vak aangeven.

Part 2: Interview

During the interviews, the following procedure was followed.

Welkom bij dit interview. Hartelijk dank dat u mee wilt werken aan dit onderzoek naar verschillen en overeenkomsten in samenwerking tussen opdrachtgever en opdrachtnemer in de ontwerpfase van bouw- en infrastructuurprojecten. Voorafgaand aan het interview heeft u een online vragenlijst ingevuld. In dit interview zullen deze onderwerpen deels terugkomen en zullen een aantal andere onderwerpen geïntroduceerd worden.

1. In de enquête heeft u de drie belangrijkste verschillen en overeenkomsten tussen de Nederlandse bouw en infrasector aangegeven. U noemde daar o.a. het aspect 'xxxxxxxxxx', zou u dat nader kunnen toelichten?

Hoe beïnvloeden deze verschillen de manier van samenwerken in bouw- en infraprojecten?

In de online vragenlijst zijn u een aantal succes factoren voorgelegd waarvan de bouw en infra van mening verschillen over de essentie voor samenwerking. In dit interview gaan we in op de argumenten waarom een verklaring onjuist is.

2. Voor factor Y, met als verklaring Z heeft u aangegeven dat u het (niet) eens was met de gevonden verklaring. Zou u deze keus nader kunnen toelichten? Heeft u zelf een andere plausibele verklaring?
   [Zo alle factoren afgaan.]

De aan u gepresenteerde verschillen tussen de bouw en de infrasector zijn gebaseerd op een onderzoek waar 25 mensen vanuit de bouw en 25 mensen vanuit de infra aan deelgenomen hebben. De respondenten uit de bouw waren allemaal betrokken bij een bouwteamproject, grotendeels van private opdrachtgevers, met een budget van meer dan €50 miljoen. De respondenten vanuit de infra waren betrokken bij diverse projecten, grotendeels bij DBFM projecten met een waarde van meer dan €100 miljoen.

3. Denkt u dat deze verschillen de resultaten beïnvloed hebben en zo ja, op welke wijze?

4. U heeft ervaring met zowel bouw als infraprojecten. Uit onderzoek blijkt dat de volgende factoren bij zowel bouw als infra essentieel zijn voor samenwerken. Welke lessen heeft u vanuit de bouw meegenomen naar de infra?

   - ☐ Het begrijpen van elkaars doelstellingen;
   - ☐ Transparantie;
   - ☐ Wederzijds vertrouwen;
   - ☐ Goede communicatie.

Dit onderzoek richt zich specifiek op samenwerking binnen Bouwteams en welke lessen de infrasector daarbij kan leren van de bouwsector. We gebruiken hierbij de volgende definitie van Bouwteams:

Het bouwteam is een tijdelijke samenwerkingsovereenkomst tijdens de ontwerpfase waarin de deelnemers - waaronder in ieder geval opdrachtgever, aannemer en consultants - samenwerken aan een uitvoerbaar ontwerp met een bijbehorend risico-logboek en een aannemingsovereenkomst. Daartoe voert elk van de deelnemers de taken uit die verband houden met hun ervaring en deskundigheid, met behoud van hun zelfstandigheid en verantwoordelijkheid.

5. De bouwsector heeft al veel ervaring opgedaan met Bouwteams, de infrasector nog veel minder. Indien u deel zou nemen aan een Bouwteam binnen de infrasector, welke ervaringen vanuit de bouwsector zou u dan toepassen?

Bedankt. Dit waren de vragen die ik u wilde stellen. Heeft u zelf nog aanvullende vragen of opmerkingen?

E.2 Results of the online questionnaire

Table E-1 Characteristics of the experts consulted in this research

	Expert 1	Expert 2	Expert 3	Expert 4
For what type of organisation are you working for?	contractor	consultancy	consultancy	consultancy
What is your highest education degree obtained?	Master public administration and change management	Master Civil Engineering	Master Building Engineering and Economy	HTS - Building Engineering
Are you experienced with client-contractor collaboration during the design phase of infrastructure projects?	Yes, from the contractor	Yes, from the client	Yes, both from the client and contractor	Yes, both from the client and contractor
Have you been present at meetings between the client and contractor during the design phase of the project?	Yes, in building projects	Yes, in building projects	Yes, both in building and infrastructure projects	Yes, both in building and infrastructure projects
During which period (year-year) have you been involved in Dutch building projects?	1999-2020	2008-2013	1992 - 2020	2007 - 2020
In how many building projects have you been involved in the design phase?	15	3	30	10
With what types of building contracts are you experienced?	Alliance, DBFM, UAV en UAV GC	DBFM, D&C	Bouwteam, DBM, UAV	Bouwteam, D&C
What was the total budget of the building projects in which you were involved?	2.5-250M	1-80M	130K-100M	1-15M
What type of clients were involved in these building projects?	Public, private	Public, private	Public, Private, foreign parties	Public, private
During which period (year-year) have you been involved in Dutch infrastructure projects?	2019-2020	1995-2020	1997 - 2020	1981 - 2020
In how many infrastructure projects have you been involved in the design phase?	0	20	40	100
With what types of infrastructure contracts are you experienced?	Alliance, DBFM, Two-fase contracts	Alliance, Bouwteam, DBFM, DBM, D&C	Bouwteam, DBFM, D&C, UAV	Alliance, Bouwteam, DBM, D&C
What was the total budget of the infrastructure projects in which you were involved?	30-250M	1-1200M	1.5M-2.1B	100K-35M
What type of clients were involved in these infrastructure projects?	Private	Public, private	Public	Public, private

E.3 Transcription of the interviews

The Dutch transcription of the interviews is presented below. Both the introductory and closing conversation are not presented.

Transcription interview Expert 1

[Voorstelrondje]

Overeenkomsten en verschillen tussen bouw en infra

I: Allereerst wil ik het graag hebben over de overeenkomsten en verschillen tussen bouw en infra. In de enquête heb je aangegeven dat een overeenkomst tussen beide sectoren de complexiteit is. En daar was ik benieuwd naar waarom je dat gezegd hebt en hoe je dat dan ziet, omdat ik in mijn onderzoek soms wat anders tegenkom.

R: *Interessant ja. Het ligt eraan wat je onder bouw verstaat. Ik heb als referentie voor die vraag een utiliteitsproject genomen. En bijvoorbeeld het gebouw in Rotterdam dat ken je misschien wel, De Theekop, dat is een project wat BAM gebouwd heeft. Dat was echt ongelofelijk complex. Wat het in de bouw lastig maakt is dat je op een heel klein plekje soms iets heel iconisch moet maken. Dat is vooral logistiek ontzettend ingewikkeld, maar ook bouwtechnisch. Toen ik aan de bouwkant werkte, zei ik altijd dat de infra geen idee had hoe complex de bouw, de utiliteitsbouw wereld is. Ook nu ik meer bij de infra betrokken ben blijf ik bij dat standpunt. In de infra zitten hele hoogstaande technische aspecten, maar ook wel heel veel eenvoudiger aspecten, zoals asfalt, rotondes, viaducten, die vaak hetzelfde zijn. Dat heb je in de woningbouw natuurlijk ook, maar ik vergelijk het nu even met de utiliteitsbouw. Zeker in het geval van renovatie of gedeeltelijke renovatie is dat enorm complex.*

I: Als ik je goed begrijp zeg je dus eigenlijk dat ze beide complex zijn, maar dat ze op een andere manier complex zijn.

R: Klopt.

I: In de bouw omdat het dan allemaal op een klein oppervlak moet gebeuren.

R: Het moet ingepast worden, heel lang ben je met heel veel stakeholders eromheen in gesprek, vaak in een hoog stedelijke omgeving. Bij Infra werk je vaak aan delen van het tracé, dus bijna niemand die de gehele periode last van je heeft, 3-4 jaar lang. Dat vraagt namelijk heel veel afstemming. Ook bouwtechnisch is het een uitdaging.

I: Daarnaast had je een aantal verschillen aangegeven tussen de bouw en infra. Zoals bijvoorbeeld mentaliteit, lineair denken en meer betrokken overheden. Zou je wat meer kunnen vertellen over deze verschillen en daarbij aan kunnen geven of deze verschillen ook leiden tot een verschil in samenwerking tussen beide sectoren?

R: *Ja wat ik bij de infrasector zie is dat het steeds ingewikkelder wordt om infra aan te leggen. Het gaat steeds meer om vervanging van bestaande infra, waarbij het bestaande gebruik niet verstoord mag worden. Vitale economische aders moeten in gebruik blijven tijdens de renovatie. Dat is dus één ding. En dan heb je vaak te maken met RWS, met een provincie, soms met een paar gemeentes. Die verkeersknopen moeten steeds vaker voor meerdere modaliteiten geschikt gemaakt worden. Het is niet alleen maar een weg, maar ook een spoor, brug, lightrail of fietspad. Van modaliteit gaat het naar opgave, waarin meerdere modaliteiten aangelegd moeten worden, waardoor meerdere overheden met elkaar moeten gaan samenwerken en dat zijn ze niet gewend. Terwijl als je een gebouw maakt in de gemeente Rotterdam, je alleen te maken hebt met die gemeente. Dus de samenwerking tussen de overheden maakt het in de infra wel ingewikkeld. Er zitten ook veel politieke achtergronden achter. Een wethouder van gemeente X ijvert voor zijn verkiezingsdoel, maar dat kan totaal haaks staan op wat RWS wil. Lokale politiek versus nationale politiek speelt dus een grotere rol in de infrasector.*

I: Oké dat is duidelijk. Daarnaast noemde je lineair denken. Ik was benieuwd wat je daar precies mee bedoelde en wat dat voor samenwerken betekent.

R: *Het is nog een beetje een hypothese, maar wat ik zie is dat als je een gebouw moet maken je heel veel dingen tegelijk moet doen, terwijl als je een wegtracé aanlegt dat meer een lineair proces is. Het is asfalt draaien. Als je een gebouw maakt hangt alles met alles samen. Dat moet je veel meer lateraal of meervoudig bekijken dan een weg. Los even van dat je af en toe een ingewikkeld kunstwerk kunt*

hebben. Zover ik de collega's uit de infra nu ken vind ik ze enkelvoudiger. Misschien is lineair niet helemaal het goede woord, maar ééndimensionaal. In de infra kunnen we een bepaald aspect overzien, maar niet teveel tegelijk. Terwijl je in een ingewikkeld bouwproces veel meer te maken hebt met samenhang tussen verschillende aspecten. Dat is mijn gevoel erbij.
I: Betekent dat dan ook dat je naar jouw idee bij de bouw meer geforceerd wordt om samen te werken dan bij de infra?
R: *Ja, daar komen op een kleinere plek meer disciplines bij elkaar. Als je naar de hele keten kijkt bij een bouwproject, dan komen daar soms wel meer dan honderd partijen bij kijken. Er komt iemand die levert de deuren, een ander levert de deurkrukken en dat moet allemaal op elkaar afgestemd worden. Terwijl je bij de aanleg van een weg een freesmaatschappij hebt, een asfaltcentrale. In mijn ogen is dat minder gelaagd.*
I: Oké dat is duidelijk, vooral de uitleg tot welke verschillen in samenwerking dit leidt. Leuk ook dat jij meer ervaring hebt met de bouw. Tot nu toe heb ik namelijk vooral gesproken met mensen die ervaring hebben in de infra, waardoor het soms lastig wordt een evenwichtig beeld te krijgen.
R: *Klopt, het heeft beide zijn eigen uitdagingen. Daarom probeer ik duidelijk te maken waarom ik denk dat zaken verschillend zijn voor beide sectoren.*

Verschillen in perspectieven op samenwerking
I: In de afgelopen weken heb ik onderzoek gedaan naar een aantal factoren van samenwerking. Participanten moesten hierbij verschillende factoren van samenwerking ten opzicht van elkaar prioriteren. De resultaten heb ik met elkaar vergeleken en hieruit kwamen een aantal verschillen tussen bouw en infra participanten. De resultaten hiervan heb ik aan je voorgelegd in de enquête die je voorafgaand aan dit interview hebt ingevuld. Daarnaast heb ik je ook een aantal mogelijke verklaringen voor deze verschillen voorgelegd, waarbij jij aangegeven hebt of je het hiermee eens bent of niet. In dit interview gaan we alle verschillen nogmaals langs. We beginnen daarbij met de factoren die in de bouw belangrijker worden gevonden dan in de infra.

Een duidelijke definitie van rollen voordat het proces start
I: Allereerst de duidelijke definitie van rollen voordat het proces start. Hierbij heb je aangegeven dat je het eens was met de stelling en met de gevonden verklaring. Zou je dat kunnen toelichten?
R: *Eigenlijk heeft het te maken met wat ik net zei: je hebt misschien wel 100 partijen die leveren. Het is daarbij heel belangrijk om de verwachtingen scherp te hebben: wat moet op welk moment geleverd worden. En ik denk dat het aantal type managers in de bouw ook meer is. Bij de infra heb je een technisch, contract en project manager. Terwijl je bij de bouw een installatie, BIM manager en van alles en nog wat hebt. Dat maakt het speelveld drukker. Dan moet je het zeker ook over elkaars rollen hebben*.
I: Duidelijk. Ik dacht dat het mogelijk ook gerelateerd is aan het verschillende type klanten en een verschillend ervaringsniveau. Dan is het belangrijker om duidelijk te hebben wie welke rol gaat vervullen dan dat je altijd met eenzelfde type klant en ervaringsniveau werkt.
R: *Nee, dat vind ik lastig om te zeggen. Bij de bouw heb je bijvoorbeeld ook te maken met het Rijksvastgoed bedrijf. Daarvan merk ik juist ook dat collega's het heel lastig vinden om het beleid van een grote opdrachtgever te vertalen. Daar zie ik zo'n variëteit aan opvattingen dat je steeds weer opnieuw moet beginnen.*
I: Dus je hebt daar geen vaste rollen?
R: *Wel vaste rollen, maar andere mensen die die rollen invullen en waar je steeds opnieuw de invulling van de rollen moet definiëren*.

