Client-contractor collaboration in bouwteams:

A contractor's perspective

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Ballast Nedam

Client-contractor collaboration in bouwteams: A contractor's perspective

by

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Preface

In front of you lies the result of my 6-month lasting graduation written to obtain my master degree. This report is the final step of the MSc program of Construction Management and Engineering and marks the end of my years of study at the Delft University of Technology. The research has been executed in collaboration with Ballast Nedam.

The topic of this research is something that I experienced myself in practice, and it is one of the most important things in project management, as I learned through almost every course. On the one hand, there is much theoretical knowledge about collaboration from books and researches, but all have different conclusions and see collaboration differently. On the other hand, there is collaboration in practice of which everybody has its own understanding, especially in a relatively new environment as a *bouwteam*. During this research, I had the opportunity to talk with many people about collaboration in bouwteams, and they shared their experiences, views and thoughts from a contractor's perspective. Over the months I came to understand the difficult position the contractor is in, in their relation to the client while simultaneously realising profitable projects with low margins.

I would like to thank my graduation committee from the Delft University of Technology. Without their help, support and guidance during this journey, I would not have delivered the report as it lies in front of you. You helped me to complete my research within the ambitious time-frame that I had imposed on myself. A special thanks to Marian, for your trust in my research and your time and effort you put in my research. Every progress meeting helped me to improve this report. Leonie, thank you for always being critical and challenging me. You showed me different angles, sometimes leaving me with more questions than before, but it always helped me to understand my research better. Hans, thank you for the clear and constructive feedback during the meetings, and for providing directions. This all helped me to improve the clarity and academic quality of my report. And finally, Geert. I want to thank you as my company supervisor for providing me with the necessary support. Your view helped me to understand the position of the contractor in the current market and helped me to stay critical until the end.

Second, I would like to thank Ballast Nedam for the opportunity the gave me to do this research. I had the pleasure to work in an environment with great people that were highly interested in my research. They provided me with the resources I needed. Furthermore, this graduation would not have been possible without the 31 interviewees with people from Ballast Nedam, Laudy and Heddes. Thank you for making time for me and sharing your knowledge, insights and views while expressing your enthusiasm in my subject. Your help made my research enjoyable.

To finalise, I would like to thank my boyfriend, Kars, and my family, friends and fellow CME students for supporting and trusting me throughout this process.

Jolanda de Hoog
Delft, April 2020

Executive summary

Currently, contractor's order books are full, many projects are initiated, and many projects are under construction. However, even though the economy is booming, failure costs are still high, projects are delayed and 'fighting' contracts are still present. The Marktvisie (2016) expressed the need for more collaborative relationships based on equality and lately, a shift from adversarial to collaborative relationships is observed. The use of collaborative contracting strategies is increasing of which the *bouwteam* is an example. The bouwteam is a collaboration agreement during the design phase of a construction project, in which at least client, contractor and designer work together to deliver a feasible and constructable design. As a result of early involvement of the contractor, changes to the project to reduce failure costs and delays can be made early on in the development when flexibility is high. The main driver for contractors to work together in bouwteams is an increased probability of being awarded the building contract. The contractor is involved early, but the client is still in charge of the project and has control over the design. Therefore, client and contractor are dependent upon each other, especially since it is in the interest of both parties to agree on a budget for execution. Even though the utility and building sector is familiar with bouwteams, collaboration between client and contractor remains a challenge, and little is known of a contractor's perspective regarding collaboration. Therefore, the research question is as follows:

In what way can contractors influence client-contractor collaboration in bouwteams to achieve successful project delivery?

The goal of the research is to provide insights into perspectives of contractors regarding success factors for collaboration in bouwteams. The aim is to develop client-specific strategies based on contractor's perspectives that can be applied by contractors to influence client-contractor collaboration to achieve successful project delivery.
Client-contractor collaboration is defined as: *"A process in which client 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 a project, in order to bring about mutually satisfactory project outcomes"*. However, only initiating collaboration is not enough for good client-contractor collaboration. It is important to maintain the relationship during the bouwteam process through balancing success factors for collaboration.

In this research, Q-methodology is used to extract the contractor's perspectives regarding collaboration in bouwteams. First, a study is conducted towards success factors for collaboration in bouwteam projects by means of literature and interviews. Success factors are defined as activities, facts, conditions or influences and are used in this research because they contribute to the result of a project. Six categories of collaboration in bouwteams are identified, which are *capability, contract, joint working, relational attitude, team working and team integration*. From an extensive list of success factors, 38 success factors scattered across the categories are identified and considered to be the most important for collaboration in bouwteams (the Q-set). The Q-set is used for Q-methodology, and with the help of a P-set (participant set) consisting of 25 participants, contractor's perspectives have been identified. The three identified perspectives are: 1) *relationship first* (10 defining participants; 22% explained variance), 2) *early involvement of the right people* (7 defining participants; 18% explained variance), and 3) *structure first* (7 defining participants; 15% explained variance). The perspectives identify success factors of collaboration that the participants believe are most essential to achieve successful project delivery. The perspectives differ in the main believes on which success factors are most or least essential but show overlap, too, as shown in figure 1. The main overlap between the perspectives is found in the importance of the success factors *mutual trust* and *defined scope of the bouwteam*. Especially for the contractor, the latter is one of the most important factors for collaboration.
In perspective one, *relationship first*, the focus is on a good relationship with the client in which mutual trust can be established and maintained with transparency and good communication, indicating a collaborative and open attitude. Perspective two, *early involvement of the right people*, is more focused on involving the right competent people early in the project with a focus on understanding each other. A win-win attitude is created, but a limited amount of information is shared. Finally, perspective three, *structure first*, focuses on identifying and determining the variables and guidelines of the bouwteam to create structure and to provide clarity; efficient communication is important to achieve this.

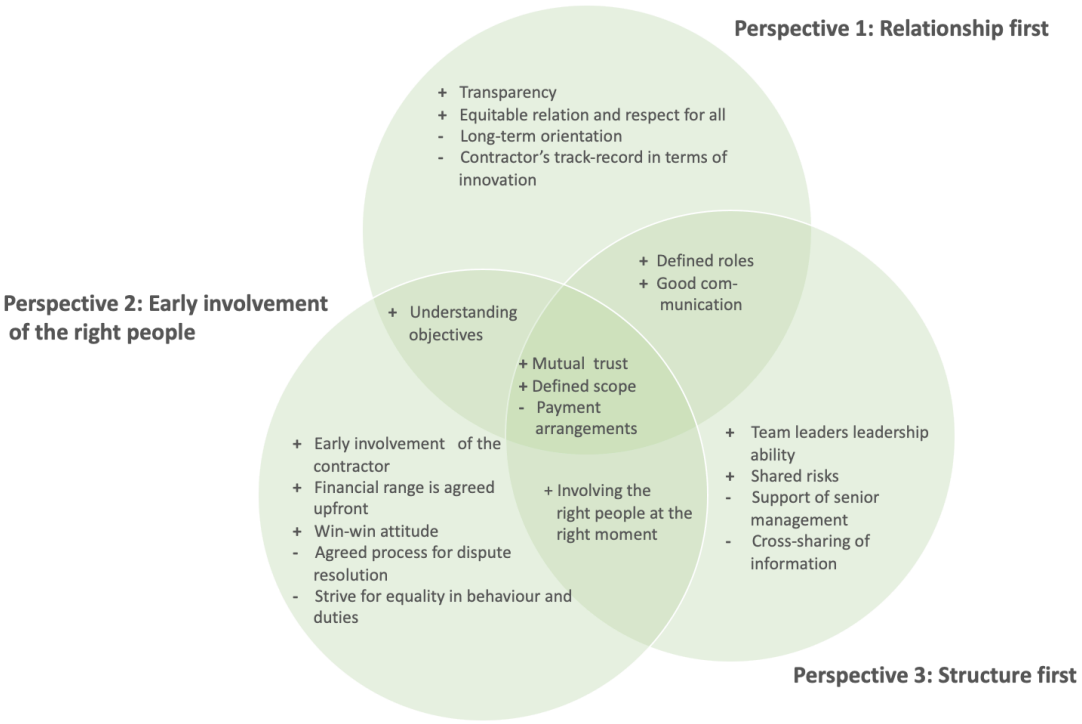

Figure 1: Similarities and differences between perspectives

Client-specific strategies are designed to establish how different perspectives can be used to influence client-contractor collaboration. Different client types present in the utility and building sector are extracted from literature. By being aware of the client characteristics, drivers and goals, approaches can be adjusted accordingly. In two steps the strategies are designed; step 1 links client types to contractor's perspectives and in step 2 implementation of the most essential success factors is elaborated as indicated by the participants of this research. Together, the strategies form a strategic framework and it is concluded that the framework indicated that there is always one perspective considered as the best fit, but a second one is advantageous to complement and connect to the first one. Involving perspective three is valuable for every client type to safeguard the position of the contractor due to the structure-oriented focus. Depending on the expected attitude of the client, either perspective one or two can complement the third perspective. In doing so, perspective one can be used for a relationship-focused and committed client while perspective two is more appropriate for an experienced and result-focused client. After completion of the strategic framework, an expert consultation was conducted to reflect upon the results and their application in practice. According to the three experts that performed the expert consultation, the designed strategies are found, in general, correct and logical. The strategic overview can be useful to create awareness among people regarding collaboration in bouwteams. It was indicated that the framework could be used as a reference or guideline at the start of a bouwteam project or for reflection during the bouwteam process.

Based on the results of the Q-study, the strategies designed, and the expert consultation conducted, it can be concluded that the results can be used to influence client-contractor collaboration in bouwteams. However, the knowledge in itself does not provide a way to do this. Therefore, the practical implications of this research are visualized in figure 2 and provide the answer to the research question. It shows when the different parts of this research could be used to benefit from the knowledge and awareness it brings.

Altogether, this research provides a first step in identifying a way to influence client-contractor collaboration from a contractor's perspective. In general, it can be concluded that it is valuable for the contractor to think about the way to approach a bouwteam before immediately starting to work and first to consider whether the client fits the contractor. Furthermore, it is of importance to involve suitable and competent people in the bouwteam for which perspective one and three are most representative for a collaborative attitude.

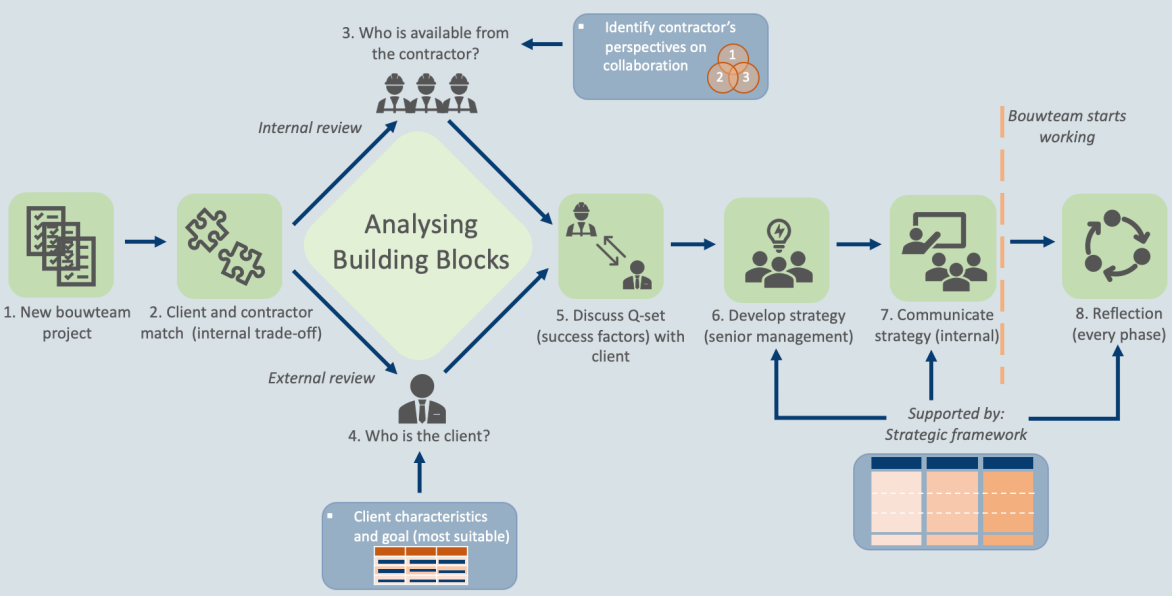

Figure 2: Implications on how to influence client-contractor collaboration in bouwteams

For the contractor, it is important to define the scope early and clearly for successful project delivery. To achieve this, the contractor can identify the client characteristics of the involved client and determine the perspectives of available personnel. The contractor's perspectives are a valuable reference for the contractor because they represent his playing field. The contractor can have a meeting with the client to elaborate on which success factors are most important for the bouwteam as visualized by step five. With this information, the contractor can determine which perspectives are most appropriate to establish good collaboration. As a result, the contractor can develop a strategy and communicate this internally. For this, the strategic framework can be used as a guideline to give insights into possibilities and considerations. Dependent on the client, the contractor can choose the right perspectives to deploy to influence client-contractor collaboration to achieve successful project delivery. Nonetheless, in the end, defining the scope is one of the most important success factors for collaboration for the contractor, independent of the strategy to be developed.
However, one has to question whether the bouwteam is a necessary approach for collaboration between client and contractor in a project. Even when this is not the case, the contractor's perspectives can still be used since the collaboration principles from a contractor's perspective are similar. Finally, the implementation of the success factors is, however, only applicable to Ballast Nedam because the implementation methods have been defined by the participants involved in this research.

This research recommends contractors to develop a quick and easy tool to determine the perspectives of personnel involved in bouwteam projects to involve the right people for collaboration. In addition, it is recommended to develop a company wide vision regarding collaboration with a focus on mutual trust since this success factor is shared by all three perspectives but is a high-over concept. The vision of collaboration can be used in bouwteam tenders to show the client willingness to collaborate and can be a basis for mutual trust.
The designed strategic framework of this research can be validated in-depth with the help of actual bouwteam projects to determine whether the results are significant and helpful. This can contribute to a better understanding of the bouwteam process and development over time. Furthermore, it is recommended to conduct further research towards a general Q-set, consisting of success factors for bouwteams, and to include a client's perspective. Thirdly, it is recommended to extend the research to the tender phase and execution phase because those phases can influence collaboration in a bouwteam. Finally, a contractor's perspective of collaboration in bouwteams in the infrastructure sector can be identified.

Keywords: Contracting strategy, bouwteam, early contractor involvement, utility and building sector, collaboration, client-contractor collaboration, Q-methodology, strategic framework

Samenvatting

Op dit moment is de orderportefeuille van de aannemer vol, worden er veel projecten geïnitieerd en zijn er veel projecten in aanbouw. Maar ook al is de economie op dit moment sterk, de faalkosten blijven hoog, projecten lopen vertraging op en is nog steeds sprake van 'vechtcontracten'. De Marktvisie (2016) gaf aan dat er behoefte is aan meer samenwerking op basis van gelijkwaardigheid en complementariteit. De laatste tijd is er een verschuiving waarneembaar van vijandige en tegenstrijdige houdingen naar samenwerkingsgerichte houdingen. Het gebruik van collaboratieve contracteringsstrategieën neemt toe, waarvan het *bouwteam* een voorbeeld is. Het bouwteam is een samenwerkingsovereenkomst in de ontwerpfase van een bouwproject, waarbij in ieder geval opdrachtgever, aannemer en architect samenwerken om een haalbaar en uitvoerbaar ontwerp te realiseren. Door de vroege betrokkenheid van de aannemer kunnen wijzigingen in het project, om faalkosten en vertragingen te verminderen, vroegtijdig worden doorgevoerd wanneer de flexibiliteit hoog is. De belangrijkste drijfveer voor aannemers om samen te werken in bouwteams is een verhoogde kans op het verkrijgen van het uitvoeringscontract. De aannemer is vroeg betrokken terwijl de opdrachtgever nog de leiding over het project en controle over het ontwerp heeft. In een bouwteam zijn de opdrachtgever en aannemer afhankelijk van elkaar, vooral omdat het in het belang van beide partijen is om tot een, voor beide partijen, geschikt budget voor de uitvoering te komen. Hoewel de utiliteits- en bouwsector bekend is met bouwteams, blijft de samenwerking tussen opdrachtgever en aannemer een uitdaging en is er weinig bekend over het perspectief van een aannemer op samenwerking. Daarom is de onderzoeksvraag van dit onderzoek als volgt:

Op welke manier kunnen aannemers de samenwerking tussen opdrachtgever en aannemer in bouwteams beïnvloeden om een succesvolle projectoplevering te bereiken?

Het doel van het onderzoek is om inzicht te geven in het perspectief van de aannemer op succesfactoren voor samenwerking in bouwteams. Het doel is om klantspecifieke strategieën (opdrachtgever gericht) te ontwikkelen, op basis van de perspectieven van de aannemers, die door de aannemers kunnen worden toegepast om de samenwerking tussen de klant en de aannemer te beïnvloeden met het oog op een succesvolle projectoplevering.

Onder samenwerking tussen klant en opdrachtnemer wordt verstaan: "Een proces waarin opdrachtgever en aannemer gezamenlijk normen, regels en structuren creëren voor hun teams en hun werkrelaties, en manieren om te handelen of te beslissen over de kwesties die zich voordoen tijdens een project, om zo tot wederzijds bevredigende projectresultaten te komen". Echter, alleen het initiëren van samenwerking is niet voldoende voor een goede samenwerking. Het is belangrijk om de relatie tijdens het bouwteamproces te onderhouden door middel van het balanceren van succesfactoren voor de samenwerking.

In dit onderzoek wordt de Q-methodologie gebruikt om perspectieven van de aannemer ten aanzien van samenwerking in bouwteams te achterhalen. Aan de hand van literatuur en interviews is onderzoek gedaan naar succesfactoren voor samenwerking in bouwteams en deze worden gedefinieerd als activiteiten, feiten, omstandigheden of invloeden en worden in dit onderzoek gebruikt omdat ze bijdragen aan het resultaat van een project. Er zijn zes categorieën van samenwerking geïdentificeerd: *bekwaamheid, contract, gezamenlijk werken, relationele houding, teamwerk en teamintegratie*. Uit een uitgebreide lijst van succesfactoren zijn 38 succesfactoren, verspreid over de categorieën, geïdentificeerd en deze worden beschouwd als de belangrijkste succesfactoren voor samenwerking in bouwteams (de Q-set). De Q-set wordt gebruikt voor het uitvoeren van Q-methodologie, en met behulp van een P-set bestaande uit 25 deelnemers zijn de perspectieven van de aannemer geïdentificeerd. De drie perspectieven zijn: 1) *relatie eerst* (10 definiërende deelnemers; 22% verklaarde variantie), 2) v*roege betrokkenheid van de juiste mensen* (7 definiërende deelnemers; 18% verklaarde variantie), en 3) *structuur eerst* (7 definiërende deelnemers; 15% verklaarde variantie). De perspectieven zijn gebaseerd op de succesfactoren van samenwerking die volgens de deelnemers het meest essentieel zijn om een succesvolle projectoplevering te realiseren. De perspectieven verschillen in de overtuiging over welke succesfactoren het meest of het minst essentieel zijn, maar vertonen ook overlap, zoals te zien is in de figuur 3. Overlap tussen de perspectieven wordt gevonden in het belang van de succesfactoren *wederzijds vertrouwen* en *gedefinieerde scope van het bouwteam*. De laatste wordt specifiek voor de aannemer gezien als een van de belangrijkste factoren. In perspectief één, *relatie eerst*, ligt de focus op een goede relatie met de klant, waarin

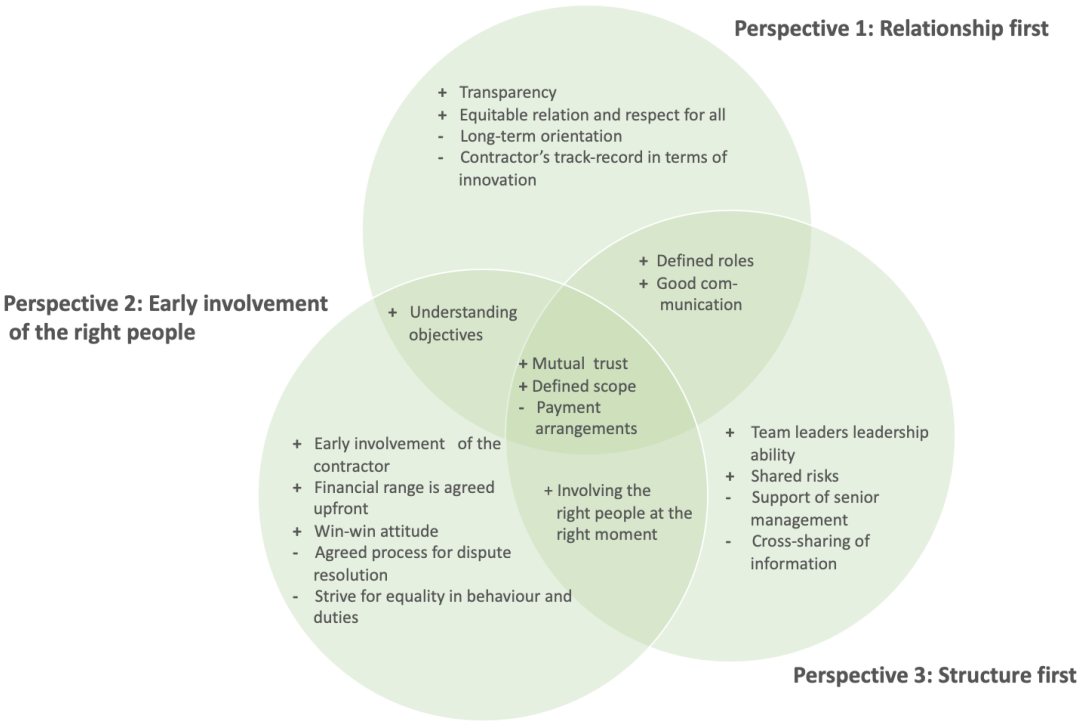

Figure 3: Overeenkomsten en verschillen tussen perspectieven

wederzijds vertrouwen kan worden opgebouwd en behouden met transparantie en goede communicatie, wat duidt op een gezamenlijke en open houding. Perspectief twee, *vroege betrokkenheid van de juiste mensen*, is meer gericht op het betrekken van de juiste competente mensen in een vroeg stadium van het project met een focus op het begrijpen van elkaar. Er wordt een win-win-houding gecreëerd, maar er wordt een beperkte hoeveelheid informatie gedeeld. Tot slot richt perspectief drie, *structuur eerst*, zich op het identificeren en bepalen van de variabelen en richtlijnen van het bouwteam om structuur te creëren en om duidelijkheid te verschaffen; efficiënte communicatie is belangrijk om dit te bereiken. Er wordt verwacht dat het ene perspectief in een bepaalde situatie meer toepasbaar is dan het andere.

Klantspecifieke strategieën zijn ontworpen om vast te stellen hoe verschillende perspectieven gebruikt kunnen worden om de samenwerking tussen opdrachtgever en aannemer te beïnvloeden. Vanuit de literatuur zijn verschillende soorten opdrachtgevers geïdentificeerd, die aanwezig kunnen zijn in de utiliteits- en bouwsector. De aanpak (strategie) van het bouwteam kan afgestemd worden op het type opdrachtgever door bewust te zijn van de kenmerken, drijfveren en doelen. In twee stappen zijn strategieën ontworpen; stap 1 is het koppelen van klanttypen aan het perspectief van de aannemer en in stap 2 wordt de implementatie van de meest essentiële succesfactoren uitgewerkt, zoals aangegeven door de deelnemers aan dit onderzoek. De strategieën vormen samen een strategisch kader waaruit geconcludeerd kan worden dat er altijd één perspectief is dat als best passend wordt beschouwd, maar dat een tweede perspectief het eerste goed kan aanvullen. Het betrekken van perspectief drie is waardevol voor elk type opdrachtgever om de positie van de aannemer te waarborgen die nodig vanwege de structuur georiënteerde focus. Afhankelijk van de verwachte houding van de opdrachtgever kan perspectief één of twee het derde perspectief aanvullen. Daarbij kan perspectief één gebruikt worden voor een relatiegerichte en gecommitteerde opdrachtgever, terwijl perspectief twee meer geschikt is voor een ervaren en resultaatgerichte opdrachtgever. Na afronding van het strategisch kader zijn drie deskundigen geraadpleegd om te reflecteren op de resultaten en de toepassing ervan in de praktijk. Volgens de drie deskundigen zijn de ontworpen strategieën, over het algemeen, correct en logisch. Het strategisch overzicht kan nuttig zijn om mensen bewust te maken van verschillende benaderingen in bouwteams. Daarnaast kan het strategisch kader worden gebruikt als referentie of leidraad bij de start van een bouwteam of voor reflectie tijdens het bouwteamproces.

Op basis van de resultaten van de Q-studie, de ontworpen strategieën en het raadplegen van de deskundigen kan worden geconcludeerd dat de resultaten kunnen worden gebruikt om de samenwerking tussen opdrachtgevers en

aannemers in bouwteams te beïnvloeden. De kennis op zich geeft echter nog geen inzicht op welke manier de informatie toegepast kan worden. Daarom zijn er praktische implicaties opgesteld welke zijn gevisualiseerd in figuur 4 en deze geven het antwoord op de onderzoeksvraag. Het overzicht laat zien wanneer de verschillende onderdelen van dit onderzoek (perspectieven van de aannemer, klanttypen en het strategisch kader) gebruikt zouden kunnen worden om te profiteren van de kennis en bewustwording die het met zich meebrengt.