Een gedefinieerde scope van het project
I: Een ander aspect was een gedefinieerde scope van het project voordat het proces start. Ook hier had je aangegeven dat je het ermee eens bent. Kun je dat nader toelichten?
R: *Dit vond ik een lastige vraag. Bij allebei is de scope heel belangrijk. In de infra is het makkelijker om het over de scope te hebben. Er zijn minder factoren die bepalen wat het uiteindelijke gebruik wordt.*

Terwijl je bij de bouw zoveel dingen hebt die van invloed kunnen zijn.
I: Ja, mijn participanten zeggen dat een gedefinieerde scope belangrijker is in de bouw dan in de infra. Ben je het daarmee eens?
R: *Nee, ik ben het daar eigenlijk niet mee eens. Bij allebei is het van belang. Alleen is het definiëren van de scope bij een bouw project lastiger dan bij een infraproject vanwege de verschillen in gebruik. Dat is mijn verklaring waarom bouw participanten deze factor belangrijker vinden dan infra participanten.*

De ontwikkeling van gemeenschappelijke processen en instrumenten
I: Dan de ontwikkeling van gemeenschappelijke processen en instrumenten. Ook deze factor vinden bouwparticipanten belangrijker dan infraparticipanten. Deel je die mening?
R: *Ik deel die mening niet. De aard is verschillend, maar het is wel heel fijn als je samen invulling geeft aan het proces ook in de infra. Ik ben nu bijvoorbeeld bezig met de twee-fasen aanpak. Daarbij is het belangrijk dat je als aannemer, maar ook als opdrachtgever duidelijk hebt wat je verwacht van dat soort processen*.
I: Hoe verklaar je dan dat de bouwparticipanten deze factor wel hoger waarderen dan infraparticipanten?
R: *Ik vind de infrasector veel traditioneler dan de bouwsector. De infra kijkt opportunistischer naar wat zich voor hun voeten ontvouwd,*
I: Dus als ik het goed begrijp, zeg je eigenlijk dat het bij beide even belangrijk is, maar dat infraparticipanten nog niet inzien hoe belangrijk het is.
R: *Ja zo zou je kunnen noemen..*

Regelmatig vergaderen
I: Dan als laatste het regelmatig vergaderen. Ook dit wordt in de bouw belangrijker gevonden dan in de infrasector. Kan jij je hierin vinden?
R: *Ik denk dat ik daar oneens heb gezegd. Ik vind dat juist helemaal niet. Juist in de infra merk je dat het gesprek voeren erg moeilijk is. Het taalgebruik is ook anders. Het vocabulaire is beperkter. Je moet daar bewust een gesprek inplannen om vrij van alle contracten en structuren die zijn opgetuigd te kunnen spreken. Er is ook onderzoek gedaan, volgens mij bij de Sluiskiltunnel. Zij geven aan dat het in de infra ontzettend belangrijk is om (informeel) met elkaar in gesprek te gaan: wat komen we tegen, waar lopen we tegenaan, wat is een goede oplossing.*
I: Tijdens mijn onderzoek merkte ik dat infraparticipanten niet zozeer zeggen dat vergaderen niet belangrijk is, maar dat het belangrijker is om efficiënt te zijn. Herken je dat?
R: *Wat ik beperkt vindt is het oplossingsvermogen. Maar de vergaderingen zijn best effectief, het overleg is heel down-to-earth, maar niet onderzoekend. Ze gaan er snel vanuit dat je doorhebt waar het over gaat. Het oogt dus wel efficiënt, de vraag is of dat het ook is, omdat er toch veel aannames zitten en er weinig echt geluisterd wordt.*

De betrokkenheid van externe stakeholders
I: Dan wil ik het graag nog even hebben over de factoren die in de infra belangrijker worden gevonden dan in de bouw. De eerste daarvan is de vroegtijdige betrokkenheid van externe stakeholders. Deel je die mening?
R: *Ik vind het lastig. Bij de infra zijn de vergunningaanvragen heel complex: MER, Tracébesluit, stikstof problematiek. Bij de bouw is dat minder aan de orde. De hele wetgevingskant aan de infrazijde is complexer. Ik kan me voorstellen dat je er daarom alles aan doet om het hele vergunningsaspect zo soepel mogelijk te laten verlopen.*
I: Zelf had ik als mogelijke verklaring gevonden dat infraprojecten een groter geografisch oppervlak hebben, wat automatisch resulteert in een groter aantal externe stakeholders. Ben je het eens met deze verklaring?
R: *Ja ik herken wel dat er meer stakeholders moeten worden. Bij de bouw heb je een vaste groep. Als je die eenmaal in kaart hebt gebracht, dan blijft het hetzelfde. Bij de infra is het een reizend circus. Daar komen nog alle betrokken overheidslagen bij.*

I: Duidelijk. Daarnaast blijkt uit de literatuur nog een ander onderscheid: de bouw heeft een eenduidige eindgebruiker, de infra niet.
R: *Ik heb een voorbeeld waarin dat anders is. In heb een heel groot binnenstad project gewerkt: een verzamelgebouw voor ministeries. Daar had je zoveel verschillende culturen dat het volstrekt onmogelijk was om een eenduidig beeld van de eindgebruiker te krijgen. In de infra heb je een weggebruiker, maar dat is redelijk overzichtelijk als ik het vergelijk met mijn ervaring in de bouw. Misschien dat er een keer een gemeentegrens wordt overschreden. Maar dan weet nog steeds iedereen dat je bij drie graden onder nul moet gaan strooien. Bij de gebouwen was het volstrekt onduidelijk hoe de eindgebruiker zou gaan reageren.*
I: Eigenlijk is het dus zo dat je bij de infra de eindgebruiker niet kent, maar er daardoor ook minder last van hebt, terwijl de eindgebruiker bij de bouw veel meer invloed kan hebben op het proces.
R: Ja, dat durf ik wel te zeggen. Mensen die een geluidsdichte ruimte willen of totaal andere eisen. En daar moesten dan vier ministeries weer over besluiten: gaan wij een geluidsdichte kamer laten realiseren of toch niet?

Een eerlijke risicoverdeling
I: Laten we gaan naar de volgende: de eerlijke risicoverdeling. Jij gaf aan dat je niet herkent dat dit belangrijker is in de infra dan in de bouw.
R: *Ik heb gemerkt dat het aan de contractvorm en de mensen ligt of een project succesvol wordt. Er zijn bepaalde contractvormen in Nederland (DBFM's) die worden door de overheid maximaal benut om de aannemer helemaal kaal te plukken. Dat is niet meer in verhouding. Dat kom je in de bouw net zo goed tegen als in de infra. Alleen zijn de investeringen in de infra veel groter. Een flink gebouw kost €300 miljoen, terwijl een groot infra project wel €1 miljard kan kosten. Dat is het risico in de infrasector: het gaat gelijk over enorme bedragen. Voor beide is het heel belangrijk dat er meer aandacht voor komt, anders gaan we onze beide sectoren om zeep helpen.*

Een gelijkwaardige relatie en respect voor elkaar
I: Dan nog een laatste aspect, de gelijkwaardige relatie en respect voor elkaar. Daarvan zeggen infraparticipanten dat het heel belangrijk is, terwijl bouwparticipanten het meer neutraal relateren.
R: *Ik relateer het aan mijn onderzoeksprojecten. Dat zijn allemaal projecten uit de publieke sector, waar ik juist zie dat de relatie ontzettend ongelijkwaardig is. In mijn nieuwe functie pleit ik voor meer gelijkwaardigheid tussen opdrachtgever en opdrachtnemer.*
I: Waarom denk je dan toch dat infraparticipanten deze hoger waarderen dan bouwparticipanten?
R: *Ik vind het echt lastig. Wat een factor zou kunnen zijn is dat de infrasector vooral een publieke opdrachtgever heeft, terwijl de bouw voornamelijk private opdrachtgevers heeft. Dat zou zomaar tot een andere perceptie over gelijkwaardigheid kunnen leiden.*
I: Tot welke andere perceptie?
R: *Als je een publieke opdrachtgever hebt in de bouw dan is dat vaak een opdrachtgever die veel opdrachtgever te vergeven heeft, waardoor er een afhankelijkheidsrelatie is. Terwijl een private opdrachtgever vaak eenmalig is en minder de kaart van de macht zal trekken. Een private partij zal het slechts een enkele keer overkomen dat hij/zij een kantoorgebouw gaat realiseren. Terwijl de publieke sector een machtiger klant is.*

Verschillende P-sets
I: Ik stipte net al even aan dat de participanten uit de verschillende sectoren andere achtergronden hebben. De bouwparticipanten namen allemaal deel aan een bouwteamproject, hoofdzakelijk van private opdrachtgevers, met een aanneemsom van meer dan €50 miljoen. De infraparticipanten waren betrokken bij projecten van publieke opdrachtgevers, hoofdzakelijk D&C en DBFM, met een waarde van meer dan €100 miljoen, veel zelfs boven de €500 miljoen. Hoe denk je dat deze verschillen de onderzoeksresultaten beïnvloed hebben.
R: *Dat heeft veel te maken met het perspectief en de ervaring die je hebt. Grote DBFM projecten boven de €500 miljoen komen bijna niet voor, waardoor mensen veel langer bij dit soort projecten betrokken*

zijn. Ik denk dat de ervaring op projecten tot €100 miljoen dan ook veel rijker is dan op zo'n groot infraproject. Dus de frequentie dat zo'n groot infraproject op de markt komt is veel lager dan aan de bouwkant. Misschien dat daardoor het lerend vermogen anders is. Als een project zo groot, moet je zoveel doen om zo'n team goed bij elkaar te krijgen, dat is een gigantische klus. Dat is echt minder aan de kant van de bouw, waar het veel overzichtelijker.

Lessen vanuit de bouw

I: Uit onderzoek blijkt dat er vier aspecten zijn die voor zowel de bouw als de infra belangrijk zijn voor samenwerking. Uitgangspunt in mijn onderzoek is dat je juist van elkaar wilt leren op die vlakken die in beide sectoren belangrijk zijn.

R: *Welke factoren zijn dat?*

I: Het begrijpen van elkaars doelstellingen, transparantie, wederzijds vertrouwen en goede communicatie. Voor elk van deze factoren zou ik willen weten of je ervaringen vanuit de bouw meeneemt naar de infrasector.

R: *Dat doe ik zeker, maar dat komt omdat ik toen ik nog aan de bouwkant werkte we een samenwerkingsvorm hebben ontwikkeld die heel erg de transparantie bevorderd door met een open boek te werken, een kernteam aan te stellen, vooraf afspraken te maken over de winst, vooraf af te spreken hoe je met de risicoverdeling omgaat. Dat gaf gelijk rust. Daardoor hoefde de aannemer niet zijn trukendoos open te halen om geld te verdienen. Die wist dat als hij zijn werkt volgens afspraak deed hij voldoende geld zou verdienen. Daardoor kon de aannemer zich focussen op het project in plaats van op de boekhouding. Wat was ook alweer je vraag?*

I: Welke lessen neem je voor deze aspecten mee vanuit de bouw naar de infrasector?

R: *Nou voor transparantie dus dat het mogelijk is aan de bouwkant, dus waarom zou het dan niet aan de infrakant kunnen? Wederzijds vertrouwen vind ik lastig, want er is best veel gebeurd in de loop van de jaren. Er zitten echt wel trauma's. De hele bouwfraude heeft aan de infrazijde harder ingehakt dan bij de bouw. Ik vind begrijpen van doelstellingen en goede communicatie heel erg te maken hebben met, het gebrek aan het onderzoekend vermogen en het gebrekkige vocabulaire. Ik denk dat als je het aantal woorden in de infrasector zou turven ten opzichte van de bouw dat je dan een ongelijkheid ontdekt. Er zit om te beginnen al geen architect aan tafel die beeldend vertelt. Infra is veel functioneler.*

I: Waardoor wordt dat veroorzaakt?

R: *Dat komt door de aard van de opgave. Bijvoorbeeld de architect van zo'n theekopje komt elke dag op de bouwplaats en vertelt helemaal lyrisch over het project en het gevoel wat het straks moet oproepen. Daardoor ontstaat er een andere leefwereld, een andere taal. Dat heb je bij de infra niet. Daar komt geen architect in de keet langs. De infra heeft ook andere eisen, wat ook leidt tot een andere interactie.*

I: Dus begrijp ik goed dat je zegt dat de communicatie veel minder gevarieerd is?

R: *Ja dat klopt. Veel minder variatie en ik denk ook minder inleving. En ik denk dus ook dat letterlijk de woordenschat beperkter is. Dat wordt het best lastig om een gesprek te voeren over samenwerken en de doelstellingen. Minder variatie en veel herhaling.*

I: Dan heb ik nog een laatste vraag, die gaat specifiek over Bouwteams. Ik zag dat je ervaring hebt met Allianties. Voor dit onderzoek gaan we er even vanuit dat de samenwerking in beide vormen ongeveer gelijk is. Als je nu deel zou mogen nemen aan een bouwteam in de infrasector, welke ervaringen zou je dan meenemen vanuit de bouwsector?

R: *Ik denk ik het open boek, een vooraf gedefinieerd resultaat (marge), afspraken over je AK vergoeding en zo'n klein team met mandaat mee willen nemen. In een klein team met mandaat heb je beslissingsbevoegdheid, maar ook een grote hygiëne. Dat is hoe ik de alliantie heb ervaren: iedereen heeft inzicht in de financiële administratie, de planning etc. Iedereen ziet gelijk wie zijn taken verzaakt, waardoor mensen ook automatisch meer aangesproken worden. Overigens heb ik die alliantie ook in een groot infraproject gezien in Manchester. Daar werkte het ook fantastisch. Het was een heel groot team, dat werkte zes tot zeven jaar in vrijwel dezelfde samenstelling. Ze werkte samen om steeds de beste oplossing te vinden.*

I: Was je daar ook bij betrokken?

R: *Nee, ik ben daar heel veel naartoe geweest om aan publieke opdrachtgevers te laten zien hoe het werkt, omdat het in Nederland niet kan volgens hen. Het kan hier ook, maar dan moet je die stip op de horizon durven zetten en daar naartoe willen werken.*

I: Dit is het einde van het interview. Heel erg bedankt voor je deelname.