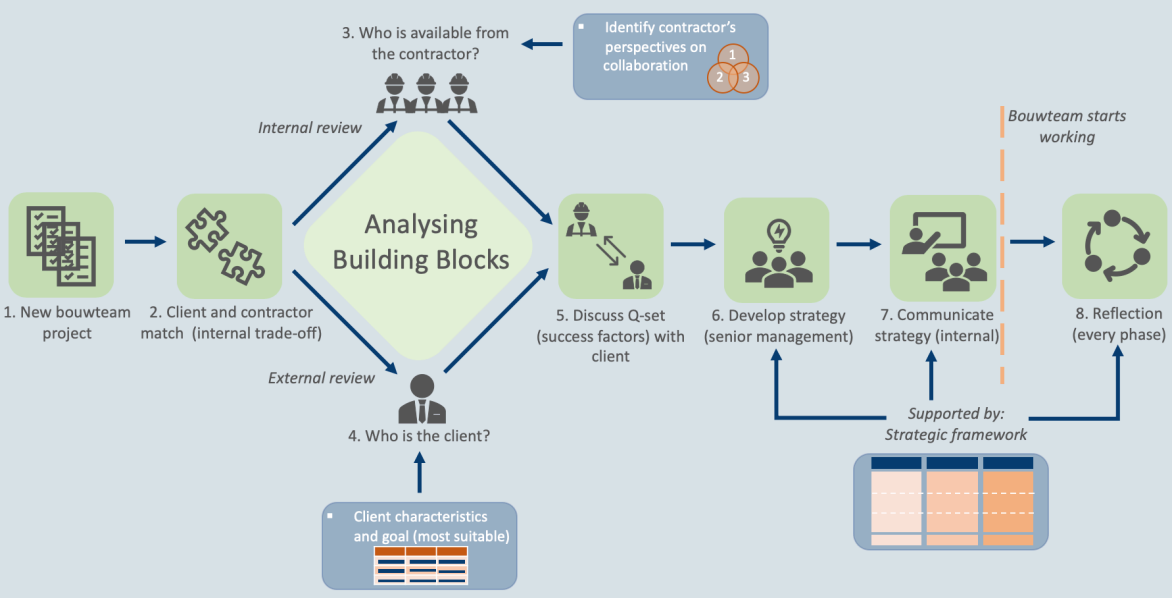

Figure 4: Praktische implicaties voor de samenwerking tussen opdrachtgever en aannemer in bouwteams

Al met al is dit onderzoek een eerste stap in het identificeren van een manier om de samenwerking tussen opdrachtgever en aannemer te beïnvloeden vanuit het perspectief van een aannemer. Er kan geconcludeerd worden dat het voor de aannemer waardevol is om na te denken over de manier waarop hij een bouwteam benadert voordat hij direct aan de slag gaat, en om eerst na te gaan of de opdrachtgever bij de aannemer past. Het is in het belang van samenwerking om geschikte en competente mensen te betrekken bij het bouwteam waarvoor perspectief één en drie het meest representatief zijn vanwege hun houding.
Voor de aannemer is het belangrijk om in een vroeg stadium de scope van het project duidelijk vast te stellen voor een succesvolle projectoplevering. Om dit te bereiken kan de aannemer de kenmerken van de betrokken opdrachtgever in kaart brengen en de perspectieven van het beschikbare personeel bepalen. De perspectieven van de aannemer zijn een waardevolle referentie omdat het speelveld waarin de aannemer zich kan bewegen vertegenwoordigt. De aannemer kan met de opdrachtgever in gesprek gaan om te bepalen welke succesfactoren voor het bouwteam het belangrijkst zijn, zoals gevisualiseerd in stap vijf. Met deze informatie kan bepaald worden welk perspectief het meest geschikt is om een goede samenwerking tot stand te brengen en hiermee kan de aannemer een strategie ontwikkelen die past bij de klant en deze intern communiceren. Het strategisch kader kan daarbij als leidraad dienen om inzicht te geven in mogelijkheden en afwegingen. Afhankelijk van de betrokken opdrachtgever, kan de aannemer de juiste perspectieven kiezen om de samenwerking tussen opdrachtgever en aannemer te beïnvloeden om tot een succesvolle projectoplevering te komen. Uiteindelijk blijft het definiëren van de scope één van de belangrijkste succesfactoren voor de samenwerking voor de aannemer.
Het is echter de vraag of het bouwteam wel een noodzakelijke aanpak is voor de samenwerking tussen opdrachtgever en aannemer in een project. Ook als dit niet het geval is, kunnen de perspectieven van de aannemer worden gebruikt, omdat de samenwerkingsprincipes vergelijkbaar zijn. Tot slot is de implementatie van de succesfactoren alleen van toepassing op Ballast Nedam, omdat de implementatiemethoden zijn gedefinieerd door de deelnemers van dit onderzoek.

Het onderzoek beveelt aan dat aannemers een eenvoudig instrument ontwikkelt om de perspectieven van het betrokken personeel te bepalen om zo de juiste mensen te betrekken voor samenwerking. Daarnaast wordt aanbevolen om een bedrijfsvisie over samenwerking te ontwikkelen met een focus op wederzijds vertrouwen, aangezien deze succesfactor door alle drie de perspectieven wordt gedeeld, maar een algemeen concept is. De visie op samenwerking kan in aanbestedingen voor bouwteams worden gebruikt om bereidheid tot samenwerking te tonen aan

de klant.
Het ontworpen strategische kader van dit onderzoek kan gevalideerd worden met behulp van concrete bouwteams om te bepalen of de resultaten realistisch en correct zijn. Dit kan bijdragen aan een beter begrip van het bouwteam proces en de ontwikkeling van bouwteams. Verder is het aan te bevelen om verder onderzoek te doen naar een algemene Q-set, bestaande uit succesfactoren van bouwteams in het algemeen. Ten derde wordt aanbevolen om het onderzoek uit te breiden naar de aanbestedings- en de uitvoeringsfase, omdat deze fasen van invloed kunnen zijn op de samenwerking in een bouwteam. Ten slotte kan het perspectief van een opdrachtgever op samenwerking tussen opdrachtgever en opdrachtnemer worden geïdentificeerd, evenals het perspectief van een aannemer op samenwerking in bouwteams in de infrastructuursector.

Trefwoorden: Aanbestedingsstrategie, bouwteam, vroege betrokkenheid vacn de aannemer, ulititeit- en bouwsector, samenwerking, samenwerking tussen opdrachtgever en aannemer, Q-methodologie, strategisch kader

Contents

Executive summary II

Samenvatting V

List of Figures XII

List of Tables XIII

I Context of the research

1 Introduction 1
- 1.1 Problem context . . . 1
- 1.2 Contracting strategies . . . 1
- 1.3 The bouwteam . . . 2
- 1.4 Why bouwteams? . . . 2
- 1.5 Contractor's perspective . . . 3
- 1.6 Problem statement . . . 4
- 1.7 Structure of the report . . . 4

2 Research design 5
- 2.1 Research approach . . . 5
  - 2.1.1 Part 1: Context of the research . . . 6
  - 2.1.2 Part 2: Finding contractor's perspectives . . . 6
  - 2.1.3 Part 3: Strategies to influence client-contractor collaboration . . . 7
- 2.2 Relevance of this research . . . 8

3 Client-contractor collaboration in bouwteams 9
- 3.1 Client-contractor collaboration . . . 9
  - 3.1.1 Definition . . . 9
  - 3.1.2 Elements of collaboration . . . 9
  - 3.1.3 Why should we collaborate? . . . 11
  - 3.1.4 A client's and contractor's perspective . . . 11
- 3.2 The bouwteam . . . 12
  - 3.2.1 Definition of bouwteams . . . 13
  - 3.2.2 The approach . . . 13
  - 3.2.3 A contractor's perspective of the bouwteam approach . . . 15
- 3.3 Conclusion . . . 16

4 Designing the Q-study: Success factors for collaboration 17
- 4.1 Step 1: Collecting statements . . . 17
  - 4.1.1 Statements derived from literature . . . 17
  - 4.1.2 Statements derived from interviews . . . 19
- 4.2 Step 2: Defining the Q-set . . . 19
  - 4.2.1 Sampling method: structured sampling . . . 19
  - 4.2.2 Number of statements . . . 19
  - 4.2.3 Preliminary Q-set . . . 20
- 4.3 Step 3: Selecting the P-set . . . 22
  - 4.3.1 Participant criteria . . . 22
  - 4.3.2 Number of participants . . . 23

4.4 Step 4: Collecting Q-sorts . . . 23
4.4.1 Q-sorting scheme . . . 23
4.4.2 Q-procedure . . . 23
4.4.3 Pilot test . . . 24
4.5 Conclusion . . . 25

II Finding contractor's perspectives

5 From factors to contractor's perspectives 27
5.1 Step 5: Q-analysis . . . 27
5.2 Step 6: Identify perspectives . . . 29
5.2.1 Perspective 1: Relationship first . . . 30
5.2.2 Perspective 2: Early involvement of right people . . . 31
5.2.3 Perspective 3: Structure first . . . 33
5.2.4 Similarities and differences between perspectives . . . 34
5.3 Conclusion . . . 36

III Strategies to influence client-contractor collaboration

6 Designing strategies 38
6.1 Method elaboration: Designing strategies . . . 38
6.2 Linking contractor's perspectives to client types . . . 39
6.3 Implementation of success factors . . . 42
6.4 Conclusion . . . 45

7 Expert consultation 46
7.1 Set-up of the expert consultation . . . 46
7.2 Findings of the expert consultation . . . 46
7.2.1 Part 1: Shared perspectives . . . 46
7.2.2 Part 2: Client types . . . 47
7.2.3 Part 3: Designed strategies . . . 47
7.3 Conclusion . . . 49

8 Discussion 50
8.1 Discussion of the results . . . 50
8.1.1 Contractors in bouwteams . . . 50
8.1.2 Contractor's perspectives on client-contractor collaboration . . . 50
8.1.3 Designed strategic framework . . . 52
8.1.4 Final remark . . . 52
8.2 Implications of the research . . . 53
8.3 Limitations . . . 54
8.4 Validity . . . 55

9 Conclusion & recommendations 56
9.1 Conclusion . . . 56
9.1.1 Sub-conclusions . . . 56
9.1.2 Main research question . . . 59
9.2 Recommendations . . . 60

Reflection 62

Photo credits 63

References 64

IV Appendix

A Background information of bouwteams **71**
A.1 Background of Early Contractor Involvement . . . 71
A.2 Detailed definition of the bouwteam . . . 72
A.3 Competences in a bouwteam . . . 72
A.4 Bouwteam UAV and bouwteam UAV-gc . . . 72
A.5 Contractual reflection . . . 73
A.5.1 Part 1: Bouwteam activities . . . 74
A.5.2 Part 2: Price formation . . . 75
A.5.3 Concluding remarks . . . 75

B Q-methodology **76**
B.1 Step 1 & 2: Collecting statements and defining the Q-set . . . 76
B.1.1 Success factors of collaboration from literature . . . 76
B.1.2 Success factors of collaboration from interviews . . . 78
B.1.3 Q-concourse . . . 79
B.1.4 Definition of the Q-set . . . 83
B.2 Step 3: Selecting the P-set . . . 84
B.3 Step 4: Collect Q-sorts . . . 84
B.4 Step 5: Q-analysis . . . 84
B.4.1 Correlation matrix . . . 85
B.4.2 Factor extraction . . . 87
B.4.3 Number of factors for analysis . . . 90
B.4.4 Factor rotation . . . 95
B.4.5 Quantitative description of the factors . . . 99
B.5 Step 6: Identify perspectives . . . 100
B.5.1 Consensus statements . . . 104
B.5.2 Descending factor array of differences . . . 105

C Q-interviews **108**
C.1 Q-procedure . . . 108
C.2 Summary of Q-interviews . . . 111

D Expert consultation **127**
D.1 Set up of the expert consultation . . . 127
D.2 Format of the expert consultation . . . 127
D.2.1 Part 1: Contractor's perspectives . . . 127
D.2.2 Part 2: Client types . . . 128
D.2.3 Part 3: Strategic framework . . . 129

List of Figures

1 Similarities and differences between perspectives . . . III
2 Implications on how to influence client-contractor collaboration in bouwteams . . . IV
3 Overeenkomsten en verschillen tussen perspectieven . . . VI
4 Praktische implicaties voor de samenwerking tussen opdrachtgever en aannemer in bouwteams . . . VII

1.1 Contracting strategies (figure of TwynstraGudde (n.d.)) . . . 2
1.2 The MacLeamy curve (figure from Davis (2011)) . . . 3

2.1 Scope of the research . . . 5
2.2 Flow diagram of the research design . . . 7

3.1 Visualization of the phases of the bouwteam approach (own figure) . . . 14
3.2 Roles in the bouwteam (figure from Chao-Duivis et al. (2013) . . . 15

4.1 Steps of Q-methodology . . . 17
4.2 Q-sorting scheme . . . 24

5.1 Characterising and distinguishing statements of factor 1 . . . 30
5.2 Characterising and distinguishing statements of factor 2 . . . 32
5.3 Characterising and distinguishing statements of factor 3 . . . 33
5.4 Similarities and differences between perspectives . . . 35

6.1 Legend of the success factors part of the designed strategies . . . 39
6.2 Implementation of success factor 12 and 33 . . . 42
6.3 Strategy for the involved client . . . 42
6.4 Strategy for the project developer . . . 43
6.5 Strategy for the representative of the client . . . 44
6.6 Strategic framework for influencing client-contractor collaboration in bouwteams . . . 45

8.1 Practical implications for influencing client-contractor collaboration in bouwteams . . . 53

9.1 Strategic framework for influencing client-contractor collaboration in bouwteams . . . 58
9.2 Practical implications on how to influence client-contractor collaboration in bouwteams . . . 59

B.1 Scree plot of eigenvalues of PCA . . . 89
B.2 Example of factor rotation (figure by Watts & Stenner (2012) . . . 96
B.3 Factor array of factor 1 . . . 101
B.4 Factor array of factor 2 . . . 102
B.5 Factor array of factor 3 . . . 103

C.1 Q sorting scheme . . . 109

List of Tables

4.1 References used to collect success factors of collaboration . . . 18
4.2 Final Q-set of success factors of collaboration in bouwteams . . . 21
4.3 Final Q-set . . . 25

5.1 Overview: Characteristics of factor solutions . . . 28
5.2 Rotated factor loadings of the three factor solution . . . 29

6.1 Overview of the characteristics per client type . . . 38
6.2 Overview of step 1: Linking contractor's perspectives to client types . . . 40

9.1 Final Q-set . . . 57

A.1 Division of competences in current bouwteams (table from Grooters (2018)) . . . 73

B.1 Detailed list of references read in-depth to collect success factors . . . 78
B.2 Final Q-set of success factors of collaboration in bouwteams . . . 83
B.3 Selected P-set . . . 84
B.4 Correlation Matrix . . . 86
B.5 Unrotated factor matrix . . . 87
B.6 Eigenvalues and Variance of factors from Centroid Factor Analysis . . . 88
B.7 Overview: Significantly loadings of Q-sorts . . . 88
B.8 Overview: Humphrey's rule . . . 89
B.9 Overview: Results from rules of thumb . . . 90
B.10 Two-factor solution . . . 91
B.11 Three-factor solution . . . 92
B.12 Four-factor solution . . . 93
B.13 Five-factor solution . . . 94
B.14 Six-factor solution . . . 95
B.15 Rotated factor loadings after Varimax and Manual rotation . . . 97
B.16 Correlations between factor scores . . . 98
B.17 Factor array of the three-factor solution . . . 98
B.18 Division of participants over the factors . . . 99
B.19 Consensus statements . . . 104
B.20 Descending factor array for differences between factor 1 and factor 2 . . . 105
B.21 Descending factor array for differences between factor 1 and factor 3 . . . 106
B.22 Descending factor array for differences between factor 2 and factor 3 . . . 107

C.1 Q-set translated to Dutch . . . 110

PART I

Context of the research

1 Introduction

1.1 Problem context

The construction industry is currently in a cyclical upturn. Contractor's order books are full, many projects are initiated, and many projects are under construction. However, even though the economy is booming, failure costs are still high, projects are delayed and 'fighting' contracts are still present (Heel & Wolf, 2019; Chao, 2018). According to Heel & Wolf (2019), failure costs run into billions of euros every year, and most of them (54%) come to light during execution, although it is advised to take measures early to prevent write-offs from occurring. Failure costs are necessary costs to repair goods if not produced as specified or desired, and are in the current cyclical upturn the result of time pressure and scarcity of personnel and materials (Heel & Wolf, 2019). The construction industry is accustomed to high failure costs while they are disproportionate to other sectors where they are lower. Heel & Wolf (2019) and Noordhuis (2015) argue that this is because the construction industry is complex and fragmented. Three causes of high failure costs are separation between design and execution, low standardisation rates, and tendering for the lowest price (Noordhuis, 2015). As a result of failure costs, claims are handed in and 'fights' start between contractor and client.

A widely recognised example of a project currently developed that is facing cost overruns, delays and fighting contracts is 'Zuidasdok'. Zuidasdok is a large infrastructure project in Amsterdam of 990 million euros with a construction time of ten years. Execution of the project started in March 2019, but in May of the same year it turned out that construction costs increased with 100 million euros and that the duration needed to be extended with one year. Furthermore, a conflict arose between client and contractor and therefore the consortium stopped their work temporarily. At the moment, the current contract is terminated and a new tender, cut into several parts, will start. This all results in a cost overrun of at least 700 million euros (Zwaga, 2020)

The example illustrates some of the problems still present in the current construction industry. The study of Heel & Wolf (2019) concluded with five recommendations to overcome failure costs, of which one is focused on collaboration and communication. In an industry where many organisations together deliver one project, it is important to collaborate as recommended by participants of the study. As a result of collaboration, organisations get to know each other and can combine their knowledge.

1.2 Contracting strategies

Various types of contracting strategies can be applied for the development of projects. The chosen contracting strategy is often related to the desired results of a project (Jansen, 2009). In figure 1.1 possible contracting strategies are displayed with on the left side traditional and on the right side life-cycle contracting strategies. In traditional strategies, the project phases are separated from each other, and the contractor is only involved during construction. On the other side, early involvement and increased responsibility of the contractor are characteristics of life-cycle contracting strategies. Traditional contracting strategies are characterised by adversarial and competitive attitudes from involved parties due to large differences between values, goals and orientations (Bresnen & Marshall, 2000; Vaaland, 2004; Suprapto et al., 2015). It is stated by Bryde & Robinson (2005) that contractors often focus on minimising costs and duration of a project while clients focus more on satisfying stakeholders. However, the Marktvisie (2016), issued by Rijkswaterstaat and Rijksvastgoedbedrijf, expresses the need for more collaborative relationships based on equality and complementarity. The need is expressed due to project overruns, failure costs and losses, wrong allocation of risks, tension between client and contractor and liability, leading to a negative sector image. Therefore, it is desirable to shift towards collaborative relationships in which organisations collaborate, respect each other and stop 'fighting' contracts from occurring.

Figure 1.1: Contracting strategies (figure of TwynstraGudde (n.d.))

The contracting strategy 'bouwteam', a collaborative relationship, is rising in popularity in the construction industry due to a period of cyclical upturn. It is a known contracting strategy in the utility and building sector (utility, non-residential and residential projects), while it is upcoming in the infrastructure sector (infrastructure and hydraulic projects) (Lagemaat, 2015; Boes, 2013; Jansen, 2009). According to Chao (2018) the reason for the increased usage of bouwteams is the current attitude of contractors of taking fewer risks in projects. Furthermore, contractors try to create certainty for the company by choosing projects with a high chance of execution.

1.3 The bouwteam

The bouwteam is a collaboration agreement during the design phase of a construction project, in which at least client, contractor and consultants are present (Chao-Duivis et al., 2013; Lagemaat, 2015; Sødal, 2014; Van Riggelen, 2019). The bouwteam way of working is related to the commonly known early contractor involvement (ECI) and is an overarching definition of contracting strategies in which contractors are involved early to advise the client (van Wijck, 2018). The bouwteam is the Dutch variant of ECI in which client and contractor collaborate during the design phase. An advantage of the approach is an integration of the design and construction phase, because the separation of them is seen as undesirable (Berg, 2010; Van Riggelen, 2019; Sødal, 2014). The goal of the bouwteam is to deliver a design that is feasible in terms of costs and constructability by taking design choices into account. In the end, the aim of a bouwteam is to let the involved contractor execute the project.
An important aspect of bouwteams is collaborative working between client, contractor and consultants towards a predefined end-goal. Suprapto (2016) states that *"a collaborative relationship is about working together and integrating different sets of skills, expertise, experiences, views and thoughts from many people with diverse backgrounds and interests."* Ideally, client and contractor have mutual goals to work together towards the end-goal of the project by using their expertise, skills and experiences. By taking adequate time and resources for the project start-up of a bouwteam, the baseline can be set for a collaborative relationship. After initiating client-contractor collaboration, the collaborative relationship should be maintained, and it is desirable to continuously pay attention to development and status of it (Van Riggelen, 2019).

1.4 Why bouwteams?

But what can be achieved by working together in bouwteams? In literature, it is stated that the costs of (design) changes are low during the start of the design phase, while flexibility is high. Later on in the design phase, costs start to increase while flexibility decreases and after the design phase, during tendering or construction, costs of design changes are at the highest level while flexibility is at its lowest (Davis, 2011) as shown in figure 1.2. From this graph, it can be concluded that changes should be made as early as possible. The bouwteam approach can be a solution for this because the contractor is involved early. At the same time, the client is still in charge of the project and has control over the design (Nielen, 2010). In the bouwteam, it is desirable that participants collaborate to ensure that changes are made as early as possible.

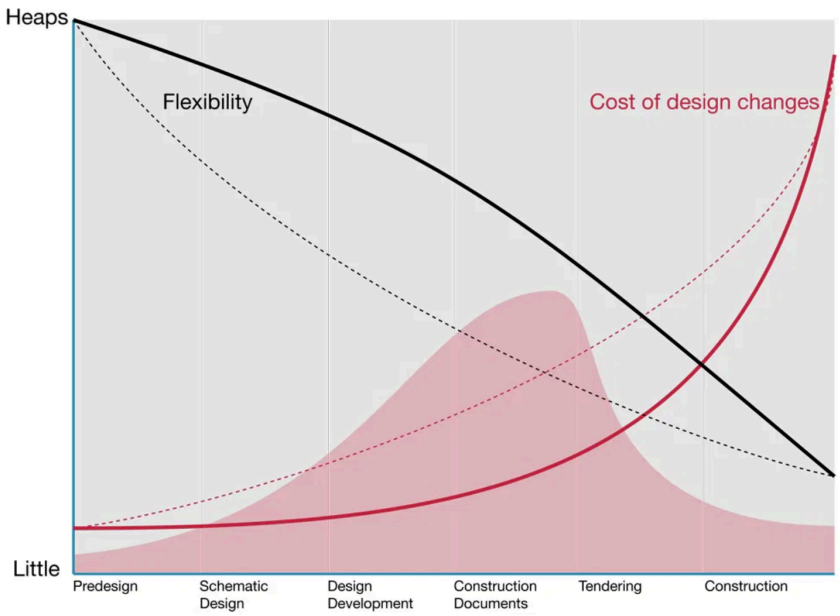

Figure 1.2: The MacLeamy curve (figure from Davis (2011))

Chao (2018) noticed that collaborative relationships in construction projects are currently more often used due to three considerations: negative experiences (e.g. 'fighting' contracts, failure costs and delays), challenges that can be solved by collaborating (e.g. complex planning, external stakeholders and technology) and inexperienced clients. Furthermore, other reasons to deliver a project through the bouwteam approach are identified by among others Van Riggelen (2019), and DuurzaamGebouwd (2019) and are (technical) complexity, unclarity and uncertainties in the scope, unclear risks, bad experiences with the traditional contracting strategies, time pressure, implementing innovations, working on an equal basis with a contractor, and for collaboration. Van Riggelen (2019) also argued that a client could have personal reasons to collaborate in a bouwteam.
However, obstacles can occur that could prevent the end-goal or benefits of collaboration between client and contractor from being achieved. Van Riggelen (2019) identified ten obstacles in her research by focusing on overcoming obstacles of bouwteams. To overcome these obstacles, success factors for collaboration in bouwteams are defined that can support bouwteams to be successful.

1.5 Contractor's perspective

In this research, collaboration in bouwteams of the utility and building sector is studied from a contractor's perspective since client and contractor are dependent upon each other. However, the contractor gets involved halfway are can be situated in a restricting position. This study is conducted in collaboration with Ballast Nedam, a large contractor in the Netherlands. Ballast Nedam is a development and construction company with projects as a core business. The company was founded in 1877 as Amsterdamse Ballast Maatschappij and merged with Nedam resulting in Ballast Nedam Group. Since 2015, Ballast Nedam is part of the international Renaissance Group. The focus lies on projects that are part of the built environment, including the infrastructure sector and the utility and building sector. The research will be carried out at the Ballast Nedam Building Projects, where large building projects with capital investments of over 50 million euros are tendered. Currently, many of these projects are developed and tendered as a bouwteam. It is in the companies interest to identify how to improve working together in bouwteams to deliver a successful project.

During orientation meetings[1] held at Ballast Nedam, it is discovered that each bouwteam is unique and that there are different ways to implement the contracting strategy. The overall agreement of employees of Ballast Nedam is that there is not one (good or bad) way of implementing the bouwteam; it depends on the type of project and client. Additionally, different perspectives regarding bouwteam came forward, different people expressed different viewpoints regarding bouwteams and their implementation, and not one specific viewpoint arose.

[1] Short orientation meetings were conducted with employees of Ballast Nedam Building Projects to gather information about bouwteam projects at Ballast Nedam

1.6 Problem statement

To summarise, a tendency from adversarial to collaborative relationships is observed. The importance of collaboration is acknowledged by the construction industry and the contracting strategy bouwteam is rising in popularity. Some (thesis) research is conducted towards bouwteam projects in the Netherlands, focusing on obstacles, success factors and differences with other contracting strategies[2]. In doing so, it is stated by Sødal (2014), Grooters (2018) and Boijens (2008) that bouwteam participants can have different interests and views. It is expected that this can influence working together in a bouwteam, and therefore, it is desirable to identify how success factors are interpreted, prioritised and valued by bouwteam participants. The problem statement of this research is:

> *Clients and contractors are highly dependent upon each other in bouwteam projects and collaborate towards successful project delivery while they have different values, goals and objectives. However, contractors perspectives regarding client-contractor collaboration in bouwteam projects are not known yet.*

The goal of the research is to identify and collect success factors for collaboration in bouwteams, from both literature and interviews. Subsequently, the study aims to provide insight into shared perspectives of contractors regarding the identified success factors. Furthermore, client-specific strategies are developed that can be applied by contractors to influence client-contractor collaboration in bouwteams to achieve successful project delivery. As a result, a strategic framework is developed that includes different client types that could initiate bouwteams.

1.7 Structure of the report

In this chapter, the subject of interest *client-contractor collaboration in bouwteams* is introduced. In chapter 2 the research design is described to reach the goals defined in this introduction. Next, a literature study concerning client-contractor collaboration and bouwteams is conducted in chapter 3, followed by the gathering of success factors for collaboration in chapter 4 to define the context of Q-methodology. The results of the Q-study and the interpretation are displayed in chapter 5 and based on this a strategic framework is designed in chapter 6. Next, expert consultations are conducted to test the logic and correctness of the strategies of which the outcomes are given in chapter 7. Finally, the research is concluded with a discussion and conclusion in respectively chapter 8 and 9.

[2]Research is done by Chao-Duivis (2012); Van Riggelen (2019); Nader (2019); van Wijck (2018); Sødal (2014); Boijens (2008); Berg (2010); Sewalt (2019)

2

Research design

This chapter describes the research design followed to address the problem statement given in the introduction. In section 2.1 the research approach is set out by identifying sub-questions to answer the main question. The research approach is divided into three parts (context, analysis and strategies) which are elaborated on in the sub-sections. Next, the relevance of this research is given in section 2.2.

2.1 Research approach

Even though the contracting strategy bouwteams is not new for the utility and building industry, the collaboration between clients and contractors remains a challenge. Contractors acquire a role during designing of projects in close collaboration with the client. However, it is still unclear for contractors how to act towards the client in such a situation. Especially since they are highly dependent upon each other for successful project delivery, it is of importance to understand ways to influence client-contractor collaboration. Therefore, in order to support contractors in bouwteams, the objective of this research is to uncover perspectives regarding client-contractor collaboration in bouwteams to provide strategies and recommendations to influence collaboration.

The main research question of this research project is:

> *In what way can contractors influence client-contractor collaboration in bouwteams to achieve successful project delivery?*

The boundaries of the research are displayed in figure 2.1 and the main aspects of the scope are highlighted below:

- *Success factors of collaboration in bouwteams:* This research focuses on success factors of collaboration in bouwteams during the design phase of a project since successful project delivery is often not the result of the application of one success factor but a combination of multiple.
- *Utility & building sector:* In the utility and building sector, the bouwteam approach is more often applied compared to the infrastructure sector.
- *Client and contractor:* A bouwteam consists of different types of bouwteam participants with among others client, contractor and different consultants. This research focuses on the relationship between client and contractor only and investigates collaboration between them.
- *Contractor's perspective:* The research will be performed from the perspective of a contractor since limited literature is available regarding a contractor's perspective of bouwteams (see section 2.2).

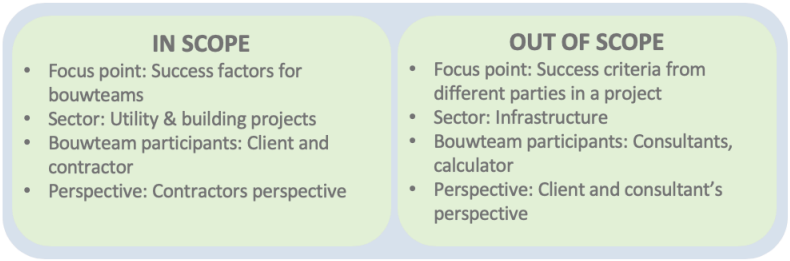

Figure 2.1: Scope of the research

To answer the main research question, a research design is set up consisting of three parts:

- Part 1: Context of the research;
- Part 2: Finding contractor's perspectives;
- Part 3: Strategies to influence client-contractor collaboration.

For each part, sub-questions are formulated which contribute to the answer of the main research question. Part 1 is discussed in section 2.1.1, part 2 in section 2.1.2 and part 3 in section 2.1.3.

2.1.1 Part 1: Context of the research

The goal of the first part is to establish a theoretical context of client-contractor collaboration in bouwteams. In order to shape the context of this research, a literature study is conducted for which searches in Google Scholar, Scopus, the Repository of the Delft University of Technology and Worldcat discovery will be used to find relevant literature. In order to understand client-contractor collaboration within bouwteams, it is essential to identify the characteristics of these concepts. Therefore, the first sub-question is:

1. What does client-contractor collaboration in bouwteams entail?

For the first question, knowledge of client-contractor collaboration within bouwteams will be identified and reflected upon. At first, the concept of collaboration in general will be examined and next, collaboration between client and contractor in bouwteams is studied. After that, the focus shifts to the bouwteam approach for which a bouwteam definition is given based on the general concept of Early Contractor Involvement (ECI). The working and functioning of bouwteams are studied, identifying the phases of a bouwteam project and the roles of client and contractor. Finally, a contractor's perspective regarding bouwteam projects is given.

Since the bouwteam approach is characterised by collaboration between client and contractor because they are dependent upon each other, success factors related to collaboration are of importance for successful project delivery. Therefore, the second sub-question is as follows:

2. What are success factors for collaboration in a Bouwteam?

The aim of sub-question two is to identify which success factors are of importance for collaboration within a bouwteam. In doing so, a broad collection of success factors from literature and interviews will be identified that apply to collaborative construction projects. By combining the answer from sub-question one and the identified success factors, a set of success factors related to client-contractor collaboration in bouwteams will be established. In literature, success factors for bouwteams can be found but mostly from a client's perspective. Since this research will be conducted from the viewpoint of a contractor, the set of collected success factors will be focused with the help of success factors from a contractor's point of view. Therefore, two semi-structured interviews will be conducted at Ballast Nedam.

2.1.2 Part 2: Finding contractor's perspectives

After the theoretical framework has been set by answering sub-question one and two, the focus shifts to the practical part of this research. Different viewpoints and attitudes of contractors are present in a project. By identifying and understanding a contractor's perspective, it will become clear what their position is within a bouwteam project regarding client-contractor collaboration. Therefore, the third sub-question is:

3. What are perspectives of contractors on specified success factors for collaboration in bouwteams?

For answering this sub-question, Q-methodology will be used to identify perspectives among bouwteam participants. Q-methodology is a combination of quantitative and qualitative research and has been designed to identify motivations and preferences of a strategically selected group of participants (Brown, 1993). The method has been used before in the construction industry by Koops (2017) and Suprapto (2016) to determine perspectives of respectively project success shared by public project managers and owner-contractor relationships in projects. The objective is to identify a contractor's perspective on success factors for collaboration in bouwteams. Therefore, it is vital to include only participants in the research that have experienced collaboration in bouwteams and Q-methodology provides this precondition by strategically selecting participants. The participants are asked to sort a set of predefined statements in a sorting scheme (a quasi-normal distribution) based on a predefined sorting question. The sorting scheme has as many boxes as there are propositions, forcing participants to prioritise. In doing so, the participant's subjective opinions will be found since observations of participants are subjective and are made by participants themselves (Stephenson, 1993; Kroesen & Bröer, 2009; Watts & Stenner, 2005; Van Exel & De Graaf, 2005). After prioritising the statements, a post-sorting interview is conducted to gather information about the prioritisation made by the participants.

2.1.3 Part 3: Strategies to influence client-contractor collaboration

Only identifying which contractor's perspectives exist regarding client-contractor collaboration in bouwteams does not lead to influencing collaboration to achieve successful project delivery. Therefore, the fourth sub-question is formulated:

4. What strategies can be applied by contractors to influence client-contractor collaboration within bouwteams?

By answering the aforementioned sub-questions, knowledge concerning bouwteams, success factors for collaboration and contractor's perspectives regarding collaboration in bouwteams are identified. This information will be combined to answer the fourth sub-question. A strategic framework will be designed to point out how client-contractor collaboration in bouwteams can be influenced by contractors. In doing so, the definition of a strategy used in this research is "a long-term plan of action designed to achieve a particular goal or set of goals or objectives" (Harvard, 2007). Every bouwteam project is unique and therefore each requires a unique approach. However, some general strategies can be applied by focusing on influencing client-contractor collaboration from different contractor's perspectives. While designing, the strategies are adjusted to possible client types present in bouwteam projects. Simplified client types will be deduced from literature on client characteristics of clients in the construction industry. For development of the strategies, the post-sorting interviews held during the Q-interviews will be used to define how success factors of collaboration can be implemented from a contractor's perspective.

After the strategic framework is designed an expert consultation is set up to discuss the findings of this research so far. Therefore, the fifth sub-question is formulated:

5. How do expert views relate to the designed strategic framework and its application in practice?

The aim of the fifth and last sub-question is to validate the answer to sub-question three and four and to determine what possibilities for application in practice are. The focus lies on the identified contractor's perspectives of client-contractor collaboration in bouwteams, client types and the designed strategies. Based on this, it will be determined whether the designed strategies can assist contractors in bouwteams. Three experts from senior management of Ballast Nedam will be consulted individually.

The overall approach of the research is displayed in the flow diagram of figure 2.2.

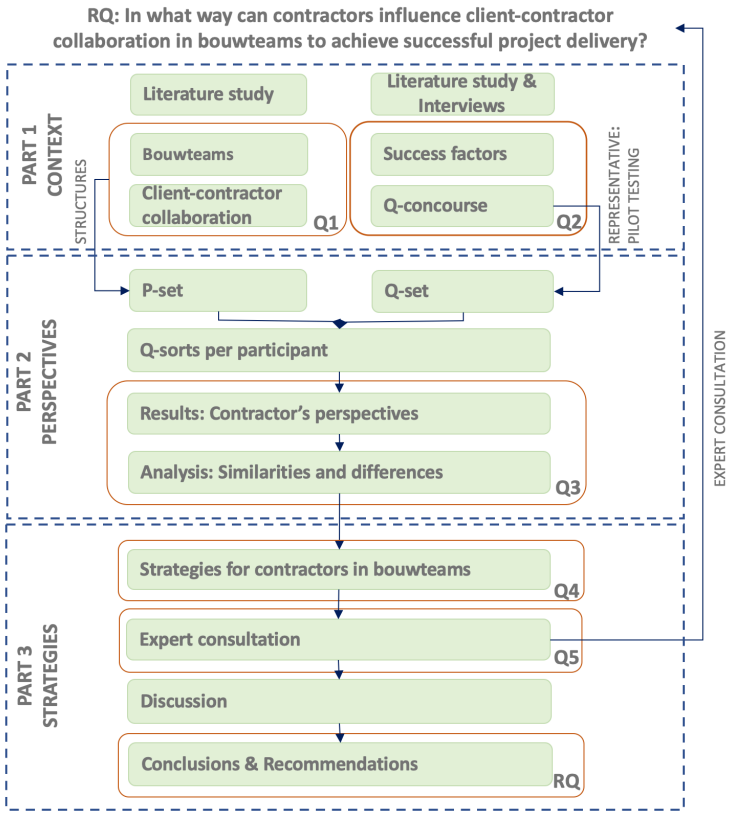

Figure 2.2: Flow diagram of the research design

2.2 Relevance of this research

The uniqueness of this research is a contractor's viewpoint on bouwteam projects. Limited literature on bouwteams is available, as is literature from a contractor's perspective on bouwteam projects.

Previous research conducted towards bouwteams mainly focused on the aspects of bouwteam projects. Sødal (2014) identified the advantages and disadvantages of bouwteams, carrying out a literature study and interviews of two cases in Norway. His focus was on multi-disciplinary collaboration, and it is argued that "*it is vital with an acceptance and dedication among the team members to adhere to new forms of collaboration*". This might be difficult to achieve due to the different interests of involved parties. Furthermore, Van Riggelen (2019) identified obstacles of infrastructure bouwteams and eleven success factors to prevent obstacles from occurring, focusing on tender till construction phase. She states that parties should be willing to collaborate, and it is recommended to investigate the possibilities to maintain collaboration during a bouwteam project.
Both Nielen (2010) and Nader (2019) compared the bouwteam way of working with design & build. In doing so, they defined the relation and dependency of client and contractor. Where Nielen (2010) studied utility and building projects, Nader (2019) looked into infrastructure projects. They argued, respectively, that research concerning collaboration among bouwteam participants, beyond architect and contractor, is valuable and knowledge regarding the soft aspects of collaboration is desirable.
Finally, Sewalt (2019) and Grooters (2018) studied the role of consultants within bouwteams. Grooters (2018) focused on the possibility for consultants to act as system integrators and identified the division of competences between client, contractor and consultant. Sewalt (2019) researched the changing role of consultants in bouwteams, taking values of client and contractor into account, to identify possibilities for new roles.
The studies of Nielen (2010); Van Riggelen (2019); Nader (2019); Sewalt (2019) and Lagemaat (2015) are all executed within a client-oriented environment. Research of Boijens (2008) is the only one conducted from a contractor's perspective. He identified prior to his research that preconditions for bouwteams are known, but not applied in practice and therefore, collaboration is obstructed. Nonetheless, Boijens (2008) argues that alignment of attitudes of bouwteam participants is still unknown, substantiated by Sødal (2014).

This research will provide insights into how contractors can use contractor's perspective regarding collaboration in projects to influence client-contractor collaboration. The scientific relevance of this study are perspectives concerning success factors of client-contractor collaboration consisting among contractors. Since client and contractor are highly dependent upon each other, it is valuable to indicate how contractors can influence collaboration to achieve successful project delivery. Therefore, strategies are designed as the practical relevance of this research.

3

Client-contractor collaboration in bouwteams

An exploratory literature study is performed consisting of two parts. Section 3.1 focuses on collaboration and client-contractor collaboration in particular. Next, the contracting strategy bouwteams as a form of early contractor involvement is elaborated in section 3.2. By relating the concepts to each other, the answer to sub-question one is given in section 3.3.

3.1 Client-contractor collaboration

In the construction industry, working together between parties with a common goal can be defined as cooperation or collaboration. This research focuses only on collaboration between client and contractor. Information on client-contractor collaboration can be found in literature related to the interrelated concepts as partnering, alliance or collaborative contracting. The terms are used interchangeably, and according to Suprapto et al. (2015), the concepts share some characteristics as trust, open communication, knowledge sharing, equality and joint problem-solving. Hence, the literature on all three concepts is used to establish a theoretical framework on client-contractor collaboration.

3.1.1 Definition

The topic of collaboration has been extensively researched, resulting in many different interpretations and definitions. By collaborating, a collaborative relationship evolves in which project participants work together, effectively and efficiently, to accomplish a common goal related to the project and its objectives. Client-contractor collaboration is a specific type of working together (synonyms: owner-contractor collaboration, owner-contractor relationship, client-contractor relationship) (Xue et al., 2010). Suprapto (2016) extensively researched the concept of owner-contractor relationship in collaborative contracting in the construction industry and therefore, his definition is used in this research to define client-contractor collaboration:

> *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.*

Clients and contractors have their own long-term goals related to their organisation, but should also have mutual goals in the project of interest (Akintoye & Main, 2007; Boukendour & Hughes, 2014; Bresnen & Marshall, 1999; Drexler & Larson, 2000; Rahman et al., 2014; Kalay, 2001). These two different types of goals might conflict with each other, and therefore, parties must recognise that different world views exist.

3.1.2 Elements of collaboration

Suprapto et al. (2015) identified six categories representing the key elements of collaborative relationships and these are based on elements of collaborative relationships extracted from literature. The framework of Suprapto et al. (2015) is used as a baseline to reflect upon the concept of client-contractor collaboration from different angles. Knowledge from literature, not yet incorporated in his research is added to the explanation of the categories.

Team Working

Team working is seen as fundamental for the success of innovative projects in which collaborative relationships are applied. By teamworking, project participants work together to combine their knowledge and increase value to achieve desired results (Suprapto, 2016; Thompson & Sanders, 1998). A team with commitment and common objectives

can improve a relationship (Drexler & Larson, 2000; Nasir & Hadikusumo, 2018). Bresnen & Marshall (2000) argue in their research that it is of importance for the team-building process to implement formal workshops to support teamworking early in the collaboration process. Furthermore, Akintoye & Main (2007) state that team-building is essential to improve project performance and could be achieved by cooperation and team integration. The elements of teamworking identified by Suprapto (2016) are *team identity, shared vision, information/knowledge sharing, team member's affective trust, attitude towards diversity in problem solving, and reflection and self-assessment.*

Relational Attitude

Project participants have different attitudes and mindsets in the organisation they are part of. When a collaborative relationship is initiated, the different attitudes are brought together. In doing so, "as the two parties interact, a set of relational norms, factors, or routines are co-developed specific to govern their relationship" (Suprapto, 2016). Relational attitude represents the aspects that become present between client and contractor in a relationship as shared goals, values and understanding each other's assumptions (Xue et al., 2010; Bresnen & Marshall, 1999).
In literature read, trust among people came forward as a vital aspect of collaboration and Bresnen & Marshall (1999) state that clients value mutual trust to establish collaborative relationships. However, the level and quality of trust are limited in practice. The elements of relational attitude identified by Suprapto (2016) are *inter-organizational trust alongside cultural fit, open communication, long-term orientation, and top management commitment.*

Capability

Capability refers to the ability of the client and the contractor to execute a project. Different types of capabilities are used to measure whether the respective organisations are capable of fulfilling the work of interest (Akintoye & Main, 2007). Contractors need to show that they are competent and have the required capabilities, including the capability of managing people (their own people and potential subcontractors) and project team capability (Drexler & Larson, 2000; O'Connor, 2009). By collaborating, organisations have the potential to develop new capabilities that become part of the organisation (Cook & Hancher, 1990; Bresnen, 2007). The elements of capability identified by Suprapto (2016) are *owner's and contractor's capabilities, technical capabilities, financial capabilities and organisational reputation.*

Team integration

Team integration relates to parties who openly exchange information and knowledge. By implementing a set of practices, methods and behaviours, an environment can be created in which parties feel free to collaborate (Suprapto, 2016; Thompson & Sanders, 1998). Bresnen (2007) argues that team integration intends to eliminate opportunistic behaviour. If parties show that they are all willing to solve problems open and honest, it is more likely that a collaborative relationship originates (Drexler & Larson, 2000). Some elements of team integration mentioned by Suprapto (2016) are *creation of a single integrated project team, seamless operation without organisational boundary, unrestricted cross-sharing of information, and collective responsibility for all project outcomes.*

Joint Working

Joint working is about project participants working together to achieve common goals. In doing so, only solutions should be implemented that are satisfying for all organisations involved (Xue et al., 2010). Organisations can see each other's willingness to solve problems as an aspect of joint working (Drexler & Larson, 2000). If problems occur, organisations should be willing to forgive and use problem-solving arrangements to quickly resolve the problem and continue joint working (Rahman et al., 2014; Ning & Ling, 2013). The elements of joint working mentioned by Suprapto (2016) are *joint decision making, joint problem solving and dispute handling, joint risk management, and joint effort for continuous improvement.*

Contract

Suprapto (2016) mentions that the key aspects of contracts are a *renumeration scheme, incentives and risk-sharing mechanisms.* The client decides what contracting strategy and contract is used for a project, based on the project characteristics and capabilities of the client and contractor. Bresnen & Marshall (2000) state that collaboration can be engineered by, among others, appropriate contracts and incentives. Unclear contracts can be a reason for the loss of the relationship (Drexler & Larson, 2000). However, contracts in collaborative approaches cannot always eliminate these adversarial attitudes, even though bouwteam contracts are more focused on collaboration than traditional contracts (Suprapto, 2016).

3.1.3 Why should we collaborate?

But why do client and contractor want to collaborate in a project? In this section, four reasons for collaboration are given.

Akintoye & Main (2007) identified, in their research regarding UK contractor's perception towards collaborative relationships, four overarching reasons why organisations should collaborate. One of them is related to initiation for a collaborative project from the client before the project started working.

- *In response to the market:* By which is meant that clients can specifically ask for collaboration in a project or competitors are showing interest in collaboration causing other parties to go along with this to stay competitive themselves (Akintoye & Main, 2007).

Furthermore, three reasons are related to working together while the project already started working.

- *Risk sharing strategies:* Risks can be identified early in the process and can be allocated to the most appropriate party to monitor and manage the risk. If there are risks that cannot be allocated to one party, project participants can negotiate during the process of how to deal with the risk. If necessary, risks can be shared among client and contractor (Boukendour & Hughes, 2014; Akintoye & Main, 2007).
- *Access to innovation and technology:* In a collaborative relationship, more knowledge is available due to different specialities present in a project. By combining knowledge, there is a potential to promote innovations during the design phase and the construction phase (Rahman & Kumaraswamy, 2005; Xue et al., 2010; Rahman et al., 2014; Akintoye & Main, 2007).
- *Resource efficiency:* By merging resources, they can be used more efficiently in a project. In doing so, the time to market can be improved, and construction development costs decreased (Akintoye & Main, 2007; M. Rahman & Kumaraswamy, 2008).

3.1.4 A client's and contractor's perspective

From the literature, two perspectives on collaboration are identified. The first is a contractor's perspective, and the second is a client's perspective.

A contractor's perspective from literature

Akintoye & Main (2007) studied reasons to enter into collaborative relationships. The main reason given by contractors is to get financial gains due to reduction of costs and risks. In deciding to collaborate, the decision is only based on whether collaboration results are viable for the party itself. Behaviour from competitors does not influence this decision (Akintoye & Main, 2007). Furthermore, contractors tend to benefit from collaboration because of the chance of being awarded a building contract increases. Collaboration creates opportunities to develop a long-term relationship and simultaneously, a track-record is built advantageous for marketing (Bresnen & Marshall, 2000). Hughes et al. (2012) defined a contractor's perspective on collaboration as:

Collaboration within the construction industry is a non-adversarial team-based environment, where through the use of the correct contract, there is early involvement of key members and everyone understands and respects the input of others and their role and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk-sharing to produce an atmosphere of mutual trust, where information is shared, problems can be solved together with everyone contributing towards a common aim and value engineering can be used to ensure that everyone is a "winner", motivated by a fair method of pain share gain share within a long term relationship.

Suspicion among parties regarding their interests, motives and actions can jeopardise the successful completion of a project. If a distrustful relationship arises, Drexler & Larson (2000) argue that owners delay approval on necessary changes, withhold funds and monitor the project obsessively while contractors focus on the contract to find loopholes, withhold information and submit project changes. When this behaviour arises, contractors tend to hold back from developing long-term relationships as is the case in a traditional contracting strategy (Suprapto et al., 2015; Humphreys et al., 2003).

A client's perspective from literature

The client is the entity with most control over resources, time and budget in a project and since this research focuses on private projects only, the perspective of the private client on collaboration is identified (Harmon, 2003). Several mixed perspectives (from both client and contractor) are found, but only one general client's perspective on collaboration is. Since it is valuable to have a pure client's perspective on collaboration, the found perspective is given as defined by Hughes et al. (2012) as

"Collaboration within the construction industry is a non-adversarial team-based environment, where through the early involvement of key members and the use of the correct contract, everyone understands and respects the input of others and their role and responsibilities. The team or project is led and managed by the client and relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where, information is shared, open book accounting is used, problems can be solved together, claims are reduced and everyone contributes towards a common aim motivated by a fair method of pain share gain share to produce a win-win outcome."

Clients stated that they prefer a different way of working because the current way is unsatisfactory (Bresnen & Marshall, 1999). Since collaboration is expressed as a primary goal by clients, Bresnen & Marshall (1999) argue that they accept that the course of the project is not yet clear. Furthermore, clients highlighted the importance of building high levels of mutual trust as an essential aspect for collaborative arrangements, substantiating the client's perspective. However, they also noted that even though there is an increase of informal agreements, formal contracts continue to be involved in case of disagreements that highlights that there is a difference between what clients prefer and what they do (Bryde & Robinson, 2005).

3.2 The bouwteam

It has been argued that the construction industry is shifting towards collaborative relationships. A type of collaborative relationships that could solve problems the construction industry is currently facing is early contractor involvement (ECI). ECI is a relationship-based contracting strategy in which a contractor is involved in the early phases of a project to advise on the design (Francis & Kiroff, 2015; Rahman & Alhassan, 2012; Whitehead, 2009). In doing so, the main task of the contractor is to advise on constructability of the design and planning. The construction industry has recognised the potential added value of advice from contractors during front-end project development due to its benefits (Eadie & Graham, 2014; Walker & Lloyd-Walker, 2012; Francis & Kiroff, 2015; Rahman & Alhassan, 2012). In addition, Rahman & Alhassan (2012) and Jergeas & Put (2001) argue that the overall project efficiency improves when ECI is applied because constructability issues can be addressed before execution.