Transcription interview Expert 2

Introductie

[Opstart]

I: In het kort even iets over mijn onderzoek. Binnen Ballast zijn er al verschillende Bouwteams uitgevoerd bij bouwprojecten, terwijl er bij de infra nog geen enkel bouwteam is uitgevoerd. Wat kan de infra dan leren van de ervaringen van de bouw met Bouwteams. Daarvoor is een onderzoek gedaan binnen de bouw welke factoren van belang zijn voor samenwerking. Vervolgens heb ik eenzelfde onderzoek gedaan met infraparticipanten, die dus niet afkomstig waren van een bouwteam, maar wel ervaring hebben met samenwerking tussen de opdrachtgever en opdrachtnemer in de ontwerpfase. Vervolgens hebben we deze resultaten met elkaar vergeleken en gekeken wat de overeenkomsten en verschillen zijn in perspectieven op samenwerking.

R: *Is dat objectief? Want ervaringen met samenwerking zijn vaak natuurlijk subjectief.*

I: Ja, wat je eigenlijk zegt is dat je de perspectieven op samenwerking met elkaar vergelijkt. Je zegt dus niet: samenwerking is anders, maar de perceptie is anders. En deze percepties heb ik in de enquête aan je voorgelegd. Ik heb geprobeerd deze met hulp van verschillende karakteristieken te verklaren. In de enquête heb je daar je mening over kunnen geven. Tijdens dit interview gaan we daar verder over in gesprek.

R*: Je zoekt dus eigenlijk mensen die in beide werkvelden ervaring hebben en er niet al te diep inzitten, maar een beetje van bovenaf kunnen kijken. Ik gaf je al aan dat bij mij de meeste ervaring in de infra zit: wegenbouw, dijkverbetering en spoorbouw. Maar ik heb in de periode bij XX, 2008-2015, een paar keer in de opdrachtnemersteam aan de bouwzijde gezeten, niet zo zeer in de ontwerpfase. Bij de een was het een tender voor de SAA project, de ander was een detentiecentrum voor Schiphol.*

I: Dat geeft op zich niet, ik zoek mensen met een bepaald soort ervaring die eigenlijk niet te vinden zijn. Als ik weet dat je vooral infra ervaring hebt aan de opdrachtgeverszijde en weinig ervaring met ontwerpen, dan weet ik dat dat mogelijk de resultaten wat kan beïnvloeden.

Verschillen en overeenkomsten tussen bouw en infra

I: In de enquête heb je drie verschillen tussen de bouw en infra aangegeven. In het kort: de aannemer in de infra is steeds vaker al in de planfase betrokken, in de infra ligt het beheer vooral bij de OG, in de bouw vaker ook bij de ON, bij de bouw heeft de gebruiker meer invloed op het ontwerp dan bij de infra en de financiële omvang van infraprojecten is vele malen groter dan bij de bouw, dus is het risico ook groter. Veel van deze zaken zag ik ook al terugkomen in de literatuur. Waar ik benieuwd naar ben is het volgende: leiden deze verschillen naar jouw mening ook tot een verschil in perspectief op samenwerking?

R: *Nou ik ben nu betrokken bij een Alliantie van een groot dijkverbeteringsproject, daar werken OG en ON samen, ook aan het ontwerp. Daar zie je dat het grootste deel van het ontwerpwerk wordt door de marktkant gedaan, dus door de aannemer. Er is een kleine inbreng van de opdrachtgeverskant. Je ziet daar dat er een vrij grote druk is van de aannemerskant om een ontwerp op een bepaalde wijze vorm te geven, waarbij de tegendruk die je van de opdrachtgever krijgt klein is. Je zult dus altijd wat kleur van de aannemer terugzien, meer dan van de opdrachtgever bij de infra.*

I: Je zegt bijvoorbeeld ook dat de financiële omvang van infraprojecten veel groter is dan van bouwprojecten. Zorgt dat ook voor een andere manier van samenwerken?

R: *Goede vraag. Dat vind ik lastig. Je hebt met grote teams en met kleine teams te maken. Kleine teams zijn qua omvang beter te overzien. Ik weet niet of jij ook ingaat op de samenstelling van een team?*

I: Dat is geen onderdeel van mijn onderzoek, maar ik kom het wel vaak tegen dat mensen aangeven

dat het onafhankelijk of het een groot of klein team is een divers team nodig is.
R: *Daar ben ik het mee eens. Maar een link tussen de omvang en het team is lastig. Ik denk dat er bij grote projecten een groter team zit dan bij kleine projecten.*

De duidelijke definitie van rollen voordat het proces start
I: Oké, dan wil ik graag verder gaan naar de verschillende waardering van samenwerkingsaspecten die in mijn onderzoek naar boven zijn gekomen. Zoals bijvoorbeeld een duidelijke definitie van rollen. Deze factor wordt in de bouw belangrijker gevonden dan in de infra. Jij gaf aan dat je dat niet herkent. Zou je dat kunnen toelichten?
R: *Ja, dus de rolverdeling is bij bouwprojecten helderder*
I: belangrijker dan bij de infra.
R: *Daar kan ik niets over zeggen. Wat is een kenmerk van een bouwproject, je hebt standaard: opdrachtgever, architect, eigenaar/gebruiker en dan een bouwende partij, misschien nog een installateur dat zijn andere partijen dan bij een infraproject. Daar heb je vaak een ingenieursbureau en een aannemer. Infra is daarmee wat overzichtelijker. Misschien doordat er meer partijen bij een bouwproject betrokken zijn, dat samenwerking belangrijker wordt dan bij een infraproject. Je moet het strakker organiseren omdat het anders chaos wordt. Dat zou ervoor kunnen pleiten dat de rolverdeling belangrijker is.*
I: Zelf kwam ik naar aanleiding van de literatuur ook nog op het aspect dat in de infra de opdracht gevende partij relatief veel ervaring heeft, terwijl je in de bouw een meer divers scala aan opdrachtgevers hebt.
R: *Ik denk zeker dat dat van invloed kan zijn. Het kennisniveau en ervaring van de opdracht gevende partij bij de infra zijn meer ervaren omdat ze niets anders doen.*

De gedefinieerde scope van het proces
I:De volgende is de gedefinieerde scope van het proces. De bouw zegt hiervan dat het belangrijker is dan in de infra. Je gaf aan dat je die mening deelt. Ik gaf aan dat ook dat te maken heeft met verschillende typen klanten en een verschillend ervaringsniveau. Je was het daarmee eens. Zou je dat kunnen toelichten?
R: *Nou ja, type klant, dat is meer dat de infra gewoon voor minder partijen projecten organiseert. Eigenlijk sluit het aan op het vorige. Bij de bouw moet je gewoon goed samenwerken met de verschillende partners die een rol hebben. Wat was ook al weer precies de vraag?*
I: Wat zou de verklaring kunnen zijn dat de gedefinieerde scope van het proces belangrijker is in de bouw dan in de infra?
R: *Nou omdat dat proces, dus wat moet er nu gebeuren om dat gebouw gerealiseerd te krijgen, is belangrijker als je meer partijen hebt dan als je minder partijen hebt.*

De ontwikkeling van gemeenschappelijke processen en instrumenten
I: Duidelijk. Dan gaan we naar de ontwikkeling van gemeenschappelijke processen en instrumenten. Ook die is volgens de participanten belangrijker in de bouw dan in de infra.
R: *Daar mis ik wat context. Wat bedoel je met gemeenschappelijk ontwikkelde processen en instrumenten.*
I: De interpretatie was aan de participanten zelf. Vaak interpreteerden personen het als volgt: hoe geef je als OG en ON het proces vorm. Dat kan financieel, middels tools om samenwerking te bevorderen, risicomanagement etc. Daarvan zegt de bouw dus dat het belangrijker is dan de infra.
R: *Bij de infra kom ik het niet zoveel tegen dat de ON het proces bepaald. Behalve als je als OG specifiek om een projectmanagementplan vraagt. Dan laat de ON zien: zo ga ik het aanpakken. Dat is niet echt een samenspel tussen OG en ON, het is meer ON legt voor en OG zegt akkoord of niet akkoord. En dan mag de ON het wel of niet gaan doen. Ik denk in de bouw dat er meer gezamenlijk wordt nagedacht over de processen en instrumenten.*
I: Ja, als je het zo zegt dan zit ik na te denken of het ook niet beïnvloed zou kunnen zijn door mijn participanten: de bouwparticipanten namen deel aan Bouwteams, de infraparticipanten hoofdzakelijk

aan DBFM's en D&C's.
R: *Ja ik denk ook dat dat een mogelijke verklaring kunnen zijn.*
I: Ik had in eerste instantie nog aangegeven dat het ook te maken zou kunnen hebben met een kleinere klantenkring, maar daar gaf je al van aan dat je het daar niet mee eens bent.
R: *Nee inderdaad, ik denk dat dat geen verklaring is.*

Regelmatig vergaderen
I:Oké, dan de laatste factor die door de bouw belangrijker wordt gevonden dan de infra. Dat is regelmatig vergaderen. Jij gaf aan het daarmee eens te zijn. Infraparticipanten gaven daarbij aan dat het niet gaat om de regelmaat, maar om de effectiviteit. Mijn verklaring was dat het mogelijk te maken zou kunnen hebben met projectgrootte, dus dat het niet belangrijker is in een van beide sectoren, maar dat het voor infraparticipanten lastiger is om effectief te vergaderen, omdat je zulke grote projecten hebt met automatisch veel vergaderen, waardoor participanten het als minder effectief gaan beleven.
R: *Goeie, ik weet dat namelijk niet. Je hebt twee dingen: bij de manier van aanbesteden in de context van Bouwteams in infra en bouw. In beide sectoren heb je een bouwteam. Dan werk je dus al samen. Ja, de omvang van een infraproject is doorgaans groter, je hebt meer te maken met verschillende gemeentes en verschillende bevoegde gezagen. Bij de bouw is het een gemeente. Je hebt dan wel de gebruiker en bewoners. Ik denk dat stakeholdermanagement wat eenvoudiger is bij een bouwproject dan bij een lijn infraproject. Bij een infraproject moet je op vergunningsniveau van alle partijen een akkoord hebben. Dan de vraag: moet je dan meer of minder vergaderen. Ik vind veel communicatie goed, maar je moet ook je werk kunnen doen…. Ik vind het lastig. Kun je het nog iets toelichten?*
I: Als ik alle antwoorden hoor, dan krijg ik niet het idee dat het vergaderen in de ene sector belangrijker is dan in de andere sector, maar dat veel infraparticipanten effectiviteit missen bij vergaderen. Ze vinden de regelmaat niet belangrijk, maar meer de effectiviteit. Waar ik dan naar op zoek ben is de vraag hoe het komt dat de vergaderingen niet effectief zijn.
R: *Je hebt verschillende samenstellingen waarin je vergaderingen hebt. Ik denk dat het belangrijk is binnen jouw studie dat je onderscheid maakt tussen de verschillende type vergaderingen.*

De vroegtijdige betrokkenheid van externe stakeholders
I: Oké, dan wil ik graag verder gaan met zaken die belangrijker worden gevonden in de infra. Eén van die factoren is de vroegtijdige betrokkenheid van externe stakeholders. Jij had aangegeven dat je het daarmee oneens was. Zou je dat kunnen toelichten?
R: *Het lijkt me ongeacht het project belangrijk om de stakeholders vroeg te betrekken. Maar uiteraard wel op de geschikte wijze. Dus niet te vroeg, maar wel passend bij de opgave. Als je kijkt naar de grootte van een infraproject, daar heb je meer stakeholders, die moet je wel vroegtijdig betrekken, dat gaat meer over de hoeveelheid stakeholders, die is anders. Je moet ze niet te vroeg betrekken, maar of er dan verschil is tussen bouw en infra. Jij hebt dat blijkbaar wel bepaald.*
I: Ja uit het onderzoek blijkt het wel heel duidelijk. Zelf ben ik er niet helemaal zeker van of het bouw of infra gerelateerd is, maar ook te maken kan hebben met de aard van het project. Veel van mijn participanten zijn afkomstig van grote DFBM's, waarbij het management van externe stakeholders een enorme klus is. Het is daarom maar de vraag of het echt een verschil tussen bouw en infra is of dat het meer gerelateerd is aan de contractvorm.
R: *Bij een infraproject heb je een omgevingsmanager die alle betrokken stakeholders informeert of betrekt. Bij een gebouw heb je minder van dat soort stakeholders, waardoor het overzichtelijker wordt.*