A Dutch form of ECI has been implemented in the Netherlands during the 1950s and is called bouwteam (Berg, 2010). The bouwteam is a collaboration agreement during the design phase of a construction project, in which at least client, contractor and designer are present to collaborate (Chao-Duivis et al., 2013; Van Riggelen, 2019; Sødal, 2014; Lagemaat, 2015). Contractors are invited early on in the design phase by clients to advise on the design. The added value of a bouwteam is that client and contractor are in contact with each other at an early stage of the project, enabling that cost-related aspects, design choices and solutions and alternatives can be taken into account by the bouwteam (Sødal, 2014; Nielen, 2010; Chao-Duivis et al., 2013).
Clients can choose to execute a project through a bouwteam to accelerate the schedule while maintaining a focus on quality and value. As a result, there is early knowledge on project costs, risks and feasibility of the design. As a consequence, extra costs are made early in a project when the project is still flexible, and changes can be made (Eadie & Graham, 2014).

Many benefits of working together in bouwteams are identified from the literature. The two most often mentioned benefits, for both client and contractor are:

- *Provision of the planning:* By collaboratively optimising the design in a bouwteam, reductions can be implemented in terms of duration and staff-hours necessary. The schedule can be accelerated with shorter delivery time as a result and an increased potential for on-time completion of a project (Song et al., 2009; Whitehead, 2009; Eadie & Graham, 2014; Scheepbouwer & Humphries, 2011; Francis & Kiroff, 2015; Rahman & Alhassan, 2012).
- *Early knowledge of costs:* By collaborating, a cost-effective design can be made by implementing cost-saving alternatives during the design phase resulting in earlier knowledge of costs. It is expected that the costs represent a realistic price due to involvement of a contractor's practical knowledge (Whitehead, 2009; Rahman & Alhassan, 2012; Eadie & Graham, 2014; Francis & Kiroff, 2015; Song et al., 2009).

According to Van Riggelen (2019) the early involvement of the contractor is only beneficial if there is good collaboration between client and contractor. In order to establish a good collaborative relationship, at least trust, openness and good communication are necessary (Boijens, 2008; Van Riggelen, 2019; Suprapto, 2016). If there is a lack of these aspects, there is a possibility that collaboration fails with adversarial attitudes as a result.

3.2.1 Definition of bouwteams

For this research, a definition of bouwteams is formulated based on three definitions found in literature or existing bouwteam contracts (See A.5 for a reflection on bouwteam contracts). The following definitions are used as a starting point[1]:

- *VGBouw (1992)*:
  "The bouwteam is a collaboration agreement in which the participants – while retaining their independence and responsibility – cooperate on the preparation of the project. To this end, each of the participants is required to make the best possible use of their experience and expertise".
- *DuurzaamGebouwd (2019):*
  "The bouwteam is a method of collaboration in which participants of the bouwteam work together on the preparation of the project with the aim to [*project specific goal*]".
- *Sijpersma & Buur (2005):*
  "The bouwteam is an integrated construction process organisation, in which the representatives of the construction process functions 'take initiative', 'design', and 'execute' collaborate towards a design".

The definition of Sijpersma & Buur is a brief and concise definition focusing on collaboration towards a design in which the bouwteam is called an integrated construction process organisation. Consequently, both VGBouw and Duurzaam Gebouwd identify the bouwteam as a method of collaboration though VGBouw calls it a collaboration agreement. Only Sijpersma & Buur indicated indirectly that participants related to a set of specific functions should be present in the bouwteam (related to process functions 'take initiative', 'design' and 'execute'). However, none of the definitions elaborates on which participants, in particular, should be involved. In this research, the necessary participants are defined as client, contractor and designer (Chao-Duivis et al., 2013; Sødal, 2014; Van Riggelen, 2019; Lagemaat, 2015).

Furthermore, it should be defined what the overall goal is of a bouwteam and how this goal can be achieved by collaboration. Duurzaam Gebouwd leaves part of the definition of the goal open for interpretation while both Sijpersma & Buur and VGBouw define the goal as respectively a design and preparation of the project. The definition of Sijpersma & Buur is considered too specific because the bouwteam does not only focus on the design itself but also on aspects as constructability, planning, costs, and developing a building contract. According to Chao-Duivis et al. (2013) the overall goal of the bouwteam is to prepare the project for execution.

The definition of VGBouw is the only definition that states that bouwteam participants retain their independence and responsibility and are required to make the best use of their experience and expertise. This part of the definition is considered valuable to create awareness among bouwteam participants regarding their role and responsibilities in the bouwteam.

Furthermore, the definition must include that the collaboration agreement is a temporary agreement because the bouwteam itself only exists during the design phase of a project; the nature of the partnership is temporary (Chao-Duivis et al., 2013). Overall, the definition of VGBouw appears to be the most specific and complete. As a result, this definition is used as the starting point, and given the aforementioned points, the bouwteam is defined as:

> *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 a building contract. To this end, each of the participants performs the tasks related to their experience and expertise while retaining their independence and responsibility.*

A detailed explanation of the bouwteam definition is given in appendix A.2.

3.2.2 The approach

In this section, the phases of the bouwteam approach and the roles of client and contractor are given. For additional information on the division of competences and the difference between two types of bouwteams, bouwteam UAV and bouwteam UAV-gc, see appendix A.3 and A.4.

Phases of the bouwteam approach

In this research, a distinction is made between the general project phases and the phases relevant to a bouwteam. General phases of a project are project start-up phase (initiation and definition of the project), design phase, preparation phase, execution phase and aftercare. In a bouwteam project, the project cycle follows the same phases as a regular project but the design phase consists of three sub-phases that are project start-up, designing and price negotiations

[1] Translated from Dutch

and can be executed separately or simultaneously. The phases of the bouwteam approach are presented in figure 3.1. In this part of the literature study, only the phases relevant to the bouwteam approach are explained.

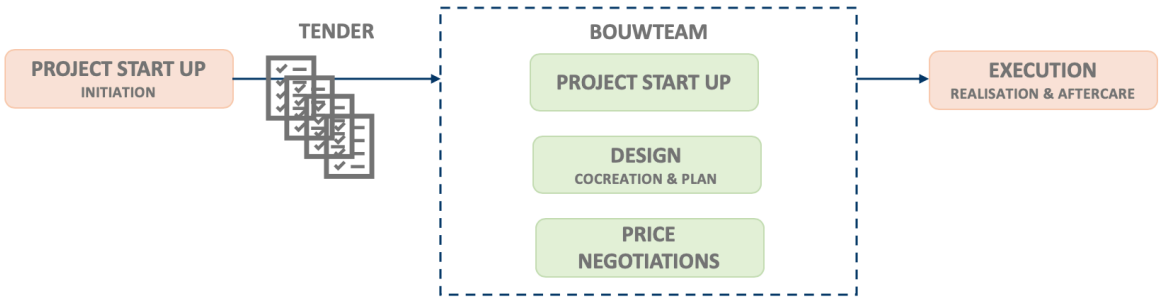

Figure 3.1: Visualization of the phases of the bouwteam approach (own figure)

After project start-up and before the design phase starts, a tender is set up to find a contractor suitable for the bouwteam and the project. Whitehead (2009); Van Riggelen (2019) and Scheepbouwer & Humphries (2011) state that criteria applied for selection are ideally non-cost criteria. It is desirable to focus on the track-records of contractors to determine if a contractor is qualified for execution of the work (Rahman & Alhassan, 2012).

Project start-up: At the start of a bouwteam, bouwteam participants can talk about how to interact and work with each other, about expectations and strong and weak points (Van Riggelen, 2019). In doing so, subjects as communication, expectation management (what is expected from one another) and the chairman of the bouwteam can be appointed. Additionally, Boijens (2008) states that legal aspects should be assigned as, e.g. permits, procurement, responsibilities and conditions. The aim of this sub-phase is to create opportunities for bouwteam participants to get to know each other and to define the common goal (Wondimu et al., 2016). However, the start-up only sets the basis for a collaborative relationship, while the relationship must be maintained during the bouwteam. The start-up is an important part of a bouwteam and is ideally not to be underestimated or rushed (Van Riggelen, 2019).

Designing: A contractor can get involved during different stages of the design phase, often in around preliminary design (PD), final design (FD) , or detailed design (DD)[2] (Sewalt, 2019). The moment a contractor gets involved in a bouwteam is often during or after final design, but during of after preliminary design is a possibility as well. The aim of collaborative designing is to deliver a feasible design in which risks are taken into account. During this sub-phase, bouwteam participants add their value by using their practical knowledge to suggest optimisations and alternatives to optimise the design (Van Riggelen, 2019; Scheepbouwer & Humphries, 2011).

Price negotiations: A bouwteam has the intention that the involved contractor is, for the time being, the first and only contractor that makes an offer for execution of the work (Van Riggelen, 2019; Grooters, 2018; Chao-Duivis, 2012; Berg, 2010). After a first price offer is handed in by the contractor to the client, price negotiations start. Scheepbouwer & Humphries (2011) argue that during price negotiations, it is important that there is mutual trust and respect between the client and the contractor. Price negotiations aim to come to a price that meets the budget of the client and is profitable for the contractor. Two outcomes exist of which the first one is that the client and contractor agree on a price and sign a building contract. It is assumed that the client will only move forward with the same contractor when the client-contractor relationship is viable. However, it is also possible that client and contractor cannot agree on the price or that the contractor fails to show what the value for money is (Grooters, 2018) resulting in the dismantling of the bouwteam (Chao-Duivis, 2012; Scheepbouwer & Humphries, 2011).

Bouwteam roles: Client and contractor

Bouwteams can consist of many different participants, as displayed in figure 3.2, of which everyone has his role, drivers and expertise in the bouwteam. In this research, the focus lies on client-contractor collaboration, and therefore a generic explanation of their roles is given. Nevertheless, the roles can deviate from the description in practice since each bouwteam is unique and has a different contract and conditions. *Client:* According to the standard bouwteam

[2]In Dutch respectively: voorlopig ontwerp, definitief ontwerp en technisch ontwerp

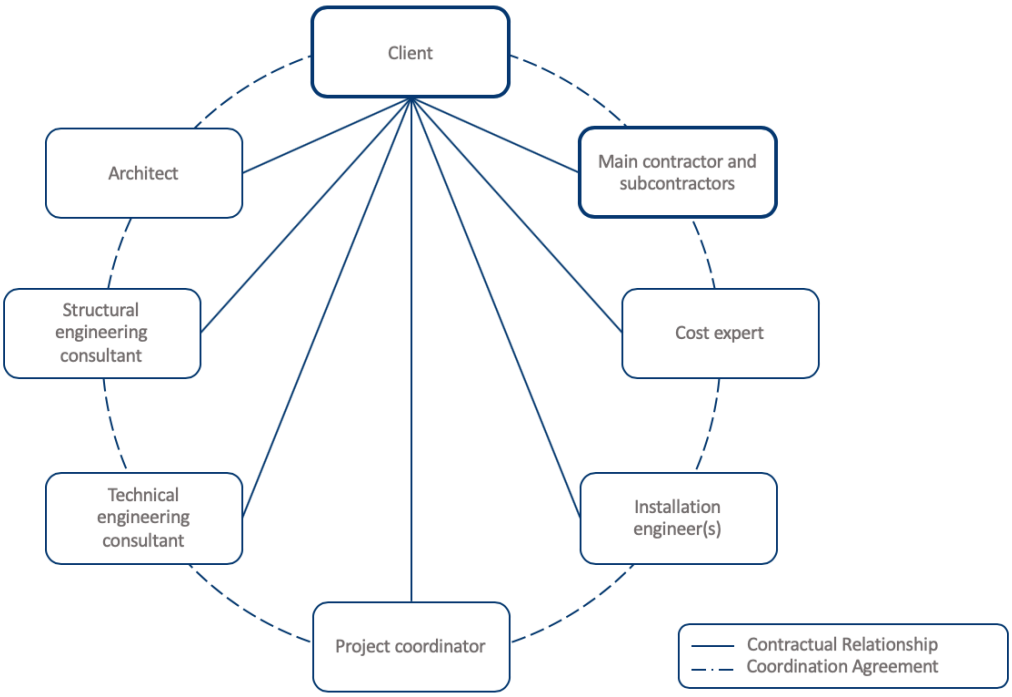

Figure 3.2: Roles in the bouwteam (figure from Chao-Duivis et al. (2013)

agreement, the client has a leadership role within the bouwteam (Chao-Duivis et al., 2013) but in practice, the contractor or a representative of the client is often the leader (Van Riggelen, 2019). The tasks of the client are laid down in the model contracts of VGBouw (1992) and DuurzaamGebouwd (2019) and can be summarised as leading the bouwteam and its meetings, coordinate and check work of the bouwteam participants, timely publication of requirements, reviewing designs, plans and budget estimates, timely decision-making, involvement of stakeholders, and identifying risks for the risk log VGBouw (1992); DuurzaamGebouwd (2019). Chao-Duivis (2012) argues that the opinion is held that involvement of the client in the bouwteam is considered important, but it is not always necessary that the client has a leadership role. Nonetheless, it is stated that the involvement of the client can affect efficiency.

Contractor: The contractor offers the bouwteam its practical experience and expertise in the form of advice to improve feasibility of the design (in terms of costs and constructability). In a bouwteam, the contractor has the task to supply sufficient capacity of his employees, assess and comment on designs, plans, budget estimates and proposed changes, tracking the risk log, and proposing alternatives (VGBouw, 1992; DuurzaamGebouwd, 2019). These contractor tasks are from the standard bouwteam agreement of VGBouw, but there are some optional tasks that can be added (VGBouw, 1992; DuurzaamGebouwd, 2019; Chao-Duivis, 2012)):

- Advising on cost-technical optimisations;
- Advising on technical feasibility of the project as a whole, and of its design;
- Preparation of sketches on introduced alternatives;
- Advising on the financial feasibility of the project as a whole;
- Setting up planning for the preparation and execution of the project.

The role of the contractor can be seen as corrective since the contractor contributes to the financial feasibility of the design. Looking from this perspective, it is desirable to involve the contractor as early as possible (Chao-Duivis, 2012). However, the moment of entering a project depends on the type and content of a project.

3.2.3 A contractor's perspective of the bouwteam approach

Chao-Duivis et al. (2013) established two considerations that create added value for a contractor to collaborate in a bouwteam. First, bouwteams create more paid work in the form of advice and second, the increased probability of being awarded the building contract as a result of the bouwteam (Van Riggelen, 2019; Berg, 2010). These considerations could both result in a profitable project. Different interests and goals are present among bouwteam participants. While the main goal of the client in a bouwteam is to use the knowledge of the contractor to develop a feasible design, the

main goal of the contractor is to execute a profitable project; different drivers are subordinate to these goals. Eadie & Graham (2014) are two of many researchers that collected the benefits of early contractor involvement. The main drivers mentioned in the literature for contractors are:

- *Improved constructability of the design:* The practical knowledge of the contractor is used during the design phase to make a design that has a high level of constructability. Contractors have in-depth knowledge and construction expertise used to optimise the design. By collaborating during the design phase, appropriate and preferred construction methods can be integrated into the design resulting in the alignment of design and execution, and development of a constructable design (Eadie & Graham, 2014; Whitehead, 2009; Rahman & Alhassan, 2012; Francis & Kiroff, 2015; Song et al., 2009).
- *Reduced risks:* In a bouwteam, the potential to create understanding and awareness of the risks of a project is high. During the design phase, risks can be identified early and allocated among bouwteam participants. In doing so, risks can be allocated better in comparison to the traditional contracting strategy. The involved contractor can decrease risks to create a low risk-profile for himself (Eadie & Graham, 2014; Francis & Kiroff, 2015; Whitehead, 2009).
- *Income from non-construction activities:* By participating in a bouwteam, contractors receive non-construction related income, during the design phase, for their advice. With this, contractors can potentially create more and steadier construction workload (Eadie & Graham, 2014; Song et al., 2009; Chao-Duivis et al., 2013). However, the reimbursement for advice is limited in relation to the reimbursement for the execution of a project.

Chao-Duivis (2012) concluded in her research that the ambience changes when contractors are added to a bouwteam; it is becoming tenser. It is expected that this is due to the desire of contractors to safeguard timely decision-making and therefore, the way of working might be adapted (Chao-Duivis, 2012).

3.3 Conclusion

In this chapter, a literature study on client-contractor collaboration in bouwteams is performed. A better understanding is given by drafting the definition for both concepts, followed by the main elements and a contractor's perspective. Based on this, the first sub-question can be answered:

1. What does client-contractor collaboration in bouwteams entail?

In a bouwteam, contractors are invited early on in the design phase by the client to advice, using their practical know-how and expertise, resulting in client-contractor collaboration. The main advantage is that the final design, at the end of the bouwteam, has an increased feasibility (in terms of costs and constructability) compared to a project following the traditional contracting strategy. Collaboration between client and contractor is valuable to reach the end-goals of a bouwteam: a feasible design and a signed building contract for the execution phase with the involved contractor. Even though the client is project owner, client and contractor are dependent upon each other to successfully deliver the project, emphasising the necessity of collaboration. In a bouwteam, client-contractor collaboration is defined as *a process in which client 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.*
The added value for contractors in the bouwteam process is an increased probability of being awarded the building contract. Underlying drivers are improved constructability of the design (beneficial for execution), reduced risks, and income from non-construction activities. Furthermore, it can be concluded that it is desirable to establish a collaborative relationship between client and contractor early, but only establishing the relationship is not enough to guarantee successful project delivery. During the process, it is important to maintain the collaborative relationship which can be done by focusing on six elements of collaboration: capability, contract, joint working, relational attitude, team working and team integration. By maintaining and supporting collaboration through balancing the categories of elements, it is expected that the bouwteam approach is more beneficial than other contracting strategies. Nonetheless, this is only the case if the bouwteam approach is suitable for the project and both client and contractor value collaboration in a project.

4

Designing the Q-study: Success factors for collaboration

This chapter describes the set-up and application of the Q-methodology as introduced in chapter 2 to identify contractor's perspectives regarding client-contractor collaboration in bouwteam. The methodology consists of six steps, of which the first four are performed in this chapter and the last two in chapter 5. Section 4.1 till 4.4 explain the methodology and its application and the results step by step. The steps for conducting Q-methodology of Van Exel & De Graaf (2005) are followed of which the last step consists of analysis and interpretation of the results. In this research, this last step is divided into two since the researcher believes that it is important to make a distinction between analysis and interpretation of the results, see figure 4.1.

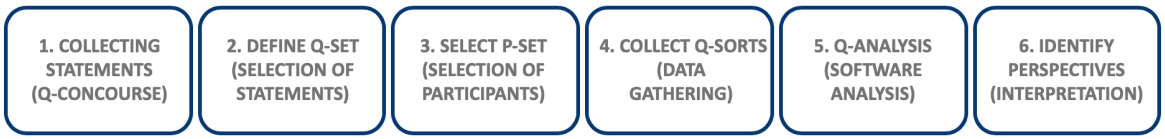

Figure 4.1: Steps of Q-methodology

4.1 Step 1: Collecting statements

The first step of Q-methodology is defining a Q-concourse consisting of a broad and diverse collection of statements representing the subject of interest. The literal definition of a concourse in the context of Q-methodology is *"the flow of communicability surrounding any topic in the ordinary conversation, commentary, and discourse of everyday life"* (Brown, 1993; Hermans et al., 2012; Van Exel & De Graaf, 2005).

This research focusses on success factors of collaboration in bouwteams projects, and therefore the statements collected represent success factors of collaboration. Success factors are activities, facts, conditions or influences that can contribute to the result of a project and can be influenced positively or negatively. Therefore, success factors are not involved in final project assessments, meaning that success factors are not used to measure project success (Lim & Mohamed, 1999). Belassi & Tukel (1996) state that it is often not the result of one success factor that leads to the success of a project, but it is often a combination of multiple.

For collecting statements, two types are collected: statements derived from texts and statements that are expressed verbally (Van Exel & De Graaf, 2005). In doing so, the Q-concourse is focused on success factors relevant for both client and contractor.

4.1.1 Statements derived from literature

Statements are identified from literature by conducting an extensive literature study with a primary focus on papers and researches. Papers and researches on the subject of collaboration in the construction industry are selected based on the goal, the sector the paper is related to, and the content. Table 4.1 shows the list of references that are read in-depth to collect statements[1]

[1] To ensure that papers are only included once in the research, the underlying references of the papers are scanned as well (see table B.1) and resulted in the removal of two often mentioned papers:Black et al. (2000) and Chan et al. (2004).

Reference	Related to	Goal of the paper
Adelback & Johansson (2013)	Large infrastructure projects	The goal of this paper is to identify factors that contribute to project success from a contractor's perspective.
Akintoye & Main (2007)	Construction projects	The goal of this paper is to describe the UK's contractor's perception of collaborative relationships in the construction industry.
Chan et al. (2004)	Construction projects	The goal of this paper is to conduct interviews on success factors deducted from seven major management journals.
Nasir & Hadikusumo (2018)	Construction projects	The goal of this paper is to develop a model to manage client-contractor relationships in the construction industry, focusing on contract management functions.
Rahman & Kumaraswamy (2005)	Construction projects	The goal of this paper is to examine the importance of a set of factors for Collaborative Working A(CWA) and to assess the relative importance of various factors for CWA.
Rahman et al. (2014)	Construction industry	The goal of this paper is to identify the view of contractors on the importance of collaboration in the construction supply chain.
Suprapto (2016) p.28; p.62	Capital projects	This dissertation shows that collaboration requires shared relational attitudes between client and contractor.
Suprapto et al. (2016)	Capital projects	The paper shows an analysis of 113 projects with the result that suggested that through relational attitudes and teamworking quality are important.
Thompson & Sanders (1998)	Construction projects	The paper shows the different degrees of partnering; from competition to cooperation, to collaboration and ending with coalescence.
Wondimu et al. (2016)	Infrastructure projects	The goal of this research is to propose suitable approaches to implement Early Contractor Involvement.
Van Riggelen (2019)	Infrastructure projects	The goal of this research is to define how the benefits of bouwteams can be achieved in construction projects.
Xue et al. (2010)	Construction projects	The goal of this paper is to present a definition of collaborative working underpinned by the principle of collaboration

Table 4.1: References used to collect success factors of collaboration

First, all success factors mentioned in literature are collected, and they are taken over as literal as possible to reduce researcher bias (Minkman et al., 2017). The goal of this is to collect a broad collection of statements that covers the whole subject of interest. After that, the statements are critically examined to determine which are relevant for this research based on the aspects of client-contractor collaboration and bouwteams, identified in section 3.1 and 3.2. A statement is relevant for this research when one of the following applies:

- The success factor is related to the design phase of a project and therefore to one of the bouwteam phases (start-up, designing, or price negotiations);
- The success factor applies from the moment the contractor is involved in negotiations about the bouwteam agreement;
- The success factor applies from the moment both client and contractor have the intention to collaborate in a bouwteam.

After the removal of irrelevant statements, a word count is done to determine which ones are reoccurring in literature. The top five mentioned words are trust (16), communication (10), joint (10), commitment (9) and performance (9). Double counting is not yet taken into account at this stage, meaning that identical or similar statements are still present in the Q-concourse and therefore in the word count. However, the word count reflects the importance of themes of collaboration since they are mentioned more often than others. Next, similar or identical statements are merged into one, and after this, the collection of statements remaining is the Q-concourse from literature. To make the Q-concourse clear and understandable for the Q-interviews, some statements are rewritten (see table B.2). In doing so, the aim is to stay as close as possible to the original text, and if no adaptions are necessary for understanding, the statement is taken over literally. This process resulted in a Q-concourse of 147 statements extracted from literature. The high number of unique statements can be explained by the different levels of detail present among them; from general to specific statements.

4.1.2 Statements derived from interviews

Most success factors identified from literature are formulated from a client's perspective. Since this study is performed from a contractor's perspective, the Q-concourse is focused with statements from a contractor's perspective. Two semi-structured interviews consisting of two parts are conducted at Ballast Nedam. The goal of the first part is to validate the findings from literature by reflecting upon the bouwteam definition, the sub-phases and the roles of client and contractor. The goal of the second part is to determine when bouwteams are successful and what can influence the success of a bouwteam. Opinions and statements mentioned during the interview, identified as success factors, are added to the Q-concourse. In this process, the factors are copied as literal as possible to stay close to the original statements (see appendix B.1.2). After the interviews were conducted, 67 success factors of collaboration in bouwteams have been extracted by following the broad definition of a success factor. From these statements, it is first decided whether they are relevant for this research, and double or similar statements are combined. After that, the statements are rewritten, if necessary, for understanding. The statements from the interviews are added to the Q-concourse as well, resulting in a final Q-concourse of 192 statements.

4.2 Step 2: Defining the Q-set

In step 2, a selection is made of statements, that represent the complete subject of interest, which is called the Q-set. The Q-set should be broadly representative to ensure that all relevant perspectives will be identified during the sorting process and the analysis (Watts & Stenner, 2005). Watts & Stenner (2005) state that it is important that the selected set of factors *"provides good coverage in relation to the research question"*. Each individual included statement should have a contribution to the subject of interest. As a consequence, a small sample is sufficient to identify the relevant perspectives present. Gaps or overlaps between statements are avoided to arrive at a balanced Q-set (Kampen & Tamás, 2014; Watts & Stenner, 2005). However, there is no one correct way to derive a Q-set from a Q-concourse (Watts & Stenner, 2012). The Q-set can never be complete since there are always more statements that could be added to the Q-set (Watts & Stenner, 2005; Stephenson, 1993). Kampen & Tamás (2014) argue that it is of importance to determine which guidelines are followed in defining a Q-set since different procedures can be followed. This is of importance to get a suitable Q-set for the aim of this research.

4.2.1 Sampling method: structured sampling

There are two ways to select a Q-set: via structured or unstructured sampling. In general, a structured sample is preferred over an unstructured sample because it reduces extremity (Kampen & Tamás, 2014). Essential for structured sampling is that a theory or knowledge regarding the subject of interest is present to establish categories to structure the Q-concourse. In unstructured sampling, no framework of categories is used to distribute the statements of the Q-concourse, but the researcher selects the statements himself. As a consequence, the Q-set can suffer from (researcher) bias (Steelman & Maguire, 1999).

In this research, structured sampling is applied for selection of the Q-set to ensure that the statements are balanced, equally distributed and represent the entire subject of interest (Hermans et al., 2012). In doing so, a set of categories is defined by theory and research (Hermans et al., 2012; Watts & Stenner, 2012) and the statements of the Q-concourse are distributed among them. Six elements of collaboration from Suprapto (2016) are mentioned and explained in section 3.1.2. Since Suprapto (2016) conducted extensive research regarding collaboration, the six categories are used to apply structured sampling to categorise statements from the Q-concourse and are *teamworking, capability, relational attitude, team integration, joint working and contract*. It is expected that by using these categories, a broad and representative collection of statements for collaborative contracting strategies in the construction industry can be selected. During the two interviews conducted at Ballast Nedam, the interviewees were asked if the categories of Suprapto (2016) represent the different themes and aspects of collaboration in bouwteams in their opinion. They agreed with the categories and did not identify any additional or irrelevant categories indicating that the categories represent the aspects of collaboration in bouwteams. Therefore it is assumed that applying these categories is valid in this research.
For each statement, it is determined to which category the statement belongs, based on the examples per category given by Suprapto (2016). In categorising, each statement is only assigned once to a category to ensure that they are mutually exclusive. The categorisation of the statements is given in table B.2.

4.2.2 Number of statements

The number of statements to be included in the Q-set should be established. In literature, no clear guidelines can be found for the number of statements a Q-set should consist of; Q-sets of twenty statements up till Q-sets of eighty

statements are found possible within Q-methodology (Donner, 2001; Hermans et al., 2012; Watts & Stenner, 2012; Shinebourne, 2009). Including too few statements creates a probability that coverage of the subject is insufficient while including too many statements can lead to unnecessary oversampling (Watts & Stenner, 2005). Therefore, a balance must be found to cover the breadth of categories and possible perspectives present. Since the steps of conducting Q-methodology of Van Exel & De Graaf (2005) are followed, it is decided to use their guidelines for the number of statements to be included. They state that approximately 40 statements are necessary for a good Q-set and therefore a guideline of including 30 - 50 statements is used.

4.2.3 Preliminary Q-set

From the final Q-concourse (of step 1), a preliminary Q-set is selected. Per category, a set of statements is selected to be included in the preliminary Q-set with the defined sorting question in mind. In this research, the sorting question is formulated as:

> *"Essential for collaboration in a bouwteam to achieve successful project delivery is ...."*

In the process of selecting statements from the Q-concourse for the preliminary Q-set, the goal is to balance the Q-set by including an equal number of six statements per category. For the selection of statements, the number of references per statement is used (see table B.2 for the references of each statement) and the following guidelines are applied until six statements per category are selected:

1. Statements with a high number of references, mentioned in both literature and interviews, are selected to include the most significant statements;
2. Statements with a high number of references, only mentioned in the literature, are selected to include the most significant statements;
3. Statements of themes not yet included and only mentioned (once) in interviews are selected to cover the breadth of the Q-set and maintain the focus on a contractor's perspective.

If one theme is reoccurring because multiple statements have a high number of references, it is decided only to include one statement of this theme. A trade-off is made, and the most representative statement is included in the Q-set (e.g. *Performance management* and *performance measurement* are both mentioned twice in literature, but only one statement related to "performance" is included in the Q-set). This process ensures that the selected Q-set covers the entire subject of interest. The final Q-set consists of 38 statements shown in table 4.2, and the explanation of selecting statements per category is given in the following sections. In the Q-set, three success factors are included with only one reference to ensure the breadth of the selected success factors[2]. The selection of statements is explained in the following section.

Capability

For the category capability, all statements that are referred to in three different references of which one is an interview are included in the Q-set to ensure high significant relevance. This resulted in the following two statements: *Early involvement of stakeholders* and *early involvement of contractors*. Furthermore, three statements that were mentioned in three references from literature only are included as well and are: *sufficient resources for collaboration*, *a continued involved project team leader* and the combined factor *team leader's leadership ability (technical, organizational, coordination, motivational, experience)*. After revising the selected statements, it came forward that a statement related to the theme "innovation" is missing. Since one of the reasons for a client to use the bouwteam approach could be to innovate his project, the statement *contractor's track-record in terms of innovation* is included.

Contract

For 'contract', all statements that are referred to in three different references are included in the Q-set of which two are mentioned in interviews as well, resulting in three statements: *Contractual incentives (positive and negative)*, *clear definition of roles before the bouwteam starts working* and *fair risk allocation*. Furthermore, two statements mentioned in both literature and interviews are included and are: *Specified payment arrangements* and *defined scope of the bouwteam*. The set of factors from this category covers different themes of, but nothing related to the budget is yet included. Since the budget for execution of the project is important for price negotiations, the statement *financial range is agreed upfront by client and contractor* is included. Even though this statement was only mentioned during the interviews, it is still considered essential.

[2] These are: *contractor's track-record in terms of innovation, financial range is agreed upfront by client and contractor*, and *propose solutions when raising problems*

Nr.	Statement	Adelback & Johansson (2013)	Akintoye & Main (2007)	Chan et al. (2004)	Nasir & Hadikusumo (2018)	Rahman & Kumaraswamy (2005)	Rahman et al. (2014)	Suprapto (2016)	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 stakeholders							x					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 leadership ability	x		x		x										3
Contract																
7.	Contractual incentives (positive and negative)							x					x		x	3
8.	Clear definition of roles before the bouwteam starts working	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 bouwteam							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		x			x	x	x								4
21.	Understanding each others' objectives					x		x							x	3
22.	Project team leader's adaptability to changes in the project			x				x					x			3
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	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 of information 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 bouwteam during the project										x				x	2

Table 4.2: Final Q-set of success factors of collaboration in bouwteams

Joint Working

In the category joint working, none of the statements were mentioned in both literature and interviews. Therefore, it is reviewed whether the most significant relevant statements cover the whole subject of interest. First, all statements that are referred to in four and three different references are included in the Q-set resulting in: *Agreed process for dispute resolution* and *joint problem solving*. Thereafter, statements that are referred to in two different references are taken into account. In doing so, a trade-off has been made which statements to include. The choice has been made to include *shared risks*, *performance management* and *joint planning with all participants*. As a consequence, four statements are excluded from the Q-set. *Responsiveness of the contractor to changes* is excluded since this factor is addressed in the category relational attitude and *joint decision-making* is excluded because *joint problem solving* is already included and they resemble each other too much. Furthermore, *joint risk management* is excluded because two other risk-related statements are included in the Q-set and lastly, *innovative solutions* is excluded since this theme is already addressed in the category capability. This selection results in statements from literature only. Therefore, the factor *propose solutions when raising problems* is added since a solution-focused theme is not yet included while it is relevant for collaboration in bouwteams.

Relational Attitude

For the category relational attitude, all statements that are referred to in five, four or three different references are included in the Q-set to ensure high significant relevance. Most of them are mentioned in both literature and the interview, resulting in the following five statements: *Support of senior management*, *long-term orientation*, *understanding each other's objectives*, *project team leader's adaptability to changes in the project*, *win-win attitude*. The statement *collaborative attitude of project members* is also mentioned in three different references, but since it is closely related to *win-win attitude* it is decided to not include the statement in order to leave room for other themes of collaboration. Furthermore, two more statements are added that have two references and are: *Transparency* and *strive for equality in behaviour and duties* and are considered important for collaboration in this research because they relate to the radiated attitude of the contractor.

Team Integration

For the category team integration, all statements that are referred to in five, four or three different references are included in the Q-set. This resulted in the following three statements: *Development of common processes*, *integrated project teams* and *unrestricted cross-sharing of information*. Thereafter, statements that are referred to in two different references are taken into account and are: *Separate conversations in small groups per discipline*, *equitable relation and respect for all* and *involving the right people at the right moment*.

Team Working

For the category team working, all statements that are referred to in four or three different references are included in the Q-set. This resulted in the following five statements: *mutual trust*, *high level of commitment*, *good communication*, *alignment of objectives* and *regular meetings*. Thereafter, statements that are referred to in two different references and both in literature and interviews are included in the Q-set, resulting in *have an elaborated project start-up* and *evaluate the bouwteam during the project*.

4.3 Step 3: Selecting the P-set

In the third step of Q-methodology, a set of participants that will conduct Q-sorting is selected: the P-set. The P-set can be a limited number of participants but should be well selected (Brown, 1993; Van Exel & De Graaf, 2005). Since the definition of 'well selected participants' is broad and vague the process of selecting participants is described.

4.3.1 Participant criteria

The P-set is a strategically selected set of participants who are theoretically relevant for the subject of interest. By selecting participants, the focus lies on selecting people who supposed to have a clear and interesting perspective (Van Exel & De Graaf, 2005; Danielson, 2009). Webler et al. (2009) state that *'Q participants are selected to represent the breadth of opinion in a target population, not the distribution of beliefs across the population'*. Because the P-set is strategically selected and the participants are not necessarily representative for the population, the results cannot be generalised to the population (Steelman & Maguire, 1999).

In this research, participants that are included in the P-set are all employees (or have been) from Ballast Nedam or its subsidiaries[3] and partners and meet the following criteria:

[3]Heddes and Laudy are subsidiaries of Ballast Nedam

- The participant is currently 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 a bouwteam 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 utility and building sector.

To collect the necessary participants for this research, two approaches have been applied: the structured approach and snowball sampling. First, two participants from Ballast Nedam that comply with the criteria are contacted to ask if they are willing to participate in the research. Next, snowball sampling is applied in which the selected participants recruit colleagues of whom they think share a similar or different opinion to enhance the overlap between opinions and increase diversity (Minkman et al., 2017).

4.3.2 Number of participants

After defining the criteria, the number of participants is established. In Q-methodology the P-set is usually smaller than the Q-set (Van Exel & De Graaf, 2005). In order to determine an appropriate number of participants, different guidelines can be found in the literature, ranging from twenty to sixty participants (Watts & Stenner, 2012; Shinebourne, 2009; Donner, 2001; Danielson, 2009). In this research, the redundancy rule from Webler et al. (2009) is applied. For redundancy, it is stated that a Q-study results on average in two to five perspectives and that four to six participants share a perspective. When these numbers are multiplied by each other, the P-set should be in between eight and thirty participants. In this research, a P-set of approximately 25 participants will be selected.

Participant groups of the P-set

With the criteria in mind, participants are selected. In doing so, three participant groups are established in which participants from the P-set can be categorised to ensure a broad but specific P-set:

- Process management entails employees acting as tender managers or plan developers. This group of people oversees the overall bouwteam process and are the connection between the client and engineers.
- Design management entails 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 management entails 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 plannings and building sites.

The final selected P-set resulted in 26 participants of which detailed information can be found in table B.3.

4.4 Step 4: Collecting Q-sorts

After the Q-set and the P-set are defined, the Q-sorting process can start resulting in Q-sorts. A Q-sort is a viewpoint regarding the subject of interest defined by a participant. In this step, the P-set sorts the statements according to a predefined Q-sorting process. In doing so, they prioritise the statements based on the predefined sorting question in a fixed sorting scheme (Van Exel & De Graaf, 2005). In this research, the Q-sorting process is referred to as a Q-interview.

The Q-interviews can be conducted in two ways: either face-to-face or digitally. Van Exel & De Graaf (2005) state that, based on previous research, results from both methods are congruent. However, in this research, the interviews are conducted face-to-face because it enables the researcher to interview the participants after the Q-sorting process, which is valuable for interpretation of the results and developing strategies.

4.4.1 Q-sorting scheme

The participants are asked to rank the statements in a sorting scheme. The sorting scheme is a quasi-normal distribution ranging from least to most essential. In the case the participants from the P-set are inexperienced with the subject of interest, the distribution can be steep in order to leave room for ambiguity, indecisiveness or errors in the middle of the sorting scheme. While participants interested in the subject with strong opinions should have a flat sorting scheme to make room for expression of opinions (Van Exel & De Graaf, 2005). In this research, the sorting scheme of figure 4.2 is used:

4.4.2 Q-procedure

The participants of the P-set receive a set of numbered statements and are asked to read them thoroughly and to divide them into three piles: essential, neutral, and not essential (Shinebourne, 2009). Next, the participants are asked

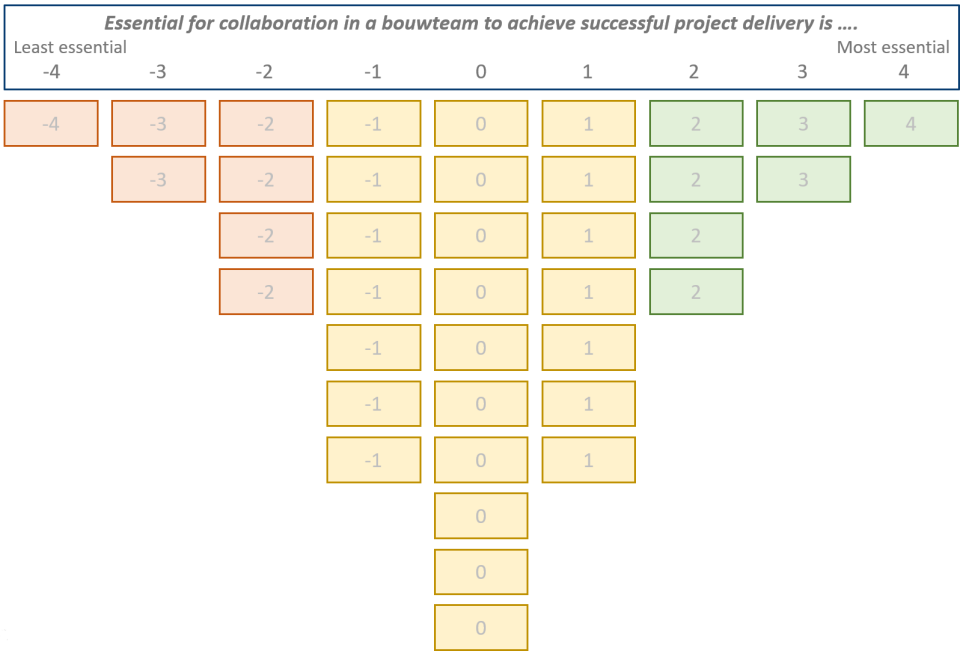

Figure 4.2: Q-sorting scheme

to take one pile (either essential or not essential) and to place the statements of this pile into the sorting scheme. In doing so, it is recommended to start with the extremes (most essential or least essential) and to work towards the centre of the sorting scheme (Amin, 2000). This process is repeated for the other two piles. In following this procedure, the participant is instructed to take the sorting question in mind (Defined as "*Essential for collaboration in bouwteams to achieve successful project delivery is ...*"). When the sorting scheme is filled with statements, participants can move them around until the sorting scheme is, in their opinion, satisfactory.
After the sorting scheme is completed, the process is succeeded by an interview. In the interview, participants are asked for the reasoning behind prioritisation of the statements and in that way to provide in-depth information for interpretation of the results and the strategies to be designed (Minkman et al., 2017; Shinebourne, 2009). The detailed Q-procedure is given in appendix C.1.

4.4.3 Pilot test

Before the Q-interviews are conducted with the defined Q-set and Q-procedure, a pilot test is conducted. Pilot testing is important because participants of a Q-study should have the freedom to respond the way they prefer to the sorting question. No limitations, restrictions or frustrations should be expressed by participants when prioritising statements (Watts & Stenner, 2012). This can be prevented upfront by defining a balanced Q-set and conducting a pilot test. The first aspect is covered by using structured sampling to select the Q-set. For the pilot test, two volunteers are asked to conduct the Q-sorting procedure according to the enclosed instructions (see appendix C.1). The goal of the pilot test is twofold: 1) to validate the Q-set in the context of client-contractor collaboration in bouwteams (complete, optimum balance, clarity, applicability and unambiguous) and 2) to validate the Q-sorting instructions (Cross, 2004). During the pilot test, it is taken into account that statements can be interpreted differently by different people.
The two volunteers are experts of Ballast Nedam with both experience of over ten years in the construction industry. They were both involved in more than ten to fifteen bouwteam projects. During the pilot test, it was first tested if the Q-procedure is understandable, clear and complete, including the post-sorting questions. Neither of the test persons had feedback on the Q-procedure. After that, the test persons were questioned if, in their opinion, the Q-set was complete. In doing so, they were asked whether any statements are irrelevant or missing. Both volunteers were of the opinion that the current Q-set is complete and no statements should be removed from or added to the Q-set.
Furthermore, it was asked if the statements were understandable. Both volunteers indicated that some statements might have too much room for interpretation. Since statements of Q-methodology must be clear and understandable, some could be clarified. However, when a statement is changed, it is taken into account that there can be some space left for interpretation of the participant itself. Furthermore, the second volunteer argued that placing success factors of collaboration on a "*disagree*" side of the sorting scheme feels negative. The researcher agreed on this, and it was

decided to change the names of the far ends of the sorting scheme to *least essential* and *most essential*, in line with the sorting question.

4.5 Conclusion

In this chapter, the first four steps of Q-methodology are elaborated on and the Q-set for this research is developed. The Q-set consists of success factors for collaboration in bouwteams mentioned in literature and in interviews. With this information, the second sub-question can be answered:

2. What success factors for collaboration are of importance for bouwteams?

The final Q-set is the best possible set of success factors of collaboration in bouwteams to extract contractor's perspectives in this research. After the pilot test, the Q-set has been clarified and it is assumed that the final Q-set is valid for the purpose it is made for. It is expected that the Q-set will lead to all perspectives present among contractors regarding collaboration in bouwteams in practice. The final Q-set is shown in table 4.3 and is the answer to sub-question two.

Nr.	Success factor	Category
1.	Sufficient resources for collaboration	*Capability*
2.	Early involvement of external stakeholders	*Capability*
3.	Contractor's track-record in terms of innovation	*Capability*
4.	A continued involved project team leader	*Capability*
5.	Early involvement of contractors	*Capability*
6.	Team leader's leadership ability	*Capability*
7.	Contractual incentives (positive and negative)	*Contract*
8.	Clear definition of roles before the bouwteam starts working	*Contract*
9.	Fair risk allocation	*Contract*
10.	Specified payment arrangements	*Contract*
11.	Financial range is agreed upfront by client and contractor	*Contract*
12.	Defined scope of the bouwteam	*Contract*
13.	Shared risks	*Joint working*
14.	Agreed process for dispute resolution	*Joint working*
15.	Performance management	*Joint working*
16.	Joint planning with all participants	*Joint working*
17.	Joint problem solving	*Joint working*
18.	Propose solutions when raising problems	*Joint working*
19.	Support of senior management from both sides	*Relational attitude*
20.	Long-term orientation of the contractor	*Relational attitude*
21.	Understanding each other's objectives	*Relational attitude*
22.	Project team leader's adaptability to changes in the project	*Relational attitude*
23.	Transparency	*Relational attitude*
24.	Win-win attitude	*Relational attitude*
25.	Strive for equality in behaviour and duties for client and contractor	*Relational attitude*
26.	Development of common processes and tools	*Team integration*
27.	Integrated project teams	*Team integration*
28.	Separate conversations in small groups per discipline	*Team integration*
29.	Unrestricted cross-sharing of information in the project	*Team integration*
30.	Equitable relation and respect for all	*Team integration*
31.	Involving the right people at the right moment	*Team integration*
32.	Regular meetings	*Team working*
33.	Mutual trust	*Team working*
34.	High level of commitment	*Team working*
35.	Good communication	*Team working*
36.	Alignment of objectives	*Team working*
37.	Have an elaborated project start-up	*Team working*
38.	Evaluate the bouwteam during the project	*Team working*

Table 4.3: Final Q-set

PART II

Finding contractor's perspectives

5

From factors to contractor's perspectives

This chapter shows the main results of the analysis performed on 25 Q-sorts. First, a summary is given of step five of Q-methodology in section 5.1 followed by an interpretation of the factors in section 5.2 till 5.2.3 as step six. Similarities and differences are elaborated on in section 5.2.4. Finally, the chapter is concluded in section5.3 by answering the third sub-question: "*What are perspectives of contractors on specified success factors for collaboration in bouwteams*".

5.1 Step 5: Q-analysis

After conducting the Q-interviews, the collected Q-sorts are analysed in step five of Q-methodology. In this research, PQMethod (version 2.35 developed by John Atkinson) is used since it is specifically designed for Q-analysis and is capable of performing the analysis necessary. Q-analysis consists of two steps: pre-analysis of the participants and factor analysis.

Pre-analysis of the participants

The Q-interviews are conducted with 26 participants. All participants were asked to fill in some general questions before the Q-sorting process started, to verify if they met the predefined participant criteria (see section 4.3 for the participant criteria). Two participants from the *cost management* category did not meet them. The first participant was not directly involved with the client and was not present at bouwteam meetings. Therefore, it was concluded that this participant did not meet the criterion *the participant experienced client-contractor collaboration in a bouwteam project* and this person was removed from the results. The second participant was not directly involved with the client but was present at bouwteam meetings. Since the participant experienced bouwteam meetings, he was considered a valuable participant and was included in the analysis.
This resulted in a total of 25 participants from whom the Q-sorts (filled in sorting schemes) are used for analysis as described in the following section.

Factor analysis

Q-methodology revolves around the identification of shared perspectives between the participants. Groups of participants who completed the Q-sort in a similar manner are searched for and with help of factor analysis clusters of participants are identified. Clusters represent dominant perspectives and these are called factors prior to interpretation. Factor analysis consists of three steps which are extensively described in appendix B.4 and summarised in this chapter. To determine the appropriate number of factors for the research, conditions defined by (Webler et al., 2009) are used as a guideline:

- *Simplicity*: The fewer factors involved, the easier the shared perspectives can be interpreted. However, it should not be taken too far since too few factors can result in losing important information and differences between perspectives.
- *Clarity*: The number of Q-sorts loading on multiple factors or no factors at all should be minimised. Q-sorts loading on multiple factors have a hybrid perspective.
- *Distinctness*: Low correlations are desired since differences between factors are important for interpretation. If a lot of high correlations are present, the factors agree on many statements.
- *Stability*: Groups of participants will cluster to share perspectives. Within these groups, certain subgroups will be present when there is a good set of factors that results in as many clusters as possible.

The first step of factor analysis is factor extraction with help of factor scores. A factor score can range between -1 and +1 and indicates how similar a perspective of a participant is to a factor. A high factor indicates that there is a high degree of similarity between the participant and the factor and a negative factor indicates that the participant has an

opposing view to a factor. Initially, eight factors are extracted with Principal Component Analysis (PCA); the default setting. From this, six factors were selected to continue the analysis. The selection criteria used to determine which factors are valid are the Kaiser-Guttman criterion, significantly loading of Q-sorts, Humphrey's rule and a scree plot. A solution of two, three, four, five or six factors could be valid and therefore, the five possible solutions are run. The results are analysed and compared with the help of three rules to distinguish if a factor is valid, summarised in table 5.1. The three-factor solution is the only solution that complies with all three rules, so this solution is used for further analysis. This results in three dominant perspectives among the 25 participants.

	2-Factor	3-Factor	4-Factor	5-Factor	6-Factor
Cumulative explained variance [%]	47	55	61	67	70
# Acceptable factors	2	3	4	4	4
# Defining sorts	25	23	17	17	16

Table 5.1: Overview: Characteristics of factor solutions

1. Cumulative explained variance > 50% (Suprapto, 2016)
The first rule states that the cumulative explained variance should be larger than 50%. If this is the case, the factor-solution explains at least half of the Q-sorts. The two-factor solution has a cumulative explained variance of 47%, lower than the required 50%, and therefore this solution is excluded as a possible factor solution.

2. A factor has at least two significant Q-sorts (Suprapto, 2016; Brown, 1980).
To determine if a factor has at least two significant Q-sorts two sub-rules are applied. The first rule marks a loading as significant if the factor loading is larger than 0.418 (in the case of a significance interval of 0.01, calculated by $2.58\ (1/)$; N = 38 statements) and the second marks a loading as significant if the highest squared factor loading explains more than half of the common variance. To clarify: each Q-sort has a loading on a factor. For each Q-sort it is determined which loading is the highest and this number is squared (defined as f2). Thereafter, this number is compared with half of the common variance; given as the sum of the squared factor loadings divided by two (defined as h2/2). This results in the equation f2>h2/2. This means, e.g. that the squared loading of Q-sort one of factor one should be larger than half of the common variance. If no or only one Q-sort is significant, a factor is not acceptable and therefore not valid. After applying both rules, the five-factor and the six-factor solution are ruled out.

3. A high number of defining sorts (Van Exel & De Graaf, 2005)
It is argued by Van Exel & De Graaf (2005) that more defining Q-sorts are more appropriate than less. Table 5.1 shows that all Q-sorts are defining in the two-factor solution, but this solution was already excluded. The factor with the second most defining Q-sorts is the three-factor solution with 23 Q-sorts. After that, the four-factor solution and the five-factor solution follow with both seventeen defining Q-sorts. These factor solutions have six defining Q-sorts less than the three-factor solution, and since this is 24% of the total number of sorts, this is considered to be too much. To conclude, the three-factor solution is the best possible solution according to this rule and the four-factor solution is excluded.