Een eerlijke risicoverdeling
I: Een ander aspect is de eerlijke risicoverdeling. Daarvan zei de infra ook dat het echt belangrijker is dan in de bouw. Daar was je het mee eens. Zou je dat kunnen uitleggen?
R: *Ja de vraag is wat versta jij onder eerlijk. Eerlijk is in mijn optiek dat de risico's bij de partijen liggen die ze kunnen dragen en beheersen. Eigenlijk de ontwikkeling van de afgelopen 10 jaar, waarin aannemers instapten met veel te lage prijzen voor veel te hoge risico's. Ik vind dat niet eerlijk. Wat je*

nu ziet is dat RWS komt met een marktvisie, waarin meer op samenwerking gefocust wordt. Als je meer gaat samenwerken, dan ga je wat beter de risico's verdelen en wellicht ook samen in kaart brengen. Bijvoorbeeld het project wat ik nu begeleidt bij het waterschap Rivierenland, het project Gorinchem-Waardenburg, kost 400-500 miljoen euro. Er is een alliantie opgetuigd met aannemers, ingenieurs, waterschap. We doen een zuivere alliantie dat alle risico's gezamenlijk beheerst worden. Als er risico's optreden dan is de marktpartij slechts voor een maximaal verlies of winst aansprakelijk. Zo wordt de marktpartij beschermd. Een marktpartij kan veel minder goed de risico's dragen dan de opdrachtgever of de subsidieverlener van de opdrachtgever.
I: Ik vraag me af of een eerlijke risicoverdeling echt belangrijker is in de infra omdat de risico's bijv. groter zijn, of dat gezien het verleden waarin aannemers een te groot risico droegen en gezien het oude zeer, waardoor daardoor deze factor bepalender wordt.
R: De markt leeft altijd in spanning. Ze moeten in concurrentie aanbieden, dus gaat zo laag mogelijk, maar accepteert wel de risico's die daarbij horen. De risicobereidheid van de marktpartij is heel bepalend hierbij. Je zou kunnen zeggen dat je minder op prijs, maar meer op kwaliteit moet gunnen. Dat gebeurd inmiddels al en is een goede verandering. Daarnaast is het belangrijk om afspraken te maken over wat te doen bij optredende risico's met een kleine kans, groot gevolg. Toen Camiel Eurlings minister was, was het idee dat alle risico's naar de markt moesten. Dan betaalde RWS er wel voor, maar waren ze er tenminste vanaf. Dat heeft dus niet gewerkt en daar komt men nu van terug met die marktvisie en ik vind dat een goede ontwikkeling. Het onderscheid tussen bouw en infra vind ik dan weer lastig.
I: Oké dan wil ik het graag nog hebben over de gelijkwaardige relatie en respect voor elkaar. Ook dat wordt door infraparticipanten belangrijker gevonden dan door bouwparticipanten. Jij had gezegd dat je het daarmee eens was, zou je dat kunnen uitleggen?
R: *Lastig, nou ik die zin: infraprojecten kunnen wat langer duren, waardoor je geforceerd wordt om langer met elkaar samen te werken. Dus als je dan niet focust om op een respectvolle manier met elkaar om te gaan, dan heb je daar aan beide kanten last van en op een langere schaal dan bij een utiliteitsbouwproject. Maar ik denk dat het daar ook speelt.*
I: Dat denk ik ook, maar ik denk ook dat het wel een mogelijke verklaring is. De infra heeft een kleinere klantenkring (publiek) dan de bouw (publiek en privaat). Als je altijd voor RWS werkt, of altijd voor bepaalde grote gemeentes in jouw omgeving, dat zo'n relatie misschien belangrijker is dan als je een keer voor een bepaalde opdrachtgever werkt.
R: Ja dat kan ook zo zijn. Je wordt niet direct op een black-list geplaatst als het niet goed gaat. Bij Prorail hebben ze een aantal aannemers geselecteerd die aan een aantal criteria moeten voldoen. Het zijn maar een beperkt aantal aannemers die aan het spoor kan werken. Daar zie je dat het heel belangrijk is om een goede relatie met elkaar op te bouwen, omdat je elkaar steeds weer tegenkomt. In de overige infra heb je meer partijen. Tsjah, ik vind dat je altijd respect moet hebben voor elkaar. Waar vertrouwen nodig is, waar dat moet groeien, kan dat vertrouwen ook geschaad worden door typisch aannemersgedrag. Als je laag inschrijft en daarmee probeert je verlies goed te maken met op elke slak zout te leggen, dan is dat irritant. Dat is geen goede basis voor samenwerking. Maar dat ligt ook aan de manier waarop de overheid dat dan uitvraagt. Als zij geen goede aanbesteding hebben gedaanen zo'n partij zoekt de grenzen op en gaat daarop inschrijven. De uitvraag moet dus niet op prijs gaan, maar meer op samenwerking en kwaliteit.

I: Oké, dat waren de vragen die in de enquête aan de orde kwamen. Ik heb nog twee aanvullende vragen. Zoals gezegd zat er wat verschil tussen de participantgroepen.
R: Ja ik denk het wel. Dus waar je vandaan komt als participant daar wordt je ook door besmet. Dus als je alleen in grote DBFM werkt, dan heb je toch wel een andere kijk op samenwerken dan als je met kleinere projecten en met andere opdrachtgevers te maken hebt.
I: Duidelijk, dan heb ik nog een laatste vraag, die gaat specifiek over Bouwteams. Uiteindelijk ben ik in mijn onderzoek op zoek naar de lessen die de infra kan leren vanuit de bouw als het gaat om Bouwteams. Als je nu deel zou nemen aan een Bouwteam binnen de infrasector, welke ervaring vanuit de bouw zou je dan meenemen?

R: Nou allereerst hoe je dat nu organiseert, hoe besteed je zoiets aan, hoe contracteer je dat, hoe ga je om met de risicoverdeling tussen partijen. Ik denk dat als er meer ervaring is in de bouw de infra daar zeker van kan leren, simpelweg omdat Bouwteams nog niet zoveel gebeuren in de infra, maar wel in een andere vorm, zoals bijvoorbeeld de alliantie waar ik bij betrokken ben. Ik denk dat een bouwteam gericht op die ontwerpfase heel belangrijk is. Daardoor zou het zijn dat je in de uitvoeringsfase minder verrassingen en minder faalkosten krijgt. Aan de voorkant zal het wat duurder worden. Maar het hele proces wordt dan wat meer voorspelbaar. En ik denk zeker dat je daarbij als infra wat kan leren van de bouw.
I: Je gaf aan zelf vijf jaar in de bouw gezeten te hebben, zijn er zaken die je daaruit meeneemt?
R: Nou het meest interessante bij dat detentiecentrum Schiphol, meer dan €100 miljoen volgens mij, daar was het een DBFMO contract, waardoor ook het beheer onderdeel was van het contract. Dat consortium heeft een ontwerp gemaakt, de betrokken partijen zijn erbij gehaald en op het moment dat het pand in gebruik is genomen en dan zegt die gebruiker dat dit en dat en zus en zo niet handig zijn. En dan zegt het consortium, je was er zelf bij. Daaraan zie je dat er nog veel leergeld te behalen is, met name aan de OG kant: denk goed na wat je allemaal nodig hebt, daarna wordt er gebouwd en kun je niets meer veranderen. Aan de andere kant zijn er prestatieafspraken gemaakt dat als er iets kapot gaat in het gebouw dan krijgt het consortium een korting op de vergoeding. Je moet dus aan de voorkant nadenken waar de risicovolle stukken zitten, die goed werken en bouwen, zodat ik later geen korting om m'n oren krijg geslagen. Want die exploitatie moet betaald worden, anders ga ik verlies lijden. Dat vond ik een hele interessante, dat je een intergratie krijgt tussen ontwerper en gebruik. Je ziet daar heel goed terug dat als je iets niet goed ontwerpt, dat je dat terugkrijgt in de exploitatiefase.
I: Oké, dankjewel. Dit waren de vragen die ik had. Heb je zelf nog aanvullingen?
R: Nee, het is wel een interessant onderwerp, maar tegelijkertijd lastig omdat het om veel meningen van participanten gaat. Wat ik graag zou willen zien van jou: infra leer dit vanuit de bouw en vise versa. Dat zou mooi zijn, ondanks de verschillen die er zijn. Ik zou dat heel goed afkaderen: dit zijn de verschillen. Maar dan toch kijken: waar kan je toch van elkaar leren.
I: Nou inderdaad, dat is precies het doel van mijn onderzoek. Het is niet altijd makkelijk omdat je zoveel meningen en vooroordelen hebt. Maar dankjewel voor de input.

Transcription interview Expert 3

Introductie

[Voorstelrondje]

R: *… De kern van mijn vakgebied is contracteren en aanbesteden. Van alle kanten ben ik daarmee bezig. Europees aanbesteden (eind jaren negentig), de opkomst van geïntegreerde contracten, best value procurement en Bouwteams. Die doe ik eigenlijk al heel lang. Ik vond jouw onderzoek wel aardig, omdat er eigenlijk heel weinig cross-over belangstelling is. Of je zit in de in de infrastructuur of de utiliteitsbouw/woningbouw. Er zijn weinig mensen die heen en weer vliegen. Veel mensen met een technische achtergrond komen van bouwkunde, civiel of aanverwante studies. En dan ben je de rest van je leven in dat vakgebied actief. Beide sectoren zijn in alles anders. Het is anders in voorwaarden, maar ook in systematiek: civielers gebruiken RAW, bouwers STABU. Andere kostenraming, ander bouwproces, andere verschillende stakeholders, de opdrachtgevers verschillen. Het heeft mij wel wat tijd gekost voordat ik de verschillen goed kan duiden. Van oorsprong kom ik uit de gebouwenhoek, ik ben begonnen bij een projectmanagement bureau waar ik vooral aan veel gebouwen in de zorg gewerkt heb. Toen ik naar W+B ging weg, zand erover, asfalt, dan is het toch wel klaar. Wat is hier nu moeilijk aan. Nee een ziekenhuis dat is pas moeilijk. Gaandeweg krijg je in de gaten dat er in de infra toch wel wat dingen zijn die het moeilijk maken. Die zitten niet in de functionaliteit. Een ziekenhuis heeft totaal andere gebruikers dan een weg. Ik heb wel duidelijk gekregen dat een weg best moeilijk kan zijn.*

I: Je zegt dat de moeilijkheid bij de infra niet zozeer in de functionaliteiten zit, maar waar zit het dan wel in?

R: *De moeilijkheid van een weg is natuurlijk dat het lijninfrastructuur is. Het heeft een veel grotere*

relatie met de beschikbare ruimte, als je er ook water naast hebt, dan heb je ook een relatie met het waterschap. Als je een ziekenhuis bouwt, dan zet je er een hek omheen. Binnen dat hek is het heel ingewikkeld, maar dat is vrij goed af te schermen, want je weet met wie je te maken. Je kunt interviews houden met de gebruikers, het aantal stakeholders valt wel mee en zitten vooral intern binnen die ene organisatie. Terwijl als je een weg ontwerpt, dan zit je met die waterschappen, maar bijv. ook Hollands Landschap of wie er maar ook allemaal bij betrokken zijn. Boeren eromheen. Maar de echte gebruiker is anoniem. Dat is een auto van verkeersklasse vier. Dan weet je als techneut welk soort weg je moet maken, de breedte, de dikte van de belijning. Dat is allemaal voorgegeven, daar zit de moeilijkheid niet in. De moeilijkheid is het voor elkaar krijgen om die weg überhaupt aangelegd te krijgen. De hele procedurele voorbereiding. Even los van het feit dat je soms wel werken hebt die lastig zijn, zoals bijv. de ondergrond in het groene hart. Daar moet je wel wat aan doen, maar strikt genomen is dat geen rocket science.

I: Dankjewel voor deze toelichting. Wat mij betreft gaat we naar het daadwerkelijke interview. Daarbij zullen ook een aantal onderwerpen terugkomen die zojuist al zijn langs gekomen. Allereerst geef ik graag een korte toelichting op het doel van mijn onderzoek en de verschillende stappen die ik heb ondernomen. Omdat de bouw al wel ervaring heeft met Bouwteams, maar de infra nog niet, is het doel om te ontdekken wat de infra kan leren van de ervaringen van de bouw op het gebied van samenwerking in de bouw. Hiervoor zijn de verschillen in karakteristieken tussen bouw en infra middels de literatuur in kaart gebracht, waarna vervolgens de perspectieven op samenwerking van bouw en infra participanten met elkaar vergeleken zijn. De verschillen die hieruit naar voren kwamen zijn voorgelegd in de enquête. Daarnaast heb ik geprobeerd om deze verschillen te verklaren met hulp van de literatuur en de antwoorden van participanten. Tijdens dit interview wil ik het graag hebben over de mogelijke verklaringen voor de verschillen.

Verschillen en overeenkomsten tussen bouw en infra

I: Dan pak ik even de resultaten van de enquête erbij. Allereerst heb ik nog een vraag over de verschillen die je aangegeven hebt. Je gaf aan dat het type aannemer verschilt, zou je dat wat meer kunnen toelichten?

R: *Ja het type aannemers zit in een aantal kenmerken. In de literatuur zit het niet, dat verbaast me weleens. Ook binnen aannemers wordt er behoorlijk onderscheid gemaakt. Grote partijen, bijvoorbeeld Heijmans hebben aparte BV's die actief zijn in de bouw of in de infra. Ik heb het idee dat als je in de bouw werkt de aannemers redelijk gewend zijn te gaan met opdrachtgevers die niet zo deskundig zijn. De infra heeft grotendeels te maken met publieke opdrachtgevers: een afdeling beheer of civiel, en daar zit over het algemeen nog wel redelijk wat kennis. Dat heeft zijn weerslag op de manier waarop ze samenwerken. Dat zie ik op gemeentelijk niveau, en ook op provinciaal niveau. Een voorbeeld: ik heb recent KWS ondersteund bij een Bouwteam voor de provincie Utrecht. Dat hebben we gewonnen, dat is een raamcontract. Daarbij wist KWS gelukkig wat voor soort opdrachtgever er uiteindelijk zou gaan beoordelen. Dat hebben we ook meegenomen in de strategie om een goede offerte te maken. Dat zijn mannen aan de opdrachtgeverszijde die al jarenlang wegenprojecten doen, die hoef je niets te vertellen. Ze zitten er inhoudelijk behoorlijk bovenop, terwijl bij de utiliteitsbouw een andere verhouding zichtbaar wordt. Als ik werkte voor een ziekenhuis directeur, dan kenden zij hun eigen proces heel erg goed, maar hadden nul verstand van bouw. Dat heeft zijn weerslag op de manier van werken, en dat heeft zijn weerslag op welke bedrijven daarbij betrokken willen worden.*

Is dat een beetje duidelijk?

I: Ja, ik had het zelf niet zo genoemd, maar in de literatuur en bijvoorbeeld ook de rapporten van de EIB kun je terugvinden hoe de verhouding publieke en private opdrachtgevers is in beide sectoren. Daarnaast zijn er bepaalde auteurs te vinden die onderscheid maken tussen verschillende type opdrachtgevers en een verschillend ervaringsniveau (ervaren/onervaren).

R: *Ja ik vind dat geen gelukkige term. Dat impliceert dat die ziekenhuis directeur ooit ervaren wordt. Dat wordt hij vaak helemaal niet. Het is vooral een ander type opdrachtgever: een ziekenhuis bouw je eens in de veertig jaar, dus slechts eens in je leven. Wat ook een verschil is dat als je kijkt naar het type aannemer. In de bouw zie je dat een bouwende aannemer vaak een ongelofelijke hoeveelheid*

onderaannemers heeft. Dat heeft te maken met de typologie: je hebt nu eenmaal heel veel verschillende disciplines en toeleveranciers in een gebouw. Dat is veel meer dan bij de infra. De infra is een weg: zand, asfalt, weg, wangrail en lantarenpalen. Dan heb je eigenlijk de hoofdcategorie al gehad. Ik heb gewerkt aan een groot bouwproject in Rotterdam, daar zaten 100 onderaannemers bij. De twee uitvoerders die hierbij betrokken waren, waren alleen maar aan het coördineren. De grote aannemers in de U-bouw zijn meer organisatiebureaus dan dat het bouwers zijn. Het is allemaal afhankelijk van verschillende ketens die hun werk moeten doen. Soms hebben onderaannemers zelf ook weer allerlei bedrijven eronder hangen.

Een duidelijke definitie van rollen

I: Het lijkt me goed als we nu gaan naar de verschillen in perspectieven op samenwerking die ik gevonden heb in mijn onderzoek. De duidelijke definitie van rollen wordt in de bouw belangrijker gevonden dan in de infra. Je had hierbij aangegeven het met de stelling en verklaring eens te zijn.
R: *Dat heeft inderdaad te maken met de aard van de opdracht. Omdat de bouw complexer is met meer partijen. In mijn interpretatie is de U-bouw meer diverse dan de infra. Je kunt zeggen een gebouw is een gebouw, maar ieder gebouw is anders als het gaat om gebruikers en functie. In de infra is dat wat eenduidiger, er zit wat minder onderscheid tussen verschillende infraprojecten.*
I: De aard van het project is dus meer divers. Hoe zou dat er dan toe leiden dat de definitie van rollen belangrijker is?
R: Ik dacht ook even aan een bouwteam, want dat is wel een van de cruciale factoren bij een bouwteam die je van te voren goed moet regelen. Mijn ervaring is dat je bij een bouwteam in de bouw meer partijen aan tafel hebt dan bij een bouwteam in de infra. Dan moet je naar mijn idee extra goed duidelijk hebben welke rol iedereen te vervullen heeft. Des te meer partijen des te groter het risico dat het verwaterd tussen de partijen.

Een gedefinieerde scope van het proces

I: Duidelijk, dankjewel. Dan gaan we naar de volgende: een gedefinieerde scope van het proces. Ook die is volgens de participanten belangrijker in de bouw dan in de infra. Jij was het daar niet mee eens. Kun je dat toelichten?
R: *Ik zat een beetje te worstelen met de term, scope van het proces. De scope van een project snap ik, dat kun je begrenzen. Wat bedoel je dan precies met de scope van het proces?*
I: Ik begrijp dat het lastig is. Met proces bedoelde ik zowel het project als het samenwerkingsproces te bedoelen. In de oorspronkelijke definitie stond de 'scope van het bouwteam', wat naar mijn idee zowel op het project als het samenwerkingsproces slaat. Dat is de reden dat ik voor de term proces gekozen heb, maar ik merk dat het soms tot wat verwarring leidt.
R: *En ik was het er mee oneens? Ook dat weer met in het achterhoofd bouwteam. Ook in de infrastructuur is het heel belangrijk om van te voren goed te definiëren. Of er dan verschillen zitten tussen de bouw en de infra, ik zag dat eerlijk gezegd niet zo.*
I: Zou het te maken kunnen hebben met mijn participanten? Mijn infra participanten zijn grotendeels afkomstig van D&C en DBFM projecten. Zou dat een reden kunnen zijn om een gedefinieerde scope minder belangrijk te vinden?
R: *Hmm, dat weet ik eigenlijk niet zo goed. Ik heb er niet zo'n verklaring voor.*

De ontwikkeling van gemeenschappelijke processen en instrumenten

I: Dat geeft niets. Dan gaan we verder naar de volgende. De ontwikkeling van gemeenschappelijke processen en instrumenten wordt ook belangrijker gevonden wordt in de bouw dan in de infra. Je was het eens met deze stelling. Mijn verklaring was dat het mogelijk zou kunnen komen doordat de infrasector een kleinere klantenkring heeft dan de bouwsector, de infra is voornamelijk afhankelijk van de publieke sector. Je was het oneens met deze verklaring. Zou je dat verder kunnen toelichten?
R: *Ik heb dat wel snel ingevuld, dus ik moet soms wel even nadenken of het allemaal klopt. Jij zoekt de verklaring in de opdrachtgeversgroep (is die klein of groot), ik zoek het meer in de opgave zelf. Dan kom ik toch weer even op de disciplines en de functionaliteiten van een gebouw. Met name in de*

ontwerpfase is mijn ervaring dat het een hele puzzel is om alle onderdelen die in een gebouw zitten onderling op elkaar af te stemmen. Het zit hem hier in en niet in het feit dat je te maken hebt met weinig of veel opdrachtgevers.
I: Bij zelf komt nog iets anders op, dat het mogelijk gerelateerd is aan mijn P-set. Infra participanten zijn hoofdzakelijk afkomstig uit een DBFM en D&C contracten. Natuurlijk is het dan belangrijk om processen en instrumenten te ontwikkelen, maar naar mijn idee gebeurt dat minder in overeenstemming met de opdrachtgever. Deel je deze mening?
R: *Ja daar zit wel wat in. Je noemt DBFM. Er zijn natuurlijk niet zoveel DBFM's, dus dan heb je geen evenwichtige afspiegeling van wat er zich op de bouwmarkt afspeelt. De grote jongens hebben dit soort projecten gedaan, maar die zijn op de vingers van één hand te tellen. En het gros van de infraprojecten in Nederland is D&C en de rest is traditioneel. Heel veel gemeentes maken gewoon nog bestekken.*
I: Denk je dat deze contractvorm van invloed kan zijn, of ben je het los van de contractvorm ermee eens dat de ontwikkeling van gemeenschappelijke processen en instrumenten belangrijker is in de bouw dan in de infra?
R: *Ehm, ja ik ben geneigd om te zeggen van wel.*

Het regelmatig vergaderen
I: Dan de laatste factor die in de bouw belangrijker is dan in de infra. Dat was het regelmatig vergaderen. Die is wat mij betreft heel interessant, omdat de infra participanten deze factor lager waarderen dan bouwparticipanten, maar tegelijkertijd zeggen zij niet dat vergaderen niet belangrijker is, maar zeggen ze meer dat het niet gaat om de regelmaat, maar om de effectiviteit. Met als gevolg dat het voor mij lastig is om deze factor te interpreteren. Mijn verklaring is dat het waarschijnlijk te maken heeft de projecten waarbij participanten betrokken zijn: DBFM's en D&C waarbij je veel overleggen, waardoor mensen het lastiger vinden om efficiënt te zijn, met als gevolg dat mensen deze factor lager waarderen. Kan je je hierin vinden?
R: *Dat vind ik niet zo makkelijk. Kijk van een afstand zou ik zeggen dat als je het hebt over de aanleg van een weg versus het bouwen van een gebouw en je denkt aan de bouwteamfase, dan heb je een ander soort stakeholders. Bij zo'n weg heb je te maken met partijen die ook een rol hebben in zo'n voorbereiding. Aan de andere kant, als je een utiliteitsgebouw hebt, dan is dat een maatpak. Dat maatpak maak je door een heel goed programma van eisen te maken, te analyseren welke processen zich gaan afspelen en hoe moet dat gebouw eromheen gekneed worden. Dat vraagt de nodige afstemming. Laat ik het simpel zeggen: voor een weg heb ik nog nooit een gebruikersoverleg gevoerd. Voor de medische faculteit van de universiteit Leiden heb ik juist wel hele intensieve gebruiker overleggen gehad. Ze delen heel veel en heel veel verschillende dingen. Dat maakte dat het aantal overleggen enorm hoog lag. Dat heb ik nog nooit gezien bij een gemeente. Als het gaat om die fase, het voorbereiden, dan is het gevoelsmatig, het gaat voorbij aan verschillen in omvang, complexer, omgeving etc. dan zou ik zeggen dat ze misschien wel meer zitten te vergaderen in de bouw dan in de infra en dat dat dan ook belangrijker is.*
I: Dan is het misschien zo dat je bij een infraproject misschien heel lang aan het vergaderen bent, terwijl je bij een bouwproject vooral aan het begin heel intensief aan het vergaderen bent.
R: *Ja, dat zou goed kunnen. Des te langer je bouwt, des te langer je zit te vergaderen. Nou ja, die toevoeging van effectiviteit is natuurlijk een beetje lastig voor jou, want het geeft een extra normering aan wat vergaderen eigenlijk is.*

De vroegtijdige betrokkenheid van externe stakeholders
I: Bedankt, dan gaan we wat mij betreft naar de factoren die in de infra belangrijker gevonden worden. Dat is bijvoorbeeld de vroegtijdige betrokkenheid van externe stakeholders. Je had aangegeven dat je het daar überhaupt al niet mee eens bent. Zou je dat kunnen toelichten?
R: *Nou gaat het om het belang of het feit dat je ze erbij moet betrekken? Lees de vraag nog eens even of de stelling?*
I: De vroegtijdige betrokkenheid van externe stakeholders wordt in de infrasector als een belangrijker factor voor succesvolle samenwerking gezien dan in de bouw.

R: *Misschien moet ik dat antwoord wijzigen, want ik denk wel dat het waar is. In de infrasector spelen de externe stakeholders een grotere rol dan in de bouw. Als je vanuit die optiek denkt: je moet ze vroegtijdig betrekken om door het project heen te kunnen gaan. Je kunt niet eerst het tracé bepalen en pas daarna het waterschap bellen.*
I: En hoe komt het dan dat de externe stakeholders bij infraprojecten een grotere rol spelen dan bij bouwprojecten?
R: *Nou ik denk dat het ermee te maken heeft dat infrastructuur een lijn oriëntatie heeft. Bij een gebouw heb je welstand die er wat van moet vinden, maar je hebt niet zo'n grote discussie met een waterschap als dat je hebt als je een paar kilometer door een stuk land moet gaan leggen.*
I: Ik heb zelf ook het idee dat infrastakeholders meer macht hebben dan bouwstakeholders. Ik kan dat niet zo beargumenteren, maar was benieuwd of je dat herkent.
R: *Ja, dat herken ik wel. Die hebben in veel gevallen de macht van de vergunning. En als ze die kaart trekken, dan ligt je project stil. Als een waterschap zegt het niet eens te zijn met de ligging of de hoe je met de verplichting voor watercreatie omgaat, dan kun je hoog en laag springen, maar als je dat niet aanpast, dan komt die weg niet. En dat soort discussies spelen eigenlijk niet bij een gebouw. Als je dan kijkt naar de interne stakeholders, die maken onderdeel uit van de opdracht gevende organisaties, dan kan er altijd iemand boven zijn, desnoods de raad van bestuur die de knoop doorhakt. Dat heb je niet bij een infrastructuurproject, de gemeente gaat niet over het waterschap.*
I: Ja, de individuele stakeholders hebben dus veel meer macht.
R: *Ja.*
Een eerlijke risicoverdeling
I: Een andere factor is de eerlijke risicoverdeling. Ook daarvan zeiden infraparticipanten dat het belangrijker was dan bouwparticipanten. Herken je dat?
R: *Nee.*
I: Zou je enig idee hebben waarom dat dan wel uit mijn onderzoek komt?
R: *Ik vind het een grappige. Volgens mij is het een universeel punt. Als je een project doel wil je het liefst een gebalanceerd contract, waarbij risicoverdeling conform draagkracht en de mogelijkheid om risico's te beïnvloeden is. Waarom zou het dan anders zijn tussen beide sectoren? Ook in een bouwproject zal er geen aannemer zijn die zomaar met een zwaardere risicoverdeling akkoord gaat.*
I: Ik had zelf nog wel een idee. Bouwparticipanten zeggen namelijk dat een eerlijke risicoverdeling niet zo belangrijk is omdat de risico's pas aan het eind van de bouwteamfase verdeeld worden.
R: *Klopt. Het is wel grappig dat je dat zegt. Daar zit wel een verschil in perceptie. Ik heb het idee dat omdat ontwerpers van gebouwen, juist omdat ze gewend zijn om met meer partijen samen te werken, mensen in de infra er alerter op zijn, in de zin van wat wordt nu precies mijn rol in dat bouwteam. Ja we gaan dat wel leuk samen doen, maar ik wil wel heel goed weten waar ik straks op afgerekend wordt. Op de een of andere manier is dat in de infra een heikeler punt dan in de bouwsector. Hoe dat komt…? Dat is wel een goeie vraag.*
I: Ik had hiervoor een gesprek met iemand die vooral infravergadering en toen bedacht ik me dat naar mijn idee de bouwfraude een grotere rol speelde in de infra. En dat infraparticipanten het veel hebben over oud gedrag, waarin ze soms het idee hebben belazerd te zijn door RWS en daardoor extra op de risicoverdeling zitten, omdat dat extra niet even goed gegaan is. Ik vraag me nu af of dat oude zeer er in de infra nog meer in zit dan in de bouw?
R: *Nou dat kan een verklaring zijn. Die hele bouw enquête en die bouwfraude was grotendeels van de infra en niet zo zeer van de bouw Kijk naar de partijen die erbij betrokken zijn geweest, dat zijn grotendeels infrabouwers geweest. Als je ervaring grotendeels gevoed wordt door samenwerking met RWS, dan snap ik het ook wel. RWS is echt een veelkoppig monster, het is een van de moeilijkste opdrachtgevers die we hebben. Zogenaamd professioneel, omdat het bouwen van wegen en vaarwegen hun corebusiness is, maar het is een ontzettend lastige klant. Misschien heeft het ook wel te maken met de beweging die een aantal jaar daarna is ingezet: alles via geïntegreerde contracten. Het heeft geleid tot een enorme afvoer van inhoudelijke kennis bij RWS. Dat proberen ze weer een beetje op te bouwen, maar dat is een moeilijk proces. Ze zijn heel erg op procesbeheersing gaan sturen, het gat tussen bouwers en RWS is daarmee wel groter geworden. Ik heb vergaderingen meegemaakt,*

daar zie je gewoon het enorme onvermogen. De bouwer is op inhoudelijk niveau aan het communiceren, RWS op procesniveau. Dan zegt de bouwer: "we hebben het rapport geschreven, hebben jullie ernaar gekeken?". Dan zegt RWS: "Nee we hebben er niet naar gekeken omdat het drie dagen te laat was". Dan zie je het enorm vermogen. Maar RWS zit alleen op het proces, laat staan of ze het überhaupt kunnen lezen, want daar hebben ze een adviseur voor nodig. Dat wantrouwen, dat dat maakt dat infrabouwers heel alert zijn op welke risico's ze lopen, dat wordt ook wel daardoor gevoed. Plus natuurlijk de enorme lijst met projecten die echt mis zijn gegaan, recent nog de sluis bij IJmuiden, dat maakt natuurlijk ook dat je steeds meer ziet dat infrabouwers van te voren heel goed nadenken waar ze precies voor aan de lat staan. Anders stappen ze er niet in. Ik denk dat dat ook een rol speelt als je dit soort uitspraken hoort.