The third step in factor analysis is factor rotation. Factor rotation aims to maximise the factor scores of the Q-sorts with a possibility to maximise the explained variance. In factor rotation, the results are rotated around a central axis (per two factors) and the position of observation is changed; this does not influence the results of factor extraction. The goal of rotation is to arrive at as much as possible defining Q-sorts per single factor (Webler et al., 2009). The non-defining Q-sorts often load high on multiple Q-sorts or do not load at all; they have not one dominant perspective in the factor solution.
In this analysis, Varimax rotation is applied to arrive at the mathematically most informative solution (Watts & Stenner, 2005; Van Duin et al., 2018). After that, manual rotation is applied as well to investigate if the solution can be optimised for participant 17 and 18 since these participants are not yet defining on one of the factors. For manual rotation, different pairs of factors are rotated and tested to find the best possible outcome. A rotation of -1 degree of factor one and three is chosen for the final factor-solution. As a result, participant 17 is included in the factor solution as a loading participant, but participant 18 is still not defining because he is a confounder and loads on both factor one and factor two.
Factor rotation resulted in 24 out of 25 defining participants with ten participants loading on factor one, seven participants on factor two and seven participants on factor three.

Three-factor solution

The factor scores of the defining participants of the three-factor solution are given in table 5.2. According to Van Exel & De Graaf (2005), a factor score is "*the normalised weighted average statement score (Z-score) of participants that define that factor*". With the help of Z-scores, an idealised Q-sort per factor can be composed representing a hypothetical participant that has a factor loading of 100% (Webler et al., 2009; Van Exel & De Graaf, 2005). The idealised Q-sorts are called factor arrays and include consensus, characterising and distinguishing statements and are given in appendix B.5. Additionally, a pre-analysis before interpretation of the factors is given in appendix B.4.5.

	Factor 1	Factor 2	Factor 3
1. Tender manager	0.5804X	0.2432	0.5042
3. Tender manager	0.6675X	0.1386	0.3410
4. Plan developer	0.6887X	-0.0620	0.2025
7. Project manager	0.5707X	0.5210	0.2152
11. Manager MEP	0.7527X	0.2543	0.2551
12. Manager MEP	0.5703X	0.3577	0.2924
14. Design leader	0.6922X	0.2230	-0.1547
16. Design leader	0.6229X	-0.0770	0.2873
19. S&L coordinator	0.6568X	0.4018	-0.0465
23. Calculator	0.5484X	0.2939	0.1808
9. Project manager	0.2816	0.5655X	0.2287
10. Project manager	0.0468	0.7789X	0.1201
13. Design leader	0.1977	0.6965X	-0.1654
15. Design leader	-0.1667	0.5970X	0.4418
18. Calculator	0.5389	0.5789	0.2433
20. S&L coordinator	0.5665	0.5958X	0.1805
21. Facade coordinator	0.2724	0.5637X	0.4065
24. Calculator	0.3079	0.5471X	0.3667
2. Tender manager	0.1753	0.1882	0.5481X
5. Plan developer	0.3545	-0.3420	0.6320X
6. Tender manager	-0.0827	0.1014	0.6519X
8. Plan developer	0.0950	0.0137	0.4809X
17. Design leader	0.3394	0.2669	0.4394X
22. Calculator	0.2788	0.3614	0.6650X
25. S&L coordinator	0.3048	0.3281	0.6194X
Explained Variance	22	18	15

indicates participants from *process management*
indicates participants from *design management*
indicates participants from *cost management*
X indicates a defining participant

Table 5.2: Rotated factor loadings of the three factor solution

5.2 Step 6: Identify perspectives

The data analysis of step five resulted in three factors that indicate which statements are essential and which are less essential for collaboration to achieve successful project delivery, according to the interviewed participants. To formulate perspectives, the factors are interpreted with help of the factor arrays depicted in appendix B.5. The distinguishing statements, characterising statements and consensus statements are used for interpretation. As a start, the statements placed on the extremes of the Q-sorts scheme are used for interpretation and are called the characterising statements. In doing so, the primary theme of the perspective is identified. Furthermore, the results of the post-sorting interviews are used in addition to indicate the reasoning behind a perspective. Finally, each perspective is given a name representing the main characteristics of the perspective.

The accuracy of the analysis and interpretation will be verified by participants that load high on a factor. They are asked to comment and feedback upon the interpretation of their perspective (Watts & Stenner, 2005; Webler et al., 2009). However, it should be taken into account that the participants asked for feedback do not all match exactly with a perspective since the interpretation is based on the factor arrays; the ideal Q-sort of a factor (Webler et al., 2009).

5.2.1 Perspective 1: Relationship first

The focus lies on the relationship between 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.

The first perspective is shared by ten participants and has an explained variance of 22%. They seem to agree that the bouwteam is a strategy to deliver the best possible design and price with open and honest interaction and a collaborative attitude; contractual aspects are less essential. Figure 5.1 shows the characterising and distinguishing statements from most essential to least essential.

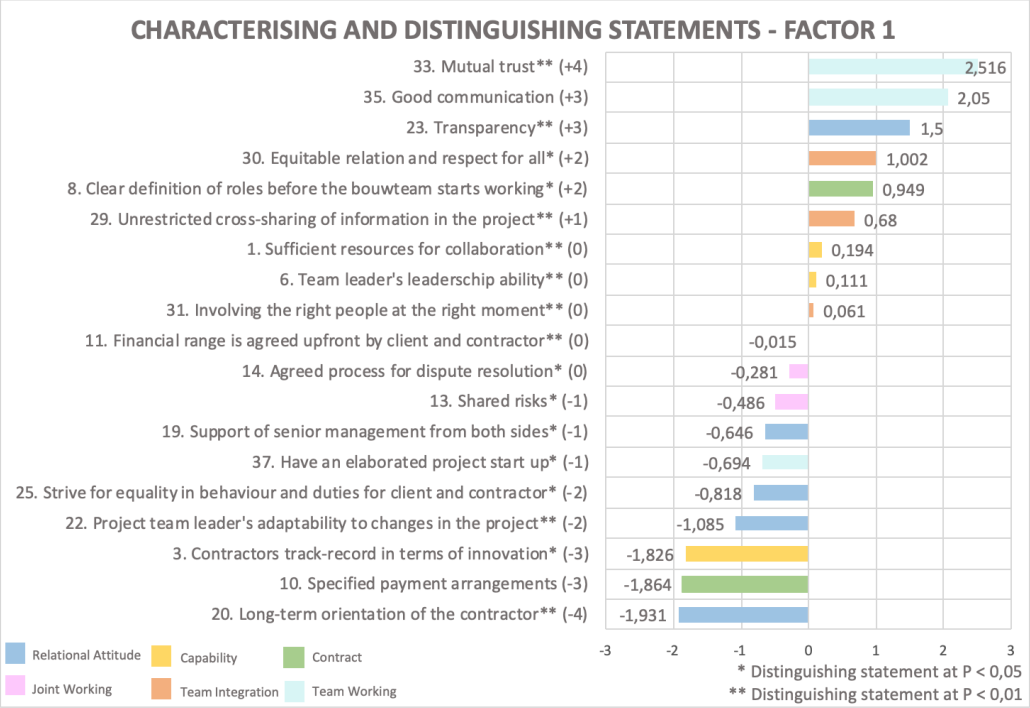

Figure 5.1: Characterising and distinguishing statements of factor 1

The participants of this perspective believe that *mutual trust* (33; 2.516) is the most essential statement to built collaboration in bouwteams. To achieve that, participants can be *transparent* (23; 2.050) towards each other which is possible if there is *good communication* (35; 1.500). They are focused on the here and now; the *long-term orientation of the contractor* (20; -1.931) is deemed less essential. Furthermore, an *innovative track-record* (3; -1.826) or *specified payment arrangements* (10; -1.864) are less essential for bouwteams as well. It stands out that there is a large spread between the positions of the less essential statements given by the individual participants while the Z-scores lie close to each other. This emphasises that all three least essential statements could be the most least essential.

During the interviews, the participants stressed the importance of *mutual trust* by "For collaboration in a bouwteam, you need trust as the first ingredient since there is a belief of distrust in the construction industry" (participant 4), "Traditionally, clients believe that contractors are frauds and contractors believe that the client has different objectives and more money than is revealed" (participant 12) and "Every relation starts with trust, also the relation between client and contractor in a bouwteam" (participant 19). Mutual trust is expressed as no double agenda, honesty, openness, enthusiasm, fulfilment of agreements and a good distribution of risks (participant 12, 16 and 19). There is hardly any spread between the place of the statement in the Q-sorts of the defining participants indicating that they highly agree on the position of mutual trust. However, it is argued by participant 11 that "Saying that you trust each other is not enough, you need to show in your behaviour that you are trustworthy". The statements *good communication* and *transparency* are needed to create mutual trust. This is reflected by "If you are transparent in

your motives, budget and figures, mutual trust can be built" (participant 3), "Good communication is communication in which feelings can be expressed" (participant 11) and "Transparent communication is good communication and results in trust" (participant 12). The connection between the essential statements and the open attitude of this perspective is reflected by the position of *unrestricted cross-sharing of information*, especially in comparison to perspective three where this statement is valued as least essential.
Long-term orientation of the contractor is less essential for the bouwteam because "Then you are not working as a good bouwteam, but as a separate organisation because the statement suggests that the focus lies on a possible future relationship with the client" (participant 14). For a *contractor's track-record in terms of innovation* it is argued that innovation is neither essential "Because you can still collaborate in a bouwteam without having an innovative track-record; it is less important" (participant 4) and "It is more important that people are open for innovation during the project" (participant 11). Furthermore, although contractual aspects are not completely irrelevant to this factor, the statements *contractual incentives (positive and negative)* (7; -1.88) and *specified payments arrangements* (10; -1.864) are valued as less essential for collaboration because these statements do not affect how bouwteam participants interact with each other.

According to the defining participants, bouwteam participants ideally have an *equitable relation and show respect for all* (30; 1.002), have a *clear definition of roles before the bouwteam starts working* (8; 0.949) and facilitate *unrestricted cross-sharing of information* (29; 0.680). This is important for establishing a positive attitude in which all participants have access to the information they need. In doing so, "Each participant should be aware of his role, corresponding to his expertise and the responsibilities belonging to it" (participant 14) because unclarity can change interactions and attitudes in the bouwteam. Later on, it is undesirable to have discussions about responsibilities while it can be determined upfront.
However, *equality in behaviour and duties* (25; -0.818), *an elaborated project start-up with bouwteam participants* (37; -0.694) and *support of senior management from both sides* (19; -0.646) are less essential for this perspective. They firmly believe that *project team leader's adaptability to changes* (22; -1.085) is not directly required in bouwteams. However, *team leader's leadership ability* (6; 0.111) can be focused on *involving the right people at the right moment* (31; 0.061) and on achieving the right scope (participant 1) which can be achieved with help of *sufficient resources for collaboration* (1; 0.194). It is remarked that statements from the category relational attitude are both essential and less essential. From these statements, it is observed that the connection between the different organisations is less relevant than the connection between participants in the bouwteam.
The joint working related statements *agreed process for dispute resolution* (14; -0.281) and *shared risks* (13; -0.486) are valued neutral by the defining participants. The statements can be taken into account, but the others from this category are more essential for collaboration in bouwteams (statement 16, 17 and 18). Furthermore, the statement *financial range is agreed upfront* (11; -0.015) is valued as neutral as well. It is important that "The client's and contractor's budgets converge to understand each other, if it does not the contractor should not start the bouwteam" (participant 1), indicating that the financial range is helpful during the bouwteam but should already be there to start client-contractor collaboration.

5.2.2 Perspective 2: Early involvement of right people

The second perspective is about involving the right competent people early in the project of which senior management and the project team leader can be part. 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. 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.

The second perspective is shared by seven participants and has an explained variance of 18%. Figure 5.2 shows the characterising and distinguishing statements of the second perspective. In this perspective, it is remarkable that there are only four distinguishing statements valued as more essential (Z-score > 1) from the total of eigh distinguishing statements, emphasising that the less essential statements are more distinguishing in relation to perspective one and three. In the second perspective, the defining participants seem to agree that a bouwteam that *involves the right people at the right moment* (31; 1.622) results in successful project delivery. Conditions for this are *understanding each other's objectives* (21; 1.593) and a *win-win attitude* (24; 1.461) but focus can be less on *specified payment arrangements* (10; -2.734) as a contractual statement.
During the interviews, the participants argued that *involving the right people at the right moment* is essential because "You want people together who understand each other and who have an affinity with the tasks in the

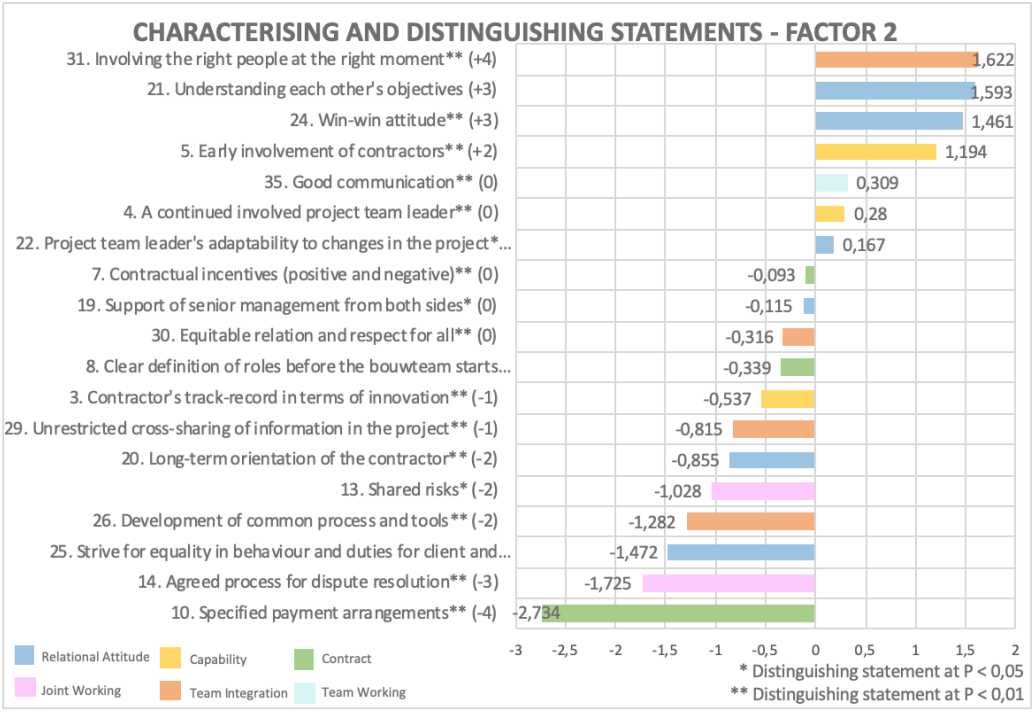

Figure 5.2: Characterising and distinguishing statements of factor 2

bouwteam; ideally, extreme opposites are not placed in the same bouwteam" (participant 13). The involved people should *Understand each other's objectives* because "If you understand what each other's objectives are in the project it can be respected" (participant 9), "You should know what to expect from each other and it should be indicated why you are participating in the process" (participant 20) and "If you do not understand the objectives or misinterpret them, you cannot understand someones attitude and interest in the project" (participant 21). This is closely correlated to a *win-win attitude* because by understanding each other there can be collaboration towards common goals. "If there is no understanding of each other, you do not have a win-win attitude and it becomes hard to create a positive attitude from both sides" (participant 21).
Another precondition for this perspective is the *early involvement of the contractor* (5; 1.194). According to the participants, "Early involvement is ideally during or right after preliminary design, but it is essential to be involved before the environmental permit is submitted to ensure that the contractor can influence the design" (participant 10 and 13). However, there is a large spread between the position of the most essential statements ranging from +4 till -1 (+4 till 0 for factor 31, +3 till 0 for factor 21, and +4 till -1 for factor 24). This emphasises that the position of the statements is insignificant, and all three statements could be most essential.

As in perspective one, the defining participants strongly believe and agree that *specified payment arrangements* are less essential because "In a bouwteam, there are often no problems with the payment arrangements because the price is most important" (participant 9), "Participants need to know what they will be paid, but how and when matters less" (participant 20) and "Specified payment arrangements should not limit the bouwteam because they should be arranged outside the bouwteam" (participant 21). All participants except one placed the statement at -4. Furthermore, it is remarkable that the participants from this perspective believe that *shared risks* (13; -1.028), *agreed process for dispute resolution* (14; -1.725), *development of common processes and tools* (26; -1.282) and *unrestricted cross-sharing of information in the project* (29; -0.815) are less essential for collaboration in bouwteams. These statements are from the categories joint working and team integration, indicating that the participants from this perspective value collaborative working less than the other two perspectives and are more focused on the individual organisations in the bouwteam. However, the place of statement 27 (*integrated project teams*) contradicts this. In combination with the earlier observation that the participants highly agree on the least essential statements, it is assumed that there is a less collaborative attitude.
It is striking that *striving for equality in behaviour and duties for client and contractor* (25; -1.472) is seen as less essential while *understanding each other's objectives* is emphasised as one of the most essential statements.

Participant 13 believes that "It is essential that the contractor is involved because of his alternative perspective and knowledge. In the bouwteam, you want to be informed by the client and therefore tasks should not be equal; there is a traditional client-contractor relationship. However, in terms of behaviour, it is desirable to have the same attitude".

The statements *contractor's track-record in terms of innovation* (3; -0.537), *contractual incentives* (7; -0.0932), *continued involved project team leader* (4; 0.280), *support of senior management from both sides* (19; -0.115) and *project team leader's adaptability to changes in the project* (22; 0.167) are all valued neutrally but are more essential than in the other two perspectives. This indicates that they believe that both the project team leader and senior management could fulfill an active role, substantiated by participant 9 by stating that "The bouwteam only works if senior management shows confidence". Furthermore, the statements indicate that innovations and contractual incentives can and should motivate bouwteam participants.
On the other hand, there are also statements that are placed lower than in the other two perspectives, these are *good communication* (35; 0.309), *equitable relation and respect for all* (30; -0.316) and *clear definition of roles before the bouwteam starts working* (8; -0.339). This contradicts both perspective one and three where it was argued that these statements are (most) essential for collaboration in a bouwteam. This shows again that this perspective has a less collaborative attitude compared to the other two and is more focused on the individual organisation and the content of the project.

5.2.3 Perspective 3: Structure first

The essence of this perspective is identifying and determining 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, as long as 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 of people is willing to share occurring risks to deliver the project successfully.

The last perspective is defined by seven participants and has an explained variance of 15%. The perspective is characterised by defining the rules of the game due to the importance of contractual aspects. They seem to agree that a bouwteam needs clarity in scope, roles and communication, and it is less essential to include senior management or to share all information present in the project. Figure 5.3 shows the characterising and distinguishing statements.

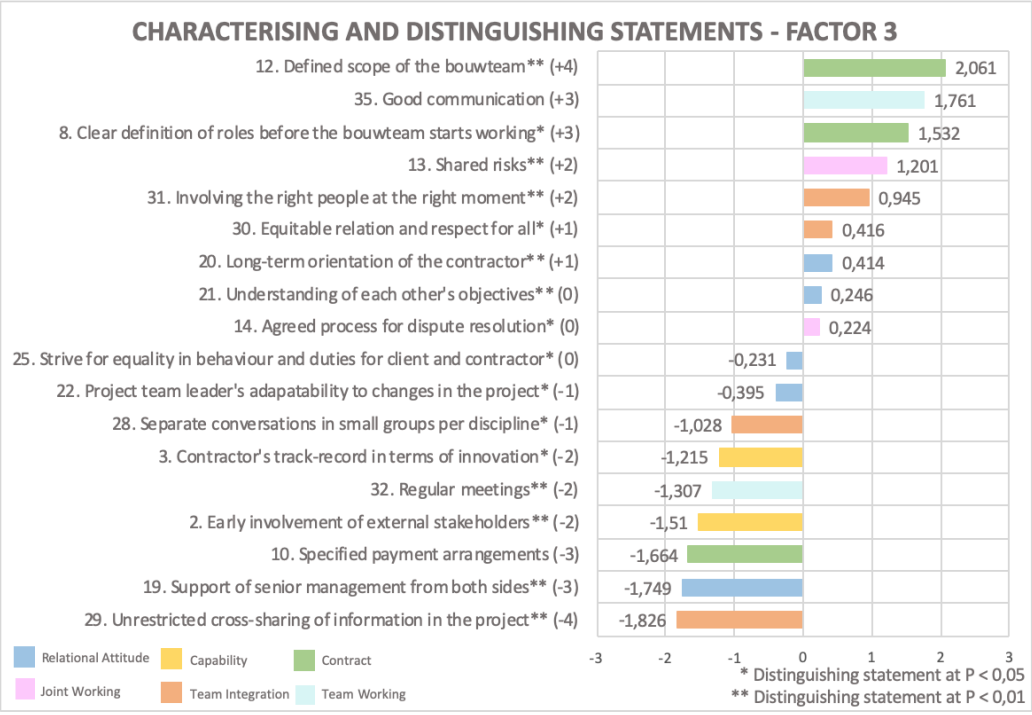

Figure 5.3: Characterising and distinguishing statements of factor 3

In the third perspective, the focus lies on the contractual statements *defined scope of the bouwteam* (12; 2.061) and *clear definition of roles before the bouwteam starts working* (8; 1.532). The defining participants from this perspective emphasize regulation of the bouwteam to collaborate towards successful project delivery. However, *good communication* (35; 1.761) is essential to facilitate the collaborative relationship but *unrestricted cross-sharing of information* (29; -1.826) should be limited because "If you exchange information unrestricted, you can be considered less respectful" (participant 5). The number of *regular meetings* (32; -1.307) should be limited because "Meetings take time and often have no outcome; they should be used efficient and only when necessary" (participant 22). By setting up efficient meetings instead of regular ones, good communication can be strengthened.
The underlying arguments of this core belief are "The scope is essential to make choices in the bouwteam, it should be clear what the focus is" (participant 25), "It is important to know what the starting point (point A) and the end-goal (point B) is" (p6) and "In many bouwteams, it is not clear what the end-goal of the bouwteam is, resulting in failure costs" (participant 22). Furthermore, the roles are essential because "If everyone knows his role, then you can work towards a common goal because you understand what should be done" (participant 25). There is little spread between the position of statement 8 between the defining participants, indicating that the statement is particularly convincing. After the scope and roles are defined, it is important to establish efficient communication because "Good communication ensures a smooth project" (participant 17) and "It is important to know how the others prefer to work and what is useful in their opinion in terms of efficient communication" (participant 2).

After defining the structure and 'rules' of the bouwteam, the participants believe that *involving the right people at the right moment* (31; 0.945) is important to have a proper bouwteam, as is establishing an *equitable relation and respect for all* (30; 0.416) for the collaborative relationship. These are both statements from the category team integration and they are valued as essential because "The right knowledge and expertise should be present in the bouwteam to deliver a successful project" (participant 8) and "It is important that everyone in the bouwteam respects each other even though no person is the same" (participant 22). On the other hand, *support of senior management from both sides* (19; -1.749) is valued as less essential since "Support of senior management is not necessary, because successful project delivery should also be possible without it" (participant 8). It is even argued that senior management from the client can slow the bouwteam process because they are too much focused on project finances. Besides *early involvement of external stakeholders* (2; -1.510) and *contractor's track-record in terms of innovation* (3; -1.215) are not necessary for the bouwteam, indicating that the participants of this perspectives want to stay within the familiar environment of the bouwteam (no innovations and no extra participants). Furthermore, *specified payment arrangements* (10) are "Always arranged in a contract, no matter what type of contract" (participant 2) and "It is a relatively small compensation compared to the budget of execution" (participant 25). The statements valued as less essential have a large spread in relation to the position received by the defining participants. This indicates that multiple factors could be valued as least essential.

Five out of six statements from the category relational attitude are valued as neutral, of which four of them are distinguishing. These are the statements *long-term orientation of the contractor* (20, 0.414), *understanding each other's objectives* (21; 0.246), *project team leader's adaptability to changes* (22; -0.395) and *strive for equality in behaviour and duties* (25; -0.231). This emphasises that the collaborative attitude is valued. But, unlike the other perspectives, the defining participants believe that *shared risks* (13; 1.201) and an *agreed process for dispute resolution* (14; 0.224) have a positive effect on collaboration in the bouwteam. They argue that "You try to mitigate and locate the risks but that is not always possible and therefore some risks should be shared instead of allocated to one party" (participant 17) and "It is all about completing a successful project but it is often seen that the project keeps on going too long because there is a conflict". Distinct to this perspective is the involvement of a project team leader and its organisational leadership abilities to create an integrated project team by *involving the right people*.

5.2.4 Similarities and differences between perspectives

As indicated by the factor correlations, the identified perspectives are opposing but show complementing parts as well. In appendix B.5.1, the consensus and differing statements as defined by PQmethod are given, indicating which statements are valued similarly between the three perspectives and which are controversial. These statements are derived from the Z-scores. However, the magnitude of the Z-scores differs substantially at the extremes (+4, -4) for each perspective. As a consequence, comparing these Z-scores for the statements results in an unfair comparison due to the difference in magnitude of Z-scores for each perspective. In order to make a fair comparison between the consensus and differing statements between the perspectives, the statements are evaluated based on their place in the factor array of each perspective. In doing so, only the statements which are placed at +4, +3, +2 and -4, -3 and are considered to be controversial or consensus are used for comparison. Figure 5.4 visualises the identified similarities and

differences between the perspectives.

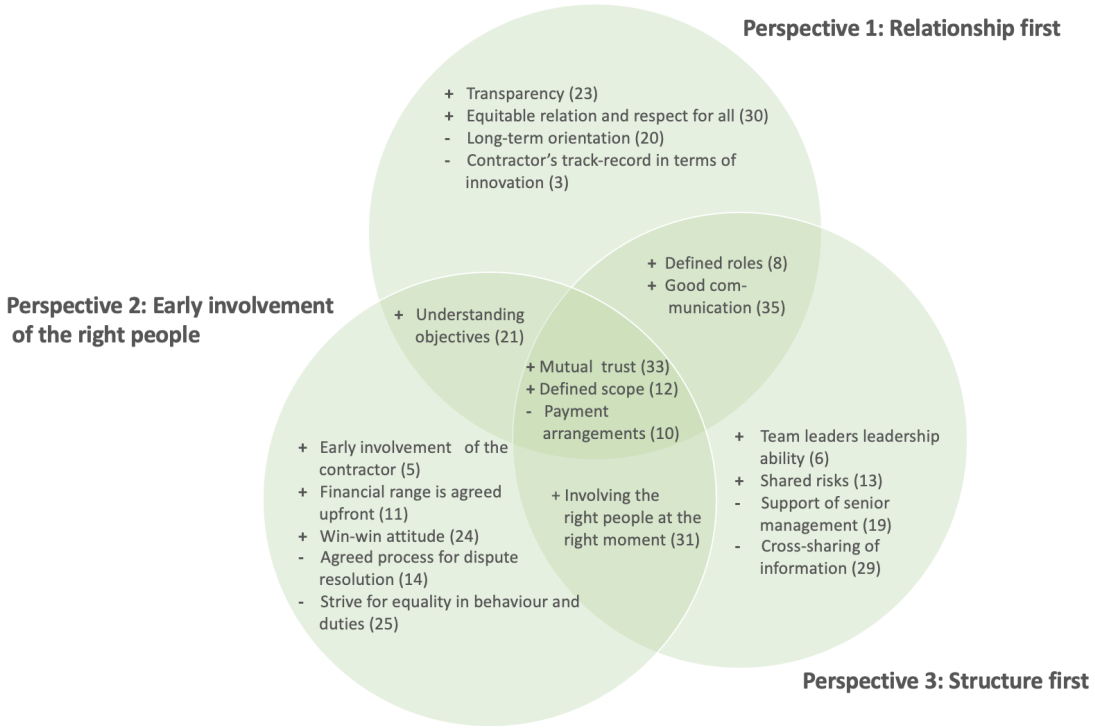

Figure 5.4: Similarities and differences between perspectives

To start with the consensus statements, the perspectives collectively believe that *mutual trust* (33) and a *defined scope for the bouwteam* (12) are essential for collaboration in bouwteams. This underlines the importance of a collaborative and proactive attitude while having a clear understanding of what the project is about. On the other hand, the perspectives collectively express that *payment arrangements* (10) are least essential for a bouwteam highlighting that the bouwteam participants have an intrinsic motivation to deliver work in a bouwteam and are not focused on payment.

The figure shows that the unique aspect of perspective one is an open and transparent attitude based on respect while the success factors of perspective two underlines the desire of early involvement with a focus on common goals to create a win-win situation. Furthermore, the unique part of perspective three is a more important role of the team leader to create structure and a desire to share risks. Perspectives one and two overlap in the believe that a client and contractor that understand each other are essential for good collaboration. But in the mean time perspective two shows a more reluctant attitude because of the focusses on the individual organisation and safeguarding his position, instead of showing the collaborative attitude of perspective one. When comparing perspective one and three, it is observed that the perspective are relatively similar except for the starting point. This indicates that they differ in opinion of what should be facilitated first to establish good collaboration. Where perspective three prioritises structure, efficiency, and leadership, perspective one believes in an open and transparent interaction, a collaborative attitude and team integration. Perspective two and three find each other in involving competent people but they differ in attitude. Perspective two is more focused on the organisation itself while perspective three is more focused on working together based on structure and the right tools.

5.3 Conclusion

In this chapter, Q-methodology is applied to identify perspectives regarding collaboration in bouwteams with the help of a selected set of participants. In doing so, a better understanding of differences between the perspectives of employees from Ballast Nedam is obtained. Based on this, the third sub-question can be answered by combining the information from the aforementioned sections:

3. What are perspectives of contractors on specified success factors for collaboration in bouwteams?

Perspectives are identified by sorting of the statements of the Q-set by 25 strategically selected participants from Ballast Nedam. The statements represent the success factors established as most essential for collaboration in bouwteams as the answer to sub-question two. From the set of 25 individual perspectives, three groups are identified that have a similar ranking, and these are used to define three different perspectives on success factors that are essential for collaboration in bouwteams.
The three identified perspectives are introduced:

1. *Relationship first*: The first perspective focuses on the relationship between 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 orientation is subordinate to the other factors because the bouwteam has to focus on their current tasks.
2. *Early involvement of the right people*: The second perspective is about involving the right competent people early in the project of which senior management and the project team leader can be part. The people involved need 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. 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.
3. *Structure first*: The third perspective focuses on identifying and determining the variables of the bouwteam. The scope and roles are ideally defined early to give structure to provide clarity for the bouwteam. Efficient communication can contribute to this, as long as only necessary information is shared. Once the project has been formulated, the focus can shift to the relationship between client and contractor. This group of people is willing to share occurring risks to deliver the project successfully.

Overall, the perspectives agreed that establishing *mutual trust* and *defining the scope* early in the process is essential to some extent for collaboration in bouwteams. Therefore, one must attempt to create an environment in which bouwteam participants can trust each other. At the same time, payment arrangements are valued as less essential since bouwteam participants should have an intrinsic motivation to deliver work in a bouwteam and must not be focused on payments.
Even though it is noticed that all perspectives contribute to collaboration, they do so differently. Whereas the first perspective first focuses on the relationship and afterwards on the structure of the bouwteam, the third perspective does it the other way around: first a focus on structure and afterwards on the relationship. However, both perspectives have a (different) collaborative attitude while perspective two is more reluctant due to a focus on the individual organization. Nonetheless, it is expected that one perspective can be more applicable than another in a given situation.

PART III

Strategies to influence client contractor collaboration

6 Designing strategies

Client and contractor are dependent upon each other in bouwteam projects. In this chapter, strategies are designed that can be used by contractors to enhance client-contractor collaboration to deliver bouwteam projects successfully. In section 6.1 the applied method is given followed by section 6.2 and 6.3 in which the designed strategies are explained. Finally, sub-question four is answered in section 6.4.

6.1 Method elaboration: Designing strategies

While collaboration between client and contractor is essential in bouwteam projects, it cannot be taken for granted. As the Marktvisie (2016) expressed the need for more collaboration in the construction industry, they did not indicate how this could be achieved. To strengthen the position of contractors, strategies are developed to give contractors a view on how to approach clients in bouwteams. The definition used by Harvard (2007) for a strategy is "a long-term plan of action designed to achieve a particular goal or set of goals or objectives". A strategy describes *how* a mission or goal can be accomplished (Harvard, 2007). In this research, strategies are designed to indicate how the contractor can use contractor's perspectives of client-contractor collaboration in bouwteams to achieve successful project delivery.

As the bouwteam approach is considered a collaborative effort in which the client and contractor are dependent upon each other, it is of importance for the contractor to understand the client and his organisation. If a contractor can recognize the type of client quickly, he can adjust his behaviour accordingly, which is beneficial for both client and contractor. Nonetheless, each bouwteam is unique due to the combination of, among others, the people involved, behavioural aspects, objectives, project size and the contractor involved. For this research, three client types have been identified, simplified from literature, that can be present in bouwteam projects in the private utility and building sector. For every client, a different approach is necessary because different aspects as, characteristics, functions, roles, interests and objectives differ, affect the attitude of the contractor.
A client is not necessarily both owner and end-user, and therefore this is used as the first defining characteristic (de Blois et al., 2011). Secondly, the main driver of developing a project can be either as a primary source of income or for self-use (de Blois et al., 2011; Nahapiet & Nahapiet, 1985). Additionally, the expected level of experience and knowledge is taken into account; a difference is made between clients with expertise and without, where no expertise refers to "no recent and relevant experience of construction, with no established access to construction expertise", in this research referred to as technical expertise (Masterman & Gameson, 1994; de Blois et al., 2011). Table 6.1 shows the three identified client clients and in section 6.2 they are elaborated.

	The involved client	The project developer	The representative of the client
Owner:	Yes	Yes	No
End-user:	Yes	No	No
Goal:	Developing a suitable building	Profitable business case	Maintaining agreed assignment
Driver:	Self-use	Primary source of income	Primary source of income
Experience:	Partly experienced and informed	Partly experienced and informed	Experienced and informed
Technical expertise:	No technical expertise	No technical expertise	Technical expertise
Bouwteam leader:	Delegation of the own organisation	Leader himself	Leader himself

Table 6.1: Overview of the characteristics per client type

The above descriptions represent generalized client types as can be present in bouwteam projects in the utility and building sector. However, there may be clients that do not fit the above descriptions exactly. In this research, other, more specific client types were not evaluated due to the desire of creating a broad strategic framework to be used by contractors. It is up to the contractor to classify the type the client belongs to and to implement the principles accordingly.
A strategy is designed for each identified client type resulting in a strategic framework. The purpose of the strategic framework is to give an indication of how different contractor's perspectives and their implementation can be used during the process of a bouwteam. The aim is to provide contractors with a view on possibilities for client-contractor collaboration. First, with the client types as a starting point, a method is established on how to design strategies, consisting of two steps.

Step 1: Linking contractor's perspectives to client types

The first step of designing is to determine which contractor's perspectives could be highlighted to fit the client's characteristics. In doing so, it is assumed that the client is unknown; the contractor has never worked with him before. For each perspective, it is argued whether it is a fit, a potential fit or no fit based on the characteristics of a perspective. The perspectives represent viewpoints of people regarding their opinion on success factors for collaboration in bouwteams and have been identified for client-contractor collaboration in bouwteams in general:

1. *Relationship first* focuses on the relationship between client and contractor and values open and honest interaction to create teamwork, with a focus on the current tasks of the bouwteams;
2. *Early involvement of the right people* is about involving the right competent people early and sharing only necessary information, while creating common goals to create a win-win attitude;
3. *Structure first* focuses on identifying and determining variables early to provide structure and clarity and efficient communication can contribute to this.

Since each bouwteam project is unique, it is advised to consider carefully which people to include. By being aware of someone's perspective, this information can be used as a reference to influence client-contractor collaboration.

Step 2: Implementation of success factors of the contractor's perspectives

The second step is to determine how the characterising or distinguishing success factors from the contractor's perspectives can be implemented to achieve successful project delivery. During the interviews with employees from Ballast Nedam, participants were asked how they would implement a success factor. This information is used as a guideline to determine implementation of the success factors of the designed strategies. In doing so, only the success factors considered as most essential, as displayed in figure 5.4, are used. In the description of the strategies, it is indicated which participants proposed the implementation by referring to the participant numbers of table B.3. The success factors used for designing strategies are visualised in figure 6.1, in the designed strategies the success factors that do not correspond to the description of the client type are left out.

Figure 6.1: Legend of the success factors part of the designed strategies

6.2 Linking contractor's perspectives to client types

Table 6.2 shows which contractor's perspectives are preferred per client type. A distinction is made between a fit, a potential fit or no fit. In the following sections, the matches are explained per client type.

	The involved client	The project developer	The representative of the client
Relationship first	Fit	No fit	Potential fit
Early involvement of the right people	No fit	Potential fit	No fit
Structure first	Potential fit	Fit	Fit

Table 6.2: Overview of step 1: Linking contractor's perspectives to client types

The involved client

The involved client is both owner and end-user of the project, and the project is not his primary source of income; the identified driver is self-use. The goal is to develop a suitable building that fulfils the desires of the client. It is expected that either a specialized delegation of the organisation or an independent representative of the client is leader of the bouwteam. Since the latter is a separate client type, the leader of the bouwteam is a specialized delegation of the organisation of the client. Technical expertise related to the project is not part of the client's expertise resulting in a partly experienced client (Boyd & Chinyio, 2008). Because the client will use the building himself, he will be committed and highly involved during the bouwteam process. An example of the involved client is a university or company that develops a new building; they are the owner, and after project delivery also end-user. An involved client can be influenced in their choice of method, and often communication problems arise (Masterman & Gameson, 1994).

To collaborate, the involved client wants to be involved during the bouwteam process, and therefore the contractor can take a supportive role and guide the client through it. The first perspective is considered a fit. It is preferred over perspective two and three because the focus lies on enhancing a collaborative relationship to develop a suitable building. Respect and transparency, two core values of the first perspective, are valuable to inform the client and to give him the opportunity to be involved in decision-making. This is in the interest of the contractor because a contractor of the first perspective believes that open and honest interaction is essential for good collaboration. Furthermore, they value the connection between the bouwteam participants and exchanging all information, resulting in teamwork to develop the design and look for optimizations and solutions. In doing so, the contractor can make the client understand design choices made and the price offered, including the reasoning behind it. It is desirable for the contractor to retain a vital client-contractor relationship during each stage of a bouwteam project and the positive attitude of this perspective can contribute to that.
For the contractor, it is preferred to have a relationship-oriented team because of the level of commitment and involvement of the client, since he is both owner and end-user. Perspective two does not represent this attitude because the main focus is on being involved as early as possible and involving competent people while the contractor is awaiting at the same time. Even though this is important for each bouwteam project, the attitude is considered less essential for the involved client. The perspective believes that collaboration and integration are less essential while the client needs guidance during the process. Together with a strong focus on the individual organisation, it contradicts the need of the involved client. Especially for development and optimisations of the design, close team working with the client is beneficial for the contractor to fulfil the client's desires.
Perspective three focuses on establishing (contractual) rules and boundaries to create structure. While this is still necessary, this is not the first focus of the contractor in the case of an involved client. It is expected that the contractor wants to develop a close relationship with the client first, based on getting to know each other personally and professionally. Thereafter, the contractor can shift his focus to the structure of the bouwteam to safeguard his interests and role since the process is not straightforward and familiar for the involved client. Especially since the client is less experienced and can be influenced, it is desirable for the contractor to make clear agreements to maintain efficiency, prevent unclarity later and to ensure everybody performs the tasks related to their experience and expertise. Therefore, the third perspective is a potential fit.

The project developer

Next, the second client is the owner of the project that develops a project as an investment, but not the end-user after project delivery. The main driver of the developer is to make a profit because the reason to deliver a project is a primary source of income which can either be through, e.g. sales, lease or investment. Therefore, the goal is to develop a profitable business case. Often, the developer has experience due to recent and relevant expertise, but there is no technical expertise resulting in a partially informed client (Boyd & Chinyio, 2008). The project developer is the leader of the bouwteam and understands the construction industry.

Perspective one is no fit for the project developer because the client is experienced with the construction industry. If the bouwteam approach is applied to deliver a project, the project developer considered this decision carefully. Therefore, it is expected that the client has no time or desire for extensive team-building activities or getting to know each other personally. The main focus of the client lies on developing a profitable business case and it is in the interest of the contractor to have a clear and organised bouwteam. However, the first perspective is more focused on the connection between client and contractor. Even though a good relationship is demanded for collaboration, it is desirable for the contractor to focus on the structure first in order to prevent confusion or expectations that might result in discussions or 'fights'.
Perspective two could be a potential fit because of the alternative perspective the client is looking for. The focus on the individual organisation and the content of the project safeguards the position of the contractor. By involving competent people early, the contractor can show the client that his contribution is valuable from the start. Since the client has experience with developing projects, he is aware of his objectives which is in the interest of the contractor. Together, the client and contractor can create a win-win situation by defining common goals. This safeguards the position of the contractor and ensures that both parties have the same expectations from each other. For the contractor, it is desirable to be involved early to influence and steer the project in the desired direction. In doing so, the focus lies on the individual organisation and less on common processes.
Perspective three is preferred over perspective one and two because it is in the interest of the contractor to have a clear and complete bouwteam structure before the bouwteam starts working. People from the third perspective experienced that clients can have expectations that should be addressed early because assumptions and expectations are dangerous when not aligned. The project developer is acquainted with the scope of the project and is looking for a profitable business case. Therefore, it is desirable for the contractor to create structure and clarity and to safeguard his role in the project, which can be done with the help of the third perspective. Preferably, this is done early in the project to ensure that people are aware of their role to understand what should be done from their experience and expertise. Furthermore, it is expected that the project developer is less involved during the bouwteam process, in relation to the involved client, and therefore it is beneficial that the third perspective values efficient communication. The contractor only shares the necessary information, and the client only receives relevant information.

The representative of the client

The third and last client type is a representative of the owner of the project and is, therefore, neither the owner nor end-user. The project is their primary source of income by managing the project for the client, resulting in direct profit. The goal of a representative is to keep the assignment and deliver work as agreed upon, according to the client's objectives. During the bouwteam, the objective of the representative is completion and optimization of the project. Since they are experienced with construction projects and possess financial or legal and technical expertise, they are well informed (specialized) clients (Boyd & Chinyio, 2008). The representative of the client knows his contribution to the project how to prioritize his objectives (Masterman & Gameson, 1994) and is the leader of the bouwteam. It is expected that he can act as a partner to the contractor because their interests are partly aligned, but in the meantime, the representative reports to the original client which goal may not directly be aligned.

Perspective one is a potential fit for the representative of the client because the relationship-oriented focus contributes to the possibility to collaborate as partners and to establish a good relationship. A connection between the bouwteam participants can be established with the help of this perspective with values as transparency, honesty and team integration. For the contractor, it is desirable to cross-share all his information to ensure that client and contractor can combine their knowledge to optimize the design and achieve the maximum outcome together. While the relation between client and contractor is vital for good collaboration, it is not considered the main focus of the contractor. It is recommended first to define the bouwteam structure to create clarity and remove assumptions, and after that, the focus can shift to the relationship.
Perspective two is no fit because both client and contractor intend to become partners on good terms. To achieve this, a collaborative attitude of the contractor is necessary which is less represented by perspective two in relation to perspectives one and three. The client is familiar with a traditional (adversarial) contractor's attitude and therefore, including perspective two could jeopardize client-contractor collaboration due to the intention to collaborate as partners. Furthermore, it is desirable that the contractor acts proactively to optimize the design together and combine the knowledge. Since perspective two has an awaiting and less collaborative attitude, it is considered no fit.
The third perspective is preferred over the other two and is considered a fit because the client is highly experienced and aware of his deliverables which can be used to develop collaboration. Both parties have similar interests, completion and optimization of the project, and therefore objectives can be defined early. It is in the interest of the contractor to have clear points of contact, and due to the client's experience and awareness of his contribution, this

could be defined. Defining the roles and the scope of the bouwteam early and clearly creates a possibility for the contractor to prevent unclarity and abuse of vagueness. In doing so, the contractor can deal with expectations from the representative of the client. But even though the aim is to collaborate as partners, the contractor must not forget that the representative reports to the client. Therefore, it is desirable to define as much variables upfront.

6.3 Implementation of success factors

The matches made between the contractor's perspectives and client types are the first step in designing the strategic framework. For the second step, implementation of the success factors considered as most essential per perspective, as displayed in figure 5.4, is defined. In doing so, it came forward that the success factors *mutual trust* (33) and *defined scope of the bouwteam* (12) are considered essential for all three perspectives. Therefore, these two success factors are always taken into account, independent of the client type. Figure 6.2 displays the implementation of success factor 12 and 33.

Figure 6.2: Implementation of success factor 12 and 33

For *mutual trust*, it is recommended that the contractor expresses enthusiasm and to let all bouwteam participants explain their expectations to align assumptions (participant 7). Furthermore, responsibilities can be assigned to bouwteam participants that they should live up to, and a team-building activity can help people to get to know each other (participant 4 and 11). However, in the end, it starts by showing trust to receive trust from another party. In doing so, the contractor can make issues debatable (participant 4, 11, 12 and 23), and show a willingness to collaborate by explaining his decisions made to give the client the possibility to understand the process.
The success factor *defined scope of the bouwteam* is important to take the client's and contractor's interest into account and to support choices to be made in the bouwteam. A defined scope is a clear road map including SMART defined starting points, milestones, end-goal and financial agreements to avoid a multi-interpretable scope (participant 1, 6 and 25). When during the process, it is noticed that the bouwteam is not acting according to the bouwteam, a change of course might be necessary (participant 20). It can be a solution to implement weekly, or biweekly meetings focused on discussing the costs and cost-consequences. As a result, the consequences can be tracked , and the client is familiar with the costs early on (participant 6).

The involved client

Figure 6.3 displays the designed strategy for the involved client, including perspective one and three.

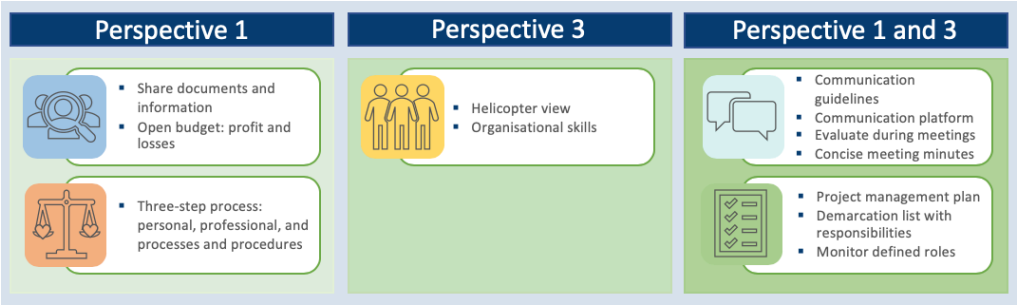

Figure 6.3: Strategy for the involved client

From perspective one, *transparency* (23) is one of the most essential success factors. The contractor can be supportive towards the involved client by being transparent in what and why something is done to get his understanding of the process. It is recommended that the contractor shares and substantiates all his documents and information to be an example for the other bouwteam participants (participant 4, 12 and 23). Additionally, being transparent in potential

profits and losses and showing an open budget to the client can contribute to the relationship to let the involved client understand the price offered and the reasoning behind it (participant 4 and 12). Secondly, the success factor *equitable relation and respect for all* (30) is considered essential as well and can be implemented through a three-step process. According to participant one, it is valuable first to get to know each other personally to develop respect, secondly to get to know each other professionally to trust the other party is competent and lastly, to define processes and procedures based on an equitable relationship.
The third perspective has two success factors that are considered unique and most essential. The success factor *team leader's leadership ability* (6) can help the contractor to support and guide the involved client carefully with the help of his organisational skills and a 'helicopter view' (participant 8). This is valuable because the involved client can easily be influenced. Furthermore, the success factor *shared risks* (13) could be implemented as well, but it is assumed that this is unrealistic for the involved client. It is expected that the involved client tries to move most of the risks to the contractor because he is less experienced. As a consequence, sharing of risks is less probable despite the intentions of the contractor.
Finally, two success factors are shared by perspective one and three. The first one is *clear defined roles before the bouwteam starts working* (8). It is recommended to make a demarcation list, including responsibilities to determine which tasks are carried out by which bouwteam participants (participant 2 and 25). Additionally, it is advised to develop a project management plan in which the roles are written down as explicitly as possible to avoid differing interpretations (participant 2 and 9). During the bouwteam, ideally, the defined roles are frequently monitored (participant 1 and 2). The second success factor is *good communication* (35) and is defined as understanding each other while exchanging information, even though participants have different expertise. The contractor might opt for applying the Thomas test (DISC) test to determine people's personality, and with that information, a set of customized communication guidelines can be developed and implemented (participant 4, 9, 11 and 12). Ideally, the set of guidelines is concise and includes what people expect from each other and which forms of communication are used. It is recommended to use one communication platform to ensure that all bouwteam participants possess the same information and have direct access to new information (participant 4 and 7). Maintaining the guidelines by regularly evaluating them as a recurring item on the bouwteam agenda might help to retain good communication (participant 8 and 11), and it is advised to make clear and concise meeting minutes that include decision-making (participant 8 and 17).

The project developer

Figure 6.4 displays the designed strategy for the project developer, including perspective two and three.

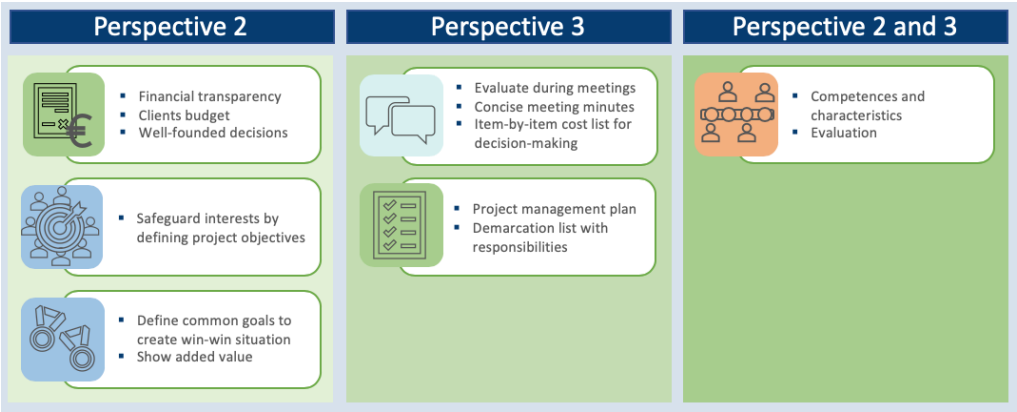

Figure 6.4: Strategy for the project developer

For the project developer, the second perspective is a potential fit, and three success factors can be implemented: 11, 21 and 24. Involvement of the contractor is ideally during of right after preliminary design, but at least before permits are submitted (participant 10 and 13). This is the starting point for the project developer. For the first success factor, *financial range is agreed upfront* (11), it is recommended to be financially transparent to be able to avoid budget-related discussions during the bouwteam partially. It is advised to uncover the clients budget by talking to each other or by making calculations, to ensure that the starting point for the bouwteam is realistic (participant 10). This is beneficial during the process to make well-founded design choices that are within the budget and are feasible (participant 10 and 21). The second success factor from the second perspective is *understanding each other's objectives* (21) and is valuable for the contractor because the client is familiar with the construction industry. To

ensure that both client and contractor act on the same level, it is advised to translate individual objectives into shared project objectives while focusing on the defined scope and roles (participant 20 and 21). In doing so, the contractor can deal with expectations from the client. Finally, the last success factor is *win-win attitude* (24), and it is argued that understanding each other can lead to a win-win situation (participant 20 and 21). The contractor can show his contribution to the bouwteam by showing his added value to the process (participant 10).
For the third perspective, success factor 8 and 35 can be implemented. These are similar as described in section 6.3 but there are some additions suitable for the project developer. For *good communication* it is recommended to communicate an item-by-item cost list to clarify decisions and assumptions made and reflect upon them (participant 6).
Finally, both perspective two and three consider *involving the right people at the right moment* (31) as essential. The right people can be appointed based on their characteristics and competencies (participant 8, 13, 15 and 24). If not available, the contractor can try to make them available if they are essential for the bouwteam (participant 8). Specialised people or senior management can be involved if required or desired, and if so, it is desirable that they show confidence. During the bouwteam process, it is recommended to regularly evaluate whether the right people are still involved (participant 8).