Een gelijkwaardige relatie en respect voor elkaar

I: Oké, de laatste factor die ik met je wil bespreken is het hebben van een gelijkwaardige relatie en respect voor elkaar. Ook daarvan zeggen infraparticipanten dat het belangrijker is dan bouwparticipanten. Je gaf in de enquête aan dat je dat niet herkent. Zou je daar iets over kunnen zeggen?

R: *Ik kan me niet voorstellen dat dit aspect in het ene deel van de bouwsector belangrijker zou moeten zijn dan in het andere deel. Dit vind ik echt zo'n generiek ding. Ik kon geen argumenten verzinnen waarom ik dat bevestigd zou kunnen zien.*

I: Ik heb een poging gedaan. Enerzijds denk ik dat het gerelateerd is aan mijn participanten: de infraparticipanten zijn bij zulke grote langdurige projecten betrokken, dat je eigenlijk een soort huwelijk met elkaar aangaat. Als je voor zo'n lange periode met elkaar moet samenwerken, kan ik me wel voorstellen dat je vooral op het relationele gaat focussen. Het lijkt alsof de bouwteamparticipanten er veel zakelijker er ingaan: we moeten nu goed samenwerken, waarin duidelijkheid over de rollen en het proces het belangrijkste is.

R: *Haha, dit is totaal contrair met wat wij in het nieuwe model hebben geschreven. We hebben daarin expliciet dingen benoemd over samenwerking in het bouwteam, zaken waarvan altijd wordt geroepen dat het daar om draait, maar waar nooit iets van wordt opgenomen in het contract. Wij hebben specifiek elementen over houding en gedrag, transparantie opgenomen, juist om te bevorderen dat die samenwerking in dat bouwteam, juist ook in de infra, beter wordt. Want daarvan hadden wij het idee dat het een beetje tekort schiet. Dat is een van de redenen om het expliciet te maken. Wij hadden zelf het idee dat we met het schrijven hiervan ook invulling gaven aan de marktvisie. Iedereen heeft die ondertekent, maar als je dan een niveau lager gaat, waar zie je dat dan terug, dan zie je het eigenlijk nergens terug. Wie maakt het nu concreet? Wij hebben een poging om het wel concreet te maken. Alle intenties om beter samen te werken en beter te communiceren hebben wij nu zwart op wit in een contract staan. En natuurlijk kun je het schrappen, maar dat moet je wel actief doen.*

I: Als ik infraparticipanten sprak vond ik het heel opvallend. Bouwparticipanten werken al veel vaker samen in Bouwteams, maar lijken duidelijkheid in definitie, rollen en proces heel belangrijk te vinden. Aan de andere kant heb je infraparticipanten die alle relationele en teamaspecten heel hoog plaatsen, tegelijkertijd zeuren dat hun opdrachtgever niet altijd aan eerlijke risicoverdeling doet, geen kennis heeft, niet altijd te vertrouwen is, en niet in Bouwteams werken. Dan vraag ik me soms af waar dat vandaan komt.

R: *Dat heb je goed geconstateerd. Bouwteams bestaan al veel langer, ze zijn net na de Tweede Wereldoorlog opgekomen en eigenlijk in de bouwsector altijd blijven bestaan. In de infra zijn ze tot een paar jaar terug nooit aan de orde geweest. Er is altijd een soort weerstand geweest tegen Bouwteams in de infra. En ik heb daar nooit helemaal de vinger achter kunnen krijgen waarom ze dat niet wilden. Of dat dan met het soort opdrachtgever, het soort project te maken heeft, ze zijn altijd een beetje huiverig geweest daarvoor. Waar dat nu in zit, ik weet het niet. Ik zie wel dat ook in de gebouwenhoek veel projecten wat kleiner zijn. Met name in die kleine projecten vinden aannemers het heel erg gebruikelijk om in Bouwteams te gaan. In de infra zijn de belangen natuurlijk snel wat groter: een weg maak je niet voor een paar ton. Plus het feit dat er een ander soort opdrachtgever is, die vaak ook nog publiek is. Dat wordt nog weleens onderschat: bij RWS maakt het niet uit wat een project kost, als er*

maar dekking is. Wat wel heel erg van belang is rechtmatigheid: alles wat ze doen moeten ze kunnen verantwoorden. De accountants zijn de echte bazen. Dus als je iets uitgeeft, dan moet daar een verplichting tegenover staan en financiële dekking, anders mag je het niet doen. In de gebouwenhoek zie je een veel diverse scala aan soorten opdrachtgevers, met name private opdrachtgevers, daar gaat het echt heel anders. Ik heb op een gegeven moment een distributiecentrum in Den Bosch begeleidt voor een importeur van kantoorartikelen. De baas van het bedrijf deed zaken met de baas van het aannemersbedrijf. Ik heb erbij gezeten. Het werd geraamd op een bepaald bedrag, dat werd met onderhandeling overleg iets bijgesteld. Vervolgens wordt het bekrachtigd met een handafdruk en daar blijft het bij. Ze hadden ook al een relatie, ze kenden elkaar, allebei uit de regio. Dat is een heel ander spel dan in de infra. De factor vertrouwen is daar echt een wezenlijk onderdeel van de samenwerking. Als je dat vertrouwen beschaamt, dan gaat er echt wat kapot. Terwijl je bij RWS niet op basis van vertrouwen werkt, dat is helemaal niet rechtmatig. Alles wat je doet moet je daar op papier kunnen verantwoorden. Ik hoor je bijna zeggen dat infrabouwers om vertrouwen schreeuwen en daarom zo haperen op vertrouwen en transparantie, terwijl ze dat zeker met RWS heel moeilijk kunnen bereiken.

Lessen vanuit de bouw voor de infra

I: Leuk dat je dat nu noemt. Want uit mijn onderzoek zijn ook een aantal zaken naar voren gekomen waar bouw en infra ongeveer hetzelfde in staan. Uitgangspunt bij mijn onderzoek is dat de aspecten die in beide sectoren van belang zijn voor samenwerken, de aspecten zijn waarop beide sectoren van elkaar kunnen leren. Vertrouwen en transparantie komen bij beide sectoren als meest belangrijkste uit. Mijn vraag is wat de infra op deze gebieden zou kunnen leren van de bouw, zeker ook tegen de achtergrond van wat je zo net vertelde. Dus: kan de infra wat leren van de bouw?

R: *Kan de infra iets leren van de bouw? Nou voor een deel zit het natuurlijk gewoon in de constitutie, in de structuur van de bouw. Bij RWS gaat er nooit een districtshoofd net zo makkelijk acteren als zo'n directeur van een import bedrijf. Dat gaat niet lukken. Dus wat zouden ze dan kunnen leren? Dat is best wel lastig. Je kunt natuurlijk simpelweg zeggen hoe functioneren Bouwteams in de gebouwenhoek en kijk wat daar de belangrijke elementen zijn en pas die ook toe op je eigen bouwteam. Maar dat is natuurlijk te kort door de bocht, omdat je zaken niet een op een kunt overnemen, misschien lopen ze zelfs wel meer risico als ze het op die manier doen, omdat hun opdrachtgever hun op een hele andere manier afrekent. Tsjah en wat kun je dan leren?*

I: Misschien kan ik de vraag wat algemener stellen en helpt je dat. Als jij nu een Bouwteam in de infra begeleidt, welke ervaringen vanuit de bouw neem je dan mee?

R: *Ja, dat zit wel in houding. Dat is meteen ook een van de moeilijkste die er is. Kijk de intentie om samen te werken en het moment dat je nu eenmaal in dat bouwteam zit, dat je niet steeds denkt: o als ik nu wat roept, dan wordt ik daar later ook op afgerekend. Als dat in het ontwerp komt, dan hang ik daar ook voor. Op de een of andere manier is er in de bouwsector veel sneller een gevoel van gemeenschappelijk werken aan het project. Bij de infra heb ik het idee nog steeds idee dat ze nog steeds af en toe achterom kijken met het idee: Mag ik dat wel roepen van mijn baas. Want ja ik zit hier toch wel met de ontwerpers en met de opdrachtgever in een Bouwteam overeenkomst. Zo meteen gaan we bouwen en als het niet goed is komen ze bij me terug. Als ze die behoedzaamheid zouden kunnen laten varen, dan denk ik dat ze ook merken dat opdrachtgevers hun houding ook gaan veranderen. Het is ook altijd actie-reactie. Er wordt weleens gezegd bouwers zijn boeven, meerwerk en noem maar op, maar eigenlijk is dat ook omdat opdrachtgevers ze zo behandelen. Ik herken dat helemaal. Als ik een offerte uitvraag krijg en ik zie de voorwaarden en denk o daar gaan we weer: onbeperkt aansprakelijk, daar moet ik voor staan, dat risico moet ik nemen. Dan denk ik: als je het zo wilt spelen, dan gaan we het zo spelen. Dan ga ik ook op die manier acteren. Terwijl als er uit een uitvraag blijkt dat het reel is en een actieve rol wil vervullen, staat voor zijn rol, risico's accepteert omdat ze nu eenmaal aan een project vastzitten. Je kunt ze wel wegschuiven in een contract, maar eigenlijk zijn ze ook inherent aan je opdrachtgeversrol, dus neem die verantwoordelijkheid dan en sta daar ook voor. Als je merkt dat het afschuiven wel gebeurd, dan wat ik zeg, ga ik terug duwen, ga ik me ook indekken. Dan krijg je ook niet meer dan je strikt genomen vraagt. Dan loop ik geen meter harder voor je.*

I: En op een andere factor, bijvoorbeeld communicatie: is er dan iets wat je leert vanuit de bouw?

R: *Ja soms wel, dat is wel een grappige. Kijk wat ik merk met het werken met architecten. Architecten staan anders in het leven dan inframensen. Inframensen vinden ze af en toe zweverig. Architecten zijn makkelijker in staat om op een metaniveau te communiceren. Dat vind ik heel plezierig. Dat leidt tot een ander soort communicatie, dan in de infra waar het toch recht toe recht aan is. Als je het hebt in kleurenleer, dan denk ik blauw en rood, terwijl in de gebouwenhoek meer mensen zitten die ook groen en geel zijn en af en toe buiten de box denken of op een andere manier communiceren. Ik ben geneigd om te zeggen dat dat een rijkere manier van communiceren is.*
I: Maar wat zou dat dan betekenen voor de infrasector? Moet je dan ineens ook groenere en gelere mensen gaan opzoeken?
R: *Nou dat roepen we intern weleens, dat het voor het functioneren van een projectteam helemaal niet zo erg zou zijn om een paar paradijsvogels erbij te zetten. Maar goed, die moet je wel vinden. Er zitten echt wel wat verschillen. De infra zou echt wel verbeteren als ze daar wat meer aandacht voor zouden hebben.*

Tot slot
I: Oké dankjewel. Dit waren de vragen die ik had. Zijn er nog aspecten die we niet aangestipt hebben, maar die wat jouw betreft wel belangrijk zijn?
R: *Nee, ik denk alleen dat het voor jou wel lastig is de resultaten juist te interpreteren. We hebben natuurlijk een deel van de uitspraken onder de loep genomen. Voor een deel zijn ze generiek, en voor een deel hebben ze te maken met het verschijnsel bouwteam, wat ook wel weer een verbijzondering is. Dus ik denk dat het nog wel wat lastig is om het door de zeef te halen: wat is nu specifiek, wat heeft een sterke relatie met het doen van een bouwteam c.q. wat is generiek en geldt sowieso voor bouw en infra.*
I: Ja dat probeer ik zoveel mogelijk te doen, we hebben het in het gesprek soms ook aangestipt, maar het blijft lastig. Het is de grote onzekerheid in het onderzoek, omdat je zulke verschillende participantengroepen hebt. Dus dat maakt het lastig om uit te zoeken waar het precies aan ligt.
R: *Ja we waren als W+B ook betrokken bij een bouwteam voor een waterfabriek. Daar is de stekker uitgetrokken. Ik hoorde dat en heb de projectleider gebeld om te vragen wat er precies gebeurd is. De evaluatie moet nog worden uitgevoerd, maar zijn eerste verklaring was dat het vooral lag aan oud gedrag aan de kant van de opdrachtgever. Het management had besloten dat het in een bouwteam moest gebeuren en er vervolgens mensen op gezet met veel ervaring, maar met ook een hele gezonde dosis wantrouwen tegen de aannemer. Dan gaat het niet werken.*
I: Jammer, juist omdat dat zo'n belangrijke factor is in een bouwteam.
R: *Ja dat is ook iets wat ik overal roep. Laatst heb ik een review gedaan op een contract, ook voor een bouwteam. Daar hadden ze het oude model gebruikt als basis en er allerlei aanpassingen op gedaan. Ik zag dat de inkoper toen ook nog wat wilde veranderen. Toen heb ik tegen onze projectleider gezegd om te adviseren om te stoppen met dat Bouwteam. Er schemerde al zoveel indekken en risico's doorschuiven in door, dat ze het beter in een geïntegreerd contract konden werken. Dat het nooit een bouwteam zou worden door een verkeerde attitude.*
I: Oké, dan wil ik je heel hartelijk bedanken voor je deelname.

Transcription interview Expert 4
[Voorstelrondje]

Verschillen tussen Bouw en Infra
I: Wat we tijdens het interview gaan doen is het volgende. Allereerst zal ik de enquête langsgaan waarbij we de verschillen tussen bouw en infra zullen bespreken, alsmede de mogelijke verklaringen. Vervolgens wil ik het graag hebben over jouw ervaringen: wat heb je in de bouw geleerd en wat pas je toe in de infra of vise versa. Dus enerzijds de verklaringen en anderzijds jouw ervaringen. In de enquête was gevraagd naar de verschillen en overeenkomsten tussen bouw en infra. Je gaf daar onder andere het cultuurverschil aan tussen beide sectoren. Zou je dat nader kunnen toelichten?

R: *Ja dat had ik al wel verwacht ja. Dat is natuurlijk ook wel heel moeilijk te duiden. Het is ook een gevoel natuurlijk, maar van oudsher, is mijn ervaring merk je gewoon wel een cultuurverschil tussen de bouw en infrawereld. Dat heeft natuurlijk ook te maken met hoe de projecten georganiseerd zijn. Dat steekt gewoon wat anders in elkaar in de bouwwereld dan in de infrasector. Maar je merkt dat het in de bouwwereld allemaal iets strakker georganiseerd is, wat meer procesmatig wordt ingevuld. Dat is denk ik ook wel inherent aan hoe projecten tot stand komen, wat daar voor nodig is. Dat wordt vaak minutieus van te voren uitgedacht van te voren, zodat het ook allemaal ook in de volgorde waarin het plaats moet vinden, gaat matchen met elkaar. In de infra is dat wat anders, deels afhankelijk van wat voor soort infra het is. De wegenbouw is wat anders dan groot grondverzet. Een kunstwerk, als het gaat om het bouwen van bruggen, viaducten e.d., dat lijkt weer veel meer aan te sluiten op hoe het plaats vindt in de bouwwereld. Dus de manier waarop dingen georganiseerd worden daar merk je wel wat verschillen in. Wat daar dan opvalt, althans dat is mijn ervaring, is dat het type mensen wat je daar tegenkomt daar naar rato ook wel een beetje bij lijkt te passen. Of dat dan iets is wat groeit in de loop van de carrière, hoe je daarmee omgaat, voorbeelden die je daarin ziet. De werkwijze is feitelijk inherent aan hoe ook mensen zich gedragen en omgaan met zaken binnen projecten. Dan is dat binnen de bouw net wat strakker, wat zakelijker, dan in het algemeen binnen de infrasector. Misschien ook wel ingegeven doordat er in de infrasector net wat minder ervaring is met werken in een Bouwteamachtige setting. Overigens is het ene Bouwteam het andere Bouwteam niet. Dat is heel inherent aan wat de scope is, of je een Bouwteam wat feitelijk alleen bedoeld is voor de ontwerpfase, waarna er een bestek of iets wat erop lijkt uit rolt, dus dat het traditioneel wordt ingevuld. Je hebt ook Bouwteams, die van A t-m Z gewoon doorgaan in de uitvoering van het project. Dat is een heel andere beleving natuurlijk hoe je daar als OG en ON met elkaar omgaat. Dus het is divers, laten we het zo noemen.*

I: En als je dan nadenkt over dat cultuurverschil, heeft dat dan ook gevolgen voor de samenwerking in die beide sectoren?

R: *Dat vind ik moeilijk te zeggen. Het valt of staat met de deelnemers. Je merkt wel dat mensen die vrij traditioneel zijn, dus hun hele leven met traditionele contractvormen hebben gewerkt, soms wat minder makkelijk open staan om in een meer transparante omgeving met elkaar samen te werken. Bij dit samenwerken zijn vertrouwen en transparantie heel belangrijk, dat is natuurlijk iets wat je moet laten groeien. Maar het valt of staat wel een beetje met de openheid die er moet zijn bij mensen om bereid te zijn om op zo'n wijze met elkaar samen te werken. De één gaat dat makkelijker af dan de ander. Je ziet dat het soms bijna vanzelf gaat, en soms heel erg moeilijk. Dat kan natuurlijk aan verschillende factoren liggen, maar het ligt met name wel aan de mensen die deelnemen aan een Bouwteam. Toevallig heb ik recent nog een ervaring opgedaan aan de opdrachtgeverszijde. Het is een project in X, een grootschalig woningbouwlocatie, die daar ontwikkeld wordt, waarbij wij als Arcadis opdrachtnemer zijn om daar de opdrachtgever in te begeleiden, mede omdat de financiën van dat project behoorlijk onder druk staan is besloten om het vervolg van het project in een Bouwteam voort te zetten. Ik heb daar voor de opdrachtgever ook een aanbesteding voor georganiseerd. Uiteindelijk hebben we puur op kwaliteit overigens, een aannemer georganiseerd. Het eerste halfjaar ben ik erbij betrokken geweest om te kijken hoe het ging. Een beetje een bijzonder project omdat de scope nog niet helemaal duidelijk is. Er was wel een plafondbedrag, maar nog geen exacte invulling. Aan het begin was het lastig om een idee te krijgen of dat plafondbedrag ook realistisch was, terwijl je nog niet weet wat de exacte invulling gaat wezen. Je merkt ook in dit geval, dat ondanks de aannemer er met kop en schouders bovenuit stak in de selectiefase, toch veel moeite had om vanuit zijn traditionele manier van denken en handelen openheid van zaken te geven. Dat heeft best wel een aantal maanden geduurd voordat dat besef doordrong. Dan zie je wel dat mensen heel enthousiast worden, dat mensen zien dat het op een andere manier kan, dat het minder vanuit een vechtcultuur gaat, en dat je daarmee op een prettiger manier, constructiever vind ik ook, met elkaar samenwerkt. Dat werd ook wel bevestigd door betrokkenen. Dat is wel een heel leuke verhouding.*

I: Ja, leuk om te zien dat een aannemer dan in een halfjaar tijd ook echt lerend vermogen laat zien.

R: *Ja.*

Een duidelijke definitie van rollen

I. Gaaf. Dan zou ik graag naar een ander aspect van de enquête willen gaan, namelijk alle stellingen waarbij je aangegeven had of je het daarmee eens of oneens was, en de verklaringen. We gaan hierbij de stellingen nogmaals af en gaan daarbij hoofdzakelijk in op de verklaring. Net als in de enquête behandelen we eerst de aspecten die in de bouw belangrijker worden gevonden dan in de infra. De eerste factor is de duidelijke definitie van rollen. Daarvan zegt de bouw dus dat dat belangrijker is dan de infra. Jij had overigens aangegeven dat je het daar niet mee eens was. Mijn verklaring voor dit verschil is dat er in de bouw meer verschillende type klanten met een verschillend verklaringsniveau betrokken zijn dan in de infrasector. Met die verklaring was je het wel eens. Zou je kunnen toelichten waarom je het niet eens was met de stelling, maar wel eens bent met de verklaring?

R: *Kijk het valt of staat natuurlijk met de taken en verantwoordelijkheden. Die moeten voor iedereen duidelijk zijn. Los van of het een bouw of infraproject is, dat is de basis. Dus dat geldt voor beide, en ik vind dat dat geen verschil uit maakt, moet maken, mag maken of je nu in een Bouwteam binnen een bouw of infraproject werkt. Dus dat is de reden dat ik dat antwoord heb gegeven. Dat het zich soms in de praktijk misschien anders voordoet.. Ik heb niet zo zeer zelf die ervaring, maar kan me er misschien wel iets bij voorstellen. Maar de rollen, taken en verantwoordelijkheden die moeten gewoon duidelijk zijn*.

I: Oké, dat is duidelijk, maar dan even verder gaand op die verklaring. Dan denk ik dat het mogelijk verklaard kan worden met een verschillend type klant en een verschillend ervaringsniveau. Als je een samenwerking hebt met een opdrachtgever, bijv. een ziekenhuisdirecteur die dat nooit doet, dan is de duidelijke definitie van rollen misschien belangrijker dan bij de infra waar je vaak met RWS of een afdeling beheer werkt.

R: *Nou, daar raak je wel een punt. Het komt dus neer op deelnemers in een bouwteam. Als je het voorbeeld neemt van een ziekenhuisproject, een uitbreiding daarvan, als onderdeel van het opdrachtgeverschap is dat bijvoorbeeld de directeur van het ziekenhuis daar ook deel aan neemt, dan krijg je een heel andere dimensie dan dat je met een ontwikkelaar in een bouwteam zit of met een aantal gemeentelijke ambtenaren die ervaring hebben op het gebied van het bouwen van projecten. Je moet altijd dus heel goed kijken naar de dynamiek van zo'n bouwteam, dus welke deelnemers daarin zitten, met welke ervaringen zij meenemen.*

I: Ja, want ik heb dus het idee dat bij de bouw veel meer divers is dan bij de infra.

R: *Ehm ja, dat denk ik wel ja. Dat is wel meer diverse dan ten opzichte van een infraproject. Dat is toch iets traditioneler, dan werk je toch met RWS of met provinciale of gemeentelijke overheden. Dat zijn toch vaak de opdrachtgevers als het gaat om opdrachtgevers van de infrasector.*

Een gedefinieerde scope van het proces

I: Ja, want de volgende is de gedefinieerde scope van het proces. Ook die wordt in de bouw belangrijker gevonden. Daarvan had je gezegd dat je het er mee eens was. Ook hiervan dacht ik dat de verklaring heel erg samenhangt met de opdrachtgever.

R: *Nou, misschien moet ik daar iets aan toevoegen. Dat schiet me nu zo te binnen. De belangen van opdrachtgevers in de bouwwereld zijn vaak wat anders dan de belangen in de infrasector. De infrasector gaat vaak om openbaar gebied, waardoor je werkt met RWS, een provincie, een gemeente en die hebben natuurlijk wat andere belangen dan de eigenaren van gebouwen. De dynamiek zit er wat anders uit. De belangen die ermee gemoeid zijn, zijn ook anders dan een wat algemeen belang van een manager bij een provincie die ergens iets in een openbaar gebied gerealiseerd wil hebben. Het is toch anders of je iets in beheer hebt of dat je er eigenaar van bent. Dus dat maakt allemaal dat er verschillen tussen de sectoren. Het zit niet alleen in de mensen zelf, maar het zit ook in het feit dat er nu eenmaal iets anders achter zit. Dat is vooral belangrijk om je in een bouwteam daar ook vooraf goed in te kunnen leven. Dus wat zijn nu de belangen van de opdracht gevende partij. Het belang is bij elk project in meer of mindere mate toch wel verschillend. Hoe beter je daar op in kunt spelen, hoe beter je rol ook in een project of in een bouwteam vorm kunt geven.*

I: Denk je dat dat bij de infra ook belangrijk is, omdat je bij de infra toch wat meer eenduidigheid in opdrachtgevers, en dus mogelijk in belangen, hebt?

R: *Ja, maar dan nog krijg je verschillen omdat mensen nu eenmaal verschillend zijn. Maar sowieso bij elk project, zeker in een bouwteam is het heel erg belangrijk om je goed in te leven in de belangen die een opdrachtgever heeft bij een project. Dat maakt het vaak heel wat makkelijker om ook op een prettige manier samen te werken. Dat is empathie ook he. De een heeft dat nu eenmaal wat meer dan de ander. Maar dat helpt je wel ontzettend om ook een goede rol in het bouwteam te pakken. Niet iedereen is geschikt om in een Bouwteam te werken. Dat is misschien een vrij boute stelling, maar dat is wel mijn ervaring.*

I: En hoe merk je dat dan?

R: *Omdat je in een bouwteam ook in staat moet zijn om transparant te werken, te willen werken, op basis van vertrouwen zaken te doen. Je merkt toch wel in de min of meer traditionele bouwwereld, dat sommige mensen met alle ervaring die ze in hun leven hebben opgedaan, de manier van werken vooral, dat dat zo ingebakken zit, naast hun eigen karakter natuurlijk, dat het voor sommigen gewoon lastig is om daar op een goede wijze invulling aan te geven, Maar dat geldt evenzeer aan opdrachtgeverszijde. Dat is iets wat je nooit van te voren weet. Je trouwt met elkaar zonder dat je vooraf weet met wie je gaat trouwen. Soms gaat het goed, soms gaat het veel moeizamer. Dat wordt toch ingegeven door het feit wie deelneemt aan zo'n bouwteam. Het is wel belangrijk, om zowel vanuit opdrachtgevers als opdrachtnemerszijde na te denken wie ik in dat bouwteam zet.*

De ontwikkeling van gemeenschappelijke processen en instrumenten

I: Oké, dan wil ik het graag even hebben over de ontwikkeling van gemeenschappelijke processen en instrumenten. Ook daarvan zegt de bouw dat het belangrijker is dan de infra. Jij gaf aan dat je dat niet herkent. Zou je dat kunnen toelichten?

R: *Zou je misschien ook even kunnen toelichten wat je daar precies mee bedoelt?*

I: Ja, gemeenschappelijke processen en instrumenten werden door respondenten geïnterpreteerd als bijvoorbeeld ene project management plan, of allerlei tools die je kan inzetten om een project te beheersen, financieel op het gebied van samenwerking, hoe je elkaar rapporteert, de keuze van de lay-out etc.

R: *Nee, dat herken ik inderdaad niet, omdat ik zelf ook vind dat het heel belangrijk is om in het kader van transparantie dat je laat zien wat de effecten zijn van de samenwerking, vooral ook in financiële zin. Denk bijv. aan een dashboard, waarop ik kan zien hoe een project zich in financiële zin ontwikkeld. Met name ook zodat je altijd weet hoe een project zich ontwikkeld, met name natuurlijk met het oog op het budget. Als je op enig moment in het project gaat merken dat het project zich scheef heeft ontwikkeld in een project, dan is het belangrijk om bij te sturen. Daarom is het van belang met elkaar af te spreken welke tools je wilt hanteren gedurende het project.*

I: En hoe verklaar je dan dat de bouw dit toch belangrijker vindt dan de infra?

R: *Het is mijn stelling niet, ik geef slechts mijn perspectief. Mijn ervaring is dat het niet uit zou moeten maken. Alle projecten waarbij ik ook in een bouwteam betrokken ben geweest, heb ik dit vanaf het begin belangrijk gevonden. En het werkt is mijn ervaring. Dus je moet het in beide sectoren doen. Dus als iemand anders daar een andere mening bij heeft, die ervaring heb ik niet.*

I: Ik zat erover na te denken, dat het misschien te maken heeft met de grote diversiteit aan opdrachtgevers die de bouw heeft. Bijv. de ziekenhuisdirecteur die je daarna nooit meer ziet. Terwijl de infra veel meer gewend is om met bijv. RWS te werken, of altijd met een vaste groep gemeentes of provincies. Dat dat misschien tot gevolg kan hebben dat je veel beter elkaars processen en instrumenten al kent, waardoor je ook zegt dat het minder belangrijk is. Zou dat een mogelijke verklaring kunnen zijn, of heb je echt geen idee?