The representative of the client

Figure 6.5 displays the designed strategy for the representative of the client, including perspective one and three.

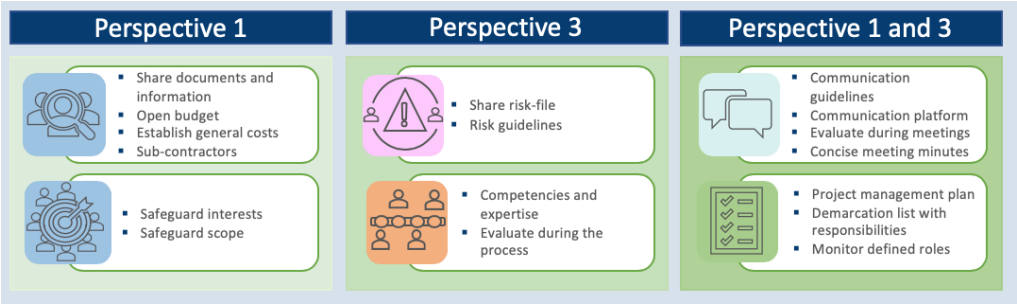

Figure 6.5: Strategy for the representative of the client

For the first perspective, the success factor *transparency* (23) is implemented, similar as for the involved client. However, for the representative of the client, the focus lies especially on financial transparency. Financial related documents are valuable and often withhold by participants (participant 4 and 14) and by being transparent, cost-related problems might be avoided. In doing so, general costs, profit, and risks can be determined upfront (participant 11 and 12). As a result, the representative possesses information about what to expect during final price negotiations, and the contractor certainty about the project costs. Additionally, it might be valuable to include sub-contractors because they have specific expertise useful to improve the project and increase feasibility (participant 11 and 23). Since the representative is an experienced client, it is assumed that he sees the added value of involving sub-contractors.
The second success factor, *understanding each other's objectives* (21), can help the contractor by safeguarding the interest of both client and contractor. During the bouwteam, the defined scope can be monitored (participant 24). Understanding each other can be done by honestly expressing what is in the interest of either client or contractor and by asking other bouwteam participants about is. Depending on the answer, a shared objective or approach can be formulated (participant 3 and 14).
For the third perspective, it is advised to pay attention to *shared risks* (13) since all risks must be discussed during the bouwteam. The contractor can start by sharing his existing risk-file, and it could be helpful to determine some guidelines on how to deal with risks to prevent discussions (participant 2 and 17). It does not matter when risks are discussed in the bouwteam, as long as they are discussed once before entering price negotiations. This success factor is considered valuable for the representative of the client because the contractor has the intention to act as a partner, and it is expected that the client is willing to share risks as well. For *involving the right people at the right moment* (31), the right people can be appointed based on their competencies and expertise (participant 8). The contractor can determine internally which people are needed and if they are available at the moment. If not available, the contractor can try to make them available if they are essential for the bouwteam (participant 8). In doing so, it is assumed that it is not necessary to focus on the team leader's leadership ability since the client has experience with managing projects. During the process, it is advised to evaluate whether the right people are still involved (participant 8).
Both perspective one and three consider factor 8 and 35 as essential. The implementation of the factors is similar as for

the involved client with some additions. For *good communication* it is advised to implement an elaborate bouwteam kick-off involving all bouwteam participants to get to know the people behind the organisation since many experienced people are involved. Ideally, the communication structure is defined before the kick-off meeting to ensure that the main features can be communicated during the meeting (participant 2). Whether the communication structure becomes part of the contract is up to the client and contractor involved in the bouwteam.

6.4 Conclusion

In this chapter, strategies are developed that could be applied to influence client-contractor collaboration in bouwteams. With this information, the fourth sub-question can be answered:

4. What strategies can be applied by contractors to influence client-contractor collaboration within bouwteams?

Since client and contractor are dependent upon each other in bouwteams, three client types are extracted from the literature, that can be present in the utility and building sector. For each client, the involved client, the project developer, and the representative of the client, a strategy is designed that shows possibilities to influence client-contractor collaboration based on the identified contractor's perspectives. During designing, a generic strategy is made for each generalized client type. Figure 6.6 gives an overview of the strategies that could be applied per client type. By visualizing the strategic framework, the differences between the approaches become visible.

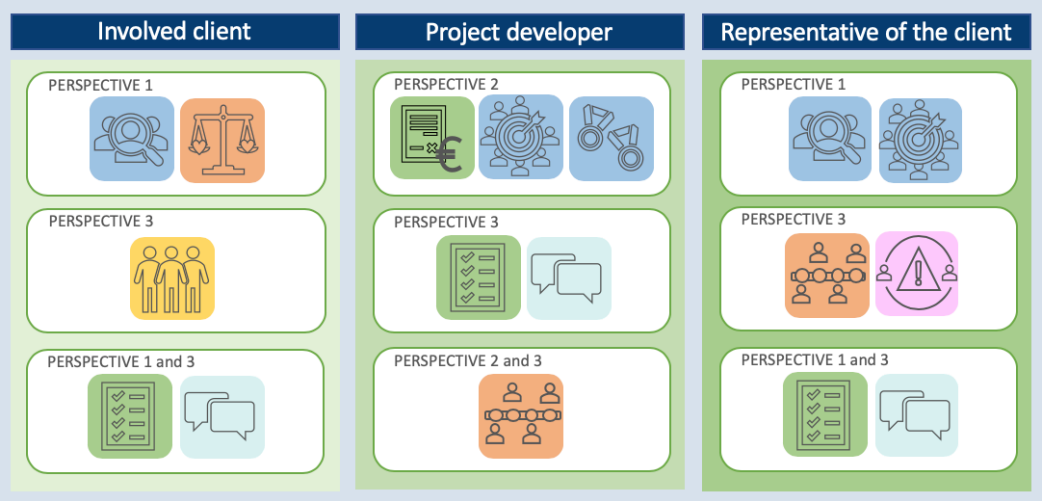

Figure 6.6: Strategic framework for influencing client-contractor collaboration in bouwteams

To conclude, the strategic framework indicates that there is always one perspective considered as the best fit, but a second one is advantageous to complement and connect to the first one. After all, the contractor's perspectives have consensus on some success factors. Involving people from perspective three is valuable for every client type to safeguard the position of the contractor due to the structure- and contract-oriented focus. Depending on the expected attitude of the client and based on his characteristics, either perspective one or perspective two can be a fit as well. In the case of a relationship-focused, committed and involved client, perspective one is a fit, and in the case of an expertise- and result-focused client, perspective two is a fit.
The implementation of the success factors as given in the strategies is found to be the most appropriate combination for client-contractor collaboration from a contractor's perspective. It stands out that from the success factors involved, four out of the twelve different ones are from the category relational attitude and only occur in perspective one and two. From this, it can be concluded that perspective one and two can safeguard the relational attitude of the contractor towards the client, while perspective three seems to be more focused on other collaborative aspects.

A note should be made that the designed strategies are not the ultimate truth since, in each bouwteam project, the combination of client and contractor is unique. However, the strategies can be used as a reference framework for Ballast Nedam to define a bouwteam approach while focusing on people's attitude involved. After all, there is no one way to influence client-contractor collaboration in a bouwteam since the strategy to apply also depends on the personal connection the contractor has with the client.

7 Expert consultation

The Q-analysis gave insight into contractor's perspectives on collaboration in bouwteams and based on that, client-specific strategies are designed. In this chapter, expert consultations are performed intending to let experts give their opinion of the results. The set-up is given in section 7.1, the findings in section 7.2 and these are used to answer the fifth sub-question in section 7.3

7.1 Set-up of the expert consultation

In this research, three members from senior management of Ballast Nedam who have experience with collaboration in bouwteams were consulted. In doing so, individual consultations were conducted due to the limited availability of the experts. Since employees from Ballast Nedam share the contractor's perspectives, senior management is used to discuss whether the results of this research can be related to practice. The experts are involved during the start-up of a bouwteam by getting to know the client and negotiating bouwteam contracts. Thereafter, they are involved in managing the bouwteam process and are in close contact with the client during price negotiations. Based on the expert's knowledge and experience the findings are discussed in three parts: the identified contractor's perspectives, client types and the designed strategies (see appendix D for the interview format). Based on this it will be determined whether the strategies can assist the contractor in bouwteams.

7.2 Findings of the expert consultation

Before the expert consultations, a presentation including the highlights of this report was created and handed to the experts in preparation. During the consultations, the experts were asked to reflect upon the findings and to comment on the logic of the framework.

7.2.1 Part 1: Shared perspectives

All three experts recognised the first perspective, relationship first, within bouwteam projects in Ballast Nedam. It is argued that this perspective is the intrinsic motivation to collaborate. People are working together to develop a feasible project, but the bouwteam participants must be willing to collaborate and believe in it (expert one and two). Expert one argues that enthusiasm and the eagerness to work together is reflected by this perspective and is valuable for bouwteams. Nonetheless, expert two and three states that this perspective does not cover all benefits a contractor can obtain from collaboration in a bouwteam.

All three experts recognised the second perspective, early involvement of the right people, within Ballast Nedam due to the focus on common goals to create a win-win attitude. It is argued that people from this perspective are focused on the content of a project and use competent people to achieve this (expert one and two). However, it is questioned by expert two and three whether this perspective is suitable for collaboration in bouwteam projects because of the desire to be involved as early as possible combined with the reluctant attitude of sharing limited information. Being involved too early can be undesirable because the business case of the client is still in progress and decisions need to be made. Nonetheless, expert three values the desire to include competent people to show the client the contractor has the right capabilities.

All three experts recognised the third perspective as well and believe that the perspective matches Ballast Nedam. It has been said that it is possible to deliver a project successfully by focusing on assigning roles and responsibilities early on in the bouwteam (expert one and two). For Ballast Nedam, it is important to talk about design responsibility early on in the project (expert one) and to define the goals of the bouwteam clearly including the costs, duration and

quality of the product to be delivered (expert three). Nevertheless, even though expert three argues that structure is important, it is not always possible to define (expert three).

7.2.2 Part 2: Client types

The three defined client types are recognised within bouwteam projects of Ballast Nedam by all three experts. No additional client characteristics were identified, nor were there any unfitting characteristics.

7.2.3 Part 3: Designed strategies

In general, expert one argues that monitoring the defined scope is valuable for a contractor because the contract is discussed at the start-up and during price negotiations. This is important for all client types and matches the result of the contractor's perspectives.

During the meetings, the experts were asked whether any obstacles could be identified for implementation of a strategy and if anything should be facilitated by senior management. Expert one argued that the biggest obstacles for the implementation of a strategy cannot be controlled by Ballast Nedam and are market conditions and the people involved from the client's side. Furthermore, expert two indicated that company policy and rules could limit a contractor to develop a strategy as desired. It is noted that no strategy-specific obstacles were identified and none of the experts mentioned anything to be facilitated by senior management. They believe that the strategies as designed can be implemented in the current organisation of Ballast Nedam since the organisation is already organised in such a way. Especially senior management is set to establish a good relationship with the client while focusing on contractual aspects and structure simultaneously. Expert two substantiates this by indicating that senior management makes decisions and develops a strategy to be followed since leadership is important for the team. After that, the strategy can be passed on to the project team and be maintained. When the focus lies on optimising the design, the focus shifts to managing what has been agreed upon and keeping the risks low. Managing is an ongoing process and therefore, nothing special needs to be facilitated (expert one).

Strategy for the involved client

The starting point for the strategy for the involved client is a focus on the relationship between client and contractor. The contractor can guide the client through the process and show his enthusiasm for working together. All three experts acknowledge this contractor's attitude.

For the involved client, the first perspective is indicated as a fit. Expert one believes that this perspective is leading because it is about defining collaboration and assessing how to collaborate; if the contractor is not open and transparent, the client will see through it. For expert one, being transparent is important in combination with good communication and mutual trust. Expert two substantiates this by stating that "perspective one should be there for sure to establish a good relationship based on collaboration".

Both perspective one and three can be highlighted to ensure the smooth progress of the bouwteam and to maintain collaboration during the process (expert one). This substantiates that both perspectives are indicated as a (potential) fit. Ideally, the structure is defined at the start and is monitored when the participants focus on designing. Expert three agrees but is more focused on communication, as shared by the perspectives since it is important that communication is clear, and it is understood what needs to be done. Furthermore, they agree that this is a good approach compared to the other client types since especially processes and agreements made with the involved client can be safeguarded by perspective three. Additionally, expert two argues that the distribution of design responsibility should be discussed early, and this can be ensured by perspective one and three.

To conclude, all three experts value the involvement of perspective one. By sustaining and emphasising the relationship, the bouwteam can be successful. Furthermore, they believe that perspective three is important as well to safeguard the interest of the contractor. Nonetheless, expert one and three argue that perspective two can be included as well to show the client that competent people are involved from the start of the project. However, including all three perspectives contradicts the goal of designing strategies since the essence of designing was only to include those perspectives that are believed to be most important for a client type instead of all perspectives.

Strategy for the project developer

The second client is more focused on investments and developing a profitable business case. Expert two acknowledges this since the client is committed to the bouwteam, but in a different way. He is more experienced and is, therefore, the leader of the bouwteam. Both expert one and two belief that there are no obstacles for implementing the strategy. However, expert two stressed that cost-related meetings should focus on designing and decision-making to ensure that the client is aware early of decisions to be made.

For this client, it is argued that it is important to create structure and to define the process. Perspective three can be used for this as substantiated by expert one and two. It is argued by expert two that too much focus on the relationship, with perspective one, is not helpful.
Furthermore, all experts agree that perspective two is a potential fit since it is in the interest of Ballast Nedam to safeguard their interests in case of an experienced client and to show that competent people are involved. However, expert one and two point out to be aware of the attitude of perspective two because they might be too focused on early involvement with capable people and have a less collaborative attitude. But, on the other hand it is argued that focusing too much on the relationship is not helpful for the project developer because he knows what he is doing (expert two).
Nonetheless, expert one argues that perspective one can be valuable as well for the project developer to show willingness of the contractor to collaborate. He believes that perspective one is always useful to initiate the collaborative relationship and that the client should get the belief that the contractor is transparent.

To conclude, expert two and three agree with the designed strategy while expert one believes that perspective one is valuable in addition. However, it is not intended to include all perspectives for every client. Focusing on the structure of the bouwteam and showing the client that the contractor involved is capable is expected to be beneficial for an experienced project developer.

Strategy for the representative of the client

The representative of the client can act as a partner in the bouwteam but always reports to the client. Therefore, this client type tries to safe himself as much as possible and can avoid responsibility (expert two).

Perspective one is a fit for a representative of the client. The perspective can be used for the personal relationship with the client since interests are similar and both can act as partners (expert one).
Both expert one and two agree that perspective three is important right after the relationship is defined to structure the bouwteam. In doing so, the focus can lie on the division of roles because the scope if often known. Expert one points out that perspective three should prevail the others since clear agreements are important for a highly experienced client. Additionally, expert two states that recording decisions as part of *good communication* is of importance to prevent discussions later on. However, all three experts argued that sharing risks is not suitable for this client since he might push as many risks as possible to the contractor to safeguard the interest of the client and avoid responsibility. It is desirable to share the risk-file, but sharing risks is more appropriate for the first two client types (expert one, two and three).
Expert one argues that a focus on the win-win attitude of the representative is valuable as well since he made agreements with the client and can assess whether the project is feasible. As a contractor, the win-win moments can be used to strengthen the relationship between client and contractor, which is fruitful for price negotiations where the win-win moments can be emphasised. Furthermore, it is argued that perspective one is important for the personal relation, two for the win-win attitude and three because of the contractual agreements that rule the bouwteam. Therefore, expert one argues that perspective two can complement perspective one and three. However, expert two contradicts this by stating that a win-win attitude is less essential since client and contractor are already heavily dependent upon each other and have similar interests.

To conclude, the experts agree for the most part with the designed strategy. On some points, the experts contradict each other, indicating that the initial strategy seems most adequate. However, the risk-avers attitude of the representative of the client is underestimated by the research since the success factor *shared risks* seems to be no fit.

Application of the strategic framework

The experts were asked whether they would use the strategic framework and if so, in what way. Overall, the experts argued that the strategic framework could be used to create awareness among people on which perspectives can contribute to collaboration. By using the overview, it can be clarified why things are approached in a certain way. If people understand the reasoning behind an approach, they might be able to follow the strategy and react to it. Especially for the process management group, including tender management, it can be useful to create and maintain awareness.
Expert two and three indicated that they would use the strategic framework, and expert two was convinced that the overview could be useful to define a general strategy. It can be used as a starting point to define an approach, and upon that, the real strategy can be built. However, the first expert indicated that he would not use the overview because his approach is based on meetings with the client, but he also indicated that he does not follow any procedures or

guidelines. Nonetheless, the expert stated that it is valuable to first look at the composition of a bouwteam and the people involed, and to have an elaborate start-up instead of directly starting to work. The strategic framework can support this.

Comments made by the experts

During the expert consultation, some other interesting comments were made unrelated to the above sections. The comments are listed below and taken along in the conclusion of the expert consultation.

- Expert one believes that perspective one is always valuable in a bouwteam project due to the focus on transparency since "there should be no doubt whether the organisation is acting transparently".
- Expert three believes that perspective three should always be included early to define the scope of the bouwteam to manage expectations from the client. Since establishing a collaborative relationship might result in expectations from the client to the contractor, it is valuable to act upon this.
- Finally, expert one pointed out that no project is the same and the contractor anticipates on this. During the start of a bouwteam, it becomes clear what the combination of client and contractor will be like and how collaboration can be established, dependent on the people involved and market conditions. Character traits play a role in this as well.

7.3 Conclusion

During the expert consultation, the results of this research were used to collect practical views on logic and accuracy of the designed strategies in order to answer sub-question 5:

5. How do expert views relate to the designed strategic framework and its application in practice?

The client types and contractor's perspectives, as identified in this research, are representative for bouwteam projects in the utility and building sector. From the contractor's perspectives, especially perspective one and three, *relationship first* and *structure first*, are considered most appropriate for collaboration in bouwteams. Perspective two is deemed less appropriate because it is not beneficial for a contractor to be involved too early.
The strategies designed by the researcher were found, in general, significant and helpful. The strategic framework can be useful to create awareness among people regarding collaboration in bouwteams, or it could be used as a reference or guideline at the start of a bouwteam project. However, the risk-averse attitude of the representative of the client was underestimated; the representative and the contractor can collaborate as partners, but only to a certain level. Nonetheless, the current designed strategy seems adequate to collaborate with a representative, except for the use of the success factor *shared risks*.

During the expert consultations, some comments were made that other perspectives can be present as well. However, the expert consultation only consisted of three experts representing three perceptions. The experts can have preferences themselves and probably belong to one of the identified contractor's perspectives as well. The comments indicate that people from senior management look differently to some parts of the strategies. Furthermore, it was noticed that the experts were reluctant in choosing perspectives for a client type, since there sometimes argued that other perspectives could be involved as well resulting in including all three perspectives. As a consequence, additional research is necessary to determine whether their comments and beliefs are well-founded and widely supported. If so, the strategic framework can be adjusted accordingly.

8 Discussion

In this chapter, the findings of the research are discussed. The aim is to discuss the results in the context of what they mean in relation to literature and how they can be placed in a broader context. A discussion of the results is given in 8.1, implications of the research in section 8.2, limitations of the research in section 8.3 and validity of the research in section 8.4.

8.1 Discussion of the results

This is an exploratory research regarding client-contractor collaboration in bouwteams. The subject is not yet studied from a contractor's perspective and is therefore non-existing in literature. In literature, success factors for collaboration are identified but not yet placed in the context of bouwteam projects from the contractor's viewpoint. This research contributes contractors perspectives regarding collaboration in bouwteams to provide insights into the contractor's attitude, based on a set of success factors considered most important for collaboration in bouwteams. The results of this study are new and cannot be compared one on one with existing literature. However, the meaning of the results is discussed in three parts: contractors in bouwteams, contractor's perspectives on client-contractor collaboration, designing the strategic framework, and a final remark.

8.1.1 Contractors in bouwteams

In this research, it is argued that the industry recognises the importance of collaboration, and it is considered a subject of interest. Clients and contractors are willing to adopt collaborative practices, of which the bouwteam is an example. Knowledge from the literature of client-contractor collaboration and bouwteams is combined. In doing so, multiple reasons were identified for a contractor to collaborate in bouwteams. It was assumed that the reasons given in literature, *financial gains* (Akintoye & Main, 2007) and a *higher chance of being awarded the building contract* (Bresnen & Marshall, 2000), motivated the contractor to collaborate. However, during the execution and analysis of the Q-interviews, it became clear that collaboration in a bouwteam is only of interest for the contractor when they are awarded the building contract. Non-execution related incomes from the bouwteam are only a small part of the income generated from a complete project and are considered less important. Therefore, a connection between the bouwteam and execution phase is of importance for a contractor, and it is concluded that the contractor values collaboration for advantages during execution. However, in this research, the relation between the bouwteam and the execution phase is not taken into account.

8.1.2 Contractor's perspectives on client-contractor collaboration

Although the differences and similarities of the perspectives have been pointed out in chapter 5, some additional comments about the results can be made.

After analysis of the contractor's perspectives it became clear that there are two success factors always considered as essential, independent of the contractor's perspective: *mutual trust* and *a clear defined scope of the bouwteam*.
It is no surprise that the success factor mutual trust is one of the key factors valued as most essential for collaboration, as was identified in literature as well. In table 4.3, it is indicated that mutual trust is mentioned in the studies of Rahman & Kumaraswamy (2005), Suprapto (2016), and Xue et al. (2010) as a success factor for collaboration. Despite the different studies conducted, all three confirm the importance of mutual trust. The study of Rahman & Kumaraswamy (2005) confirmed that trust is one of the factors that is more helpful for collaborative working than others and is central to any collaborative working, concluded based on perceptions of respondents of a

set of 25 factors. Furthermore, the study of Suprapto (2016) concluded that trust is one of the core elements of teamworking that needs attention for a collaborative relationship, based on a Q-study consisting of 55 statements. Finally, Xue et al. (2010) identified four aspects that affect the performance of collaborative working in the construction industry with among them trust. Those researches confirmed that trust is considered the most significant factor that affects collaborative working in other collaborative relationships as well. Besides the aforementioned researches, some more recent student research was conducted regarding the subject bouwteams. In the studies of Sødal (2014); Nader (2019) and (Van Riggelen, 2019) trust was recurring as an important element for bouwteams to be successful. However, it is also argued by van Wijck (2018) that even though trust is recognized as an important success factor for collaboration in bouwteams, it is not naturally present in the construction industry due to the building fraud. Akintoye & Main (2007) emphasized that trust is not naturally present since they indicated a lack of trust as a failure factor. This indicates that this research is consistent with past research, especially for the specific case of collaboration in bouwteams. However, the behaviour of the contractor during the bouwteam process is not taken into account in this research, leaving the question unanswered whether the desired behaviour of the contractor to show mutual trust is actually exhibited. In other words, are the success factors actually implemented as indicated?
Second, a clear scope for the bouwteam was labelled as one of the most essential success factors as well across all three perspectives. During the Q-interviews, it was argued that bouwteams often have an unclear scope and organizations are not aware of what is expected from them, resulting in expectations and assumptions. However, it stands out that this success factor was extracted from two interviews and only from one literature reference. Most literature as, e.g. Akintoye & Main (2007); Nasir & Hadikusumo (2018) and Rahman et al. (2014), only refer to aspects as communicating goals, shared goals, and identification of clear goals or objectives, but do not mention a clear scope specifically. Only two references mention it (in)directly:Suprapto (2016) refers in his research to the scope as the *scope of works* and Van Riggelen (2019) argues that an elaborated project start-up is necessary to discuss collaboration, agreements and the scope. However, Suprapto (2016) concluded that the scope of works, as part of contractual aspects, is less important. Even though an appropriate contract is necessary, in itself, it is not sufficient to ensure effective collaboration. Nonetheless, both references have in common that front-end definition is somehow important for collaboration in a bouwteam. Overall, it can be concluded that for contractors, in particular, it is more important than for the client, first to define early and clearly what the scope of works is.
Notably, the success factor *mutual trust* is highly related to the perspective *relationship first* and the factor *clear defined scope* is related to the perspective *structure first*. This highlights the importance of the relational attitude and contractual aspects, and it substantiated that perspective one and perspective three are most important for collaboration in bouwteams. This brings up the question what the added value of the second perspective is for collaboration in bouwteams.

By applying Q