R: *Tsjah, … dat zou een mogelijke verklaring kunnen zijn. Alleen nogmaals ik vind zelf dat het niet uit moet maken voor het belang van het project en de samenwerking dat je het op een soort gelijke wijze invult voor beide sectoren.*

Regelmatig vergaderen

I: Oké, dan gaan we naar de volgende. De bouwparticipanten vinden deze factor belangrijker dan de infraparticipanten. Jij deelde die mening. Zou je dat kunnen toelichten?

R: *Het heeft natuurlijk hoofdzakelijk te maken met de detaillering van het project. In een bouwproject gaat de detaillering natuurlijk veel verder, omdat het effect en het belang ervan veel groter zijn dan in de infrasector. Dat maakt gewoon dat je veel meer overleggen hebt om bepaalde zaken vast te stellen. Ik vind het eigenlijk een beetje inherent aan de projecten zelf; een bouwproject is anders dan een infrasectorproject. Los van de verschillen die er ook nog zijn als het gaat om een langere doorlooptijd.*

I: Ja, dus je zegt dit is duidelijk een verschil tussen bouw en infra als ik het goed begrijp.

R: *Ja.*

De vroegtijdige betrokkenheid van externe stakeholders

I: Oké, dan gaan we naar de factoren die belangrijker worden gevonden door de infraparticipanten dan door de bouwparticipanten. De allereerste daarvan is de vroegtijdige betrokkenheid van externe stakeholders. Je was het er mee eens dat het in de infra belangrijker is om die vroeg te betrekken dan in de bouwsector. Ik zei dat dat verklaard kan worden doordat infraprojecten een groter geografisch oppervlak hebben, resulterend in meer stakeholders en een werklocatie die meer verweven is met de omgeving. Daarnaast heb je bij een infraproject een minder eenduidige eindgebruiker. Daar was je het allemaal mee eens. Zou je dat wat nader kunnen toelichten?

R: *Als je kijkt naar een infraproject, dan is dat geografisch inderdaad vaak veel groter dan een bouwproject, wat maakt dat je automatisch veel meer stakeholders hebt. Dat kan omgeving zijn,*

nutsbedrijven, rijksoverheden, dat maakt nogal een verschil inderdaad. Dat maakt ook al een groot verschil in de dynamiek van een bouwteam. Als je kijkt naar omgevingsmanagement, dat is in een infraproject vaak een groot onderdeel, ook in een bouwteam, ten opzichte van een bouwproject. Een heel wezenlijk verschil inderdaad, wat ook vrij logisch is. Waarbij omgevingsmanagement in de infrasector vaak een heel belangrijk onderdeel vormt.

Een eerlijke risicoverdeling

I: Een andere factor is de eerlijke risicoverdeling. Die wordt in de infra belangrijker gevonden dan in de bouw. Je had aangegeven dat je het daarmee eens was, maar je was het niet eens met mijn verklaringen. Zou je kunnen zeggen waarom je denkt dat een eerlijke risicoverdeling belangrijker is dan in de infra.

R: *Even denken hoor, even terughalen wat ik daarover precies dacht. Zou je het nog een keer kunnen herhalen?*

I: Ja, een eerlijke risicoverdeling is belangrijker in de infra dan in de bouw. Ik dacht dat het misschien te maken heeft met de horizontale oriëntatie van infraprojecten, waardoor het gevoeliger is voor condities voor de ondergrond. Daar was je het mee oneens. Een andere verklaring is het grotere geografische oppervlak van infraprojecten, waardoor het gevoeliger zou zijn voor risico's.

R: *Wat je zegt klinkt logisch. De reden dat ik het er niet mee eens was is dat op het moment dat er een fout ontstaat in een project, stel bijvoorbeeld in de ontwerpfase, als dat in een bouwproject gebeurd, dan werkt dat vaak veel harder en langer door, omdat als er een radartje ontbreekt of niet goed is, dan zie je vaak dat de fouten zich daar opstapelen van alle vervolgwerkzaamheden die nadien komen. Dus het kan veel ingrijpender zijn vaak in de bouw als het niet goed gaat, dan in de infrasector. De infrasector is over het algemeen wat makkelijker om te herstellen. Dat is denk ik de reden dat ik dit antwoord heb gegeven. Aan de andere kant, wat jij bedoelt denk ik, is dat door het feit dat je met een groter geografisch oppervlak te maken hebt incl. onduidelijke ondergrondcondities, die verstrekkend kunnen zijn. Maar op het moment dat er iets in het tot stand komen van een bouwproject of infraproject mis gaat, dan zie je wel vaak dat als het een fout is in het bouwproject, dat de dimensie en de impact daarvan veel groter kan zijn.*

I: Een andere factor die ik tijdens mijn interviewrondes bedacht heb, is dat het misschien te maken kan hebben met het sentiment t.g.v. de bouwfraude, en de verhouding die de infra met RWS. Dat klinkt misschien een beetje vaag, maar als je bedenkt wat er de afgelopen jaren is gebeurd tussen aannemers en RWS, dat aannemers het idee hebben dat alle risico's bij hen neergelegd zijn, dat dat zo diep zit, dat die eerlijke risicoverdeling het belangrijkste gaat worden in samenwerking, terwijl je dat hele aspect naar mijn idee minder hebt in de bouw. En dat daardoor de eerlijke risicoverdeling minder hoog gewaardeerd wordt door de bouwsector. Kan je je daar iets bij voorstellen?

R: *Dat herken ik wel inderdaad. Dat is inderdaad sector-breed bekend. Die gevoeligheid van met name die samenwerking in het verleden met RWS, hoe zij contracten in de markt hebben gezet en verantwoordelijkheid in hele grote mate bij de aannemers hebben neergelegd. Vaak in combinatie met een krap budget. Die verhouding is wel een beetje scheef gegroeid in de laatste jaren. Dan zien je dat RWS eigenlijk een beetje alleenheerser is, dat is wel een beetje doorgeslagen.*

Een gelijkwaardige relatie en respect voor elkaar

I: Dan een laatste factor, de gelijkwaardige relatie en respect voor elkaar. Ook deze factor wordt door de infra belangrijker gevonden dan door de bouw. Hierbij had je aangegeven dat je deze mening deelt. Zou je dat kunnen toelichten.

R: *Ehm, ja. Enerzijds herken ik het niet, wat ik al eerder heb aangegeven: het moet niet uitmaken of je nu in de setting van een bouw of infraproject in een bouwteam met elkaar samenwerkt. Maar, wellicht wordt dat ook wel ingegeven door wat we net nog aan de orde hadden. Doordat die verhoudingen in de infra tussen de OG en ON in de loop der jaren wat anders zijn gegroeid, waardoor het gevoeliger ligt dan in de bouwwereld. Op het moment dat je in een project zit, waarbij je vooraf niet alles kunt weten, natuurlijk ook afhankelijk van de informatie die verstrekt wordt bij aanvang van een project, maar natuurlijk ook zelf heel goed moet nadenken bij de voorwaarden die contractueel gesteld worden. Dat*

is gewoon een hele lastige. Je kunt niet van te voren alles uitsluiten, want dan neem je als aannemer zijnde geen werk aan. Aan de andere kant moet je ook heel goed nadenken over welke voorwaarden je dan aannemelijk vindt, ook in de risicoverdeling OG-ON en of je daarmee uit de voeten kunt. En wat de gevolgen daarvan kunnen zijn. Daar zie ik met name dat het nog weleens mis gaat, wat tot hele grote financiële gevolgen kan leiden. Vaak heeft dat te maken met discussies met bekende factoren van overleg. Dat is en blijft een uitdaging bij elk project. En daar wordt denk ik nog weleens te lichtzinnig over gedaan. Ik vind ook wel dat de aannemerij zich dat zelf ook wel een beetje moet aantrekken. Want je kunt van alles vinden dat het zomaar over de schutting wordt gegooid, maar soms is de honger naar werk ook wel erg groot bij aannemers, zonder dat ze nadenken over de consequenties. Dat kan hele vervelende gevolgen hebben.

Samenwerking in bouw en infra

I: Dit waren de aspecten die ik je in de enquête al had voorgelegd. Naast dat er dus een aantal verschillen tussen bouw en infra uit mijn onderzoek naar voren zijn gekomen, zijn er ook een aantal factoren van samenwerking die door zowel de bouw als de infra als essentieel voor samenwerking worden gezien. Eén daarvan is transparantie, wellicht niet heel verwonderlijk. Tegelijkertijd is dat wel interessante tegen de achtergrond van oude gedrag waar we zojuist over spraken. Wat zou de infra nu kunnen leren van de ervaringen van de bouw?

R: *Nou wat ontzettend helpt bij transparantie, is dat je inzage geeft in hoe kosten tot stand komen. In de bouwwereld is het vaak veel gebruikelijker om te specificeren hoe de kostenopbouw tot stand is gekomen. Hoe meer je dat specificeert, hoe meer je dus ook inzicht geeft in hoe die kosten tot stand zijn gekomen. En dat is voor de infrawereld soms best wel lastig. Mijn ervaring is dat het allemaal wat grover wordt ingeschat bij de infra, en dat onderdelen kunnen tegenvallen, omdat sommige onderdelen weer wat mee kunnen vallen. Sommige onderdelen worden bewust wat opgeplust, om tegenvallers te kunnen opvangen. Op het moment dat je met een open begroting komt, dan is die mogelijkheid er natuurlijk niet meer. Ik vind het persoonlijkheid dat er openheid komt over de opbouw van de begroting. Ik denk dus dat de eenheidsprijzen gespecificeerd moeten worden, de risico's benoemd moeten worden om tot een eerlijke en faire prijs te komen. Daarbij betekent het wel, dat je ook als opdrachtgever de aannemer een goede boterham moet laten verdienen. Je moet de aannemer dus niet het vel over de oren willen trekken. Daar zit natuurlijk wel een beetje die angst van als ik het aan de voorkant allemaal weggeef, en het valt een keer ergens tegen. Daarom moet je natuurlijk ook een goede risicoregeling met elkaar afspreken, door bijvoorbeeld een budget onvoorzien op te nemen. Als er dan echt onvoorziene zaken zijn die zich voordoen, die beide partijen redelijkerwijs niet hadden kunnen weten, dat je daar een bedrag onvoorzien voor hebt gereserveerd dat daarvoor aangewend kan worden. Tegelijkertijd kun je ook aan het begin van het project met elkaar afspreken, dat als je die pot niet hoeft te gebruiken, je met elkaar een bepaalde verdeling afspreekt hoe het bedrag aan het eind van het project kan vrijvallen. Dus ten gunste van wie dat komt. Dat helpt ontzettend in het vertrouwen dat je met een eerlijke en prettige manier met elkaar samen kunt werken, zonder allerlei dubbele agenda's of dat de boekhouding tegen de borst wordt gehouden. Dat is toch voor veel mensen lastig om met een open boekhouding te kunnen en willen werken. Maar dat is wel essentieel.*

I: Is het dan ook moeilijker om een goede inschatting te maken in de infra, of is het meer dat ze het niet gewend zijn?

R: *Dat laatste. Het is helemaal niet moeilijk. Je moet de begrotingen die je toch al moet maken bloot en dat zijn ze niet gewend.*

I: Een andere factor is het begrijpen van elkaars doelstellingen. Zijn er op dat gebied ook lessen vanuit de bouw die je meeneemt naar de infra?

R: *Nee, niet in het bijzonder. Ik heb het natuurlijk al een paar keer aangegeven: het moet niet uitmaken of je in een bouwteam in een bouw of infraproject werkzaam bent. Dat er bepaalde zaken zijn waardoor er verschillen ontstaan, bijvoorbeeld de opdrachtgever, dat het in de bouw allemaal wat detaillistische is, de manier waarop een project tot stand komt, de omgevingsfactoren die anders zijn. Maar in zijn algemeenheid komt dat naar mijn mening op hetzelfde neer. Mits je rekening houdt met de factoren die verschillend zijn.*

I: En op het gebied van communicatie, denk je dat de infra daarbij was zou kunnen leren van de ervaringen van de bouw?
R: *Nee, dat komt op hetzelfde neer. Het is bij beide belangrijk. Mijn ervaring is overigens ook niet dat er in bouwprojecten beter wordt gecommuniceerd dan in infraprojecten.*
I: De laatste factor is, niet geheel verrassend, het wederzijds vertrouwen. Deze staat bij beide sectoren met stip bovenaan. Denk je dat de infra daarbij nog wat van de bouw zou kunnen leren?
R: *Ja, dat komt natuurlijk omdat er in de bouwwereld al veel langer samenwerkingsvormen zoals bijvoorbeeld een Bouwteam of het werken in een Bouwteamachtige setting, dan in de infra. De infrawereld loopt daarbij een beetje achteraan. Je ziet wel grote verschillen in de aannemers. Er zijn best wel wat aannemers die daar behoorlijk wat ervaring in hebben. Het valt op dat Ballast Nedam daar binnen infra nog betrekkelijk weinig ervaring in heeft. Dat zegt ook wel iets over het bedrijf, het typologie aan projecten waarop ze ingezet hebben. Ze hebben niet tijdig geparticipeerd op de ontwikkelingen in de markt, want die ontwikkelingen zijn er al wat langer. Je ziet dat steeds meer partijen er ook voor open staan. Wat wel van belang is, is dat met name plafondbudgetten ook weleens misbruikt worden. Als de enige motivatie voor een opdrachtgever om in een bouwteam te willen werken de budgetten die onder druk staan is, dan wordt het lastig. Dan misbruik je eigenlijk het fenomeen bouwteam om een project voor een bepaald bedrag gerealiseerd te krijgen. Dat komt natuurlijk omdat er binnen een traditioneel contract het allemaal wat scherper is geformuleerd en een aannemer wellicht wat meer aanspraak kan maken op scopewijziging, meerwerk dus, dan dat in een bouwteam het geval is. Daar moet je wel voor waken. Ik zie daar soms wel een beetje scheefgroei in ontstaan.*

Tot slot
I: Oké, dat waren de vragen die ik had. Heb je zelf nog aanvullende opmerkingen?
R: *Ehm nee, niet dat me nu zo één-twee-drie te binnen schiet.*
I: Prima, wat ik ga doen is dat ik het interview ga transcriberen. Je kunt het dan één dezer dagen tegemoet zien en mocht je dan nog opmerkingen hebben dan hoor ik het graag. Bedankt voor je deelname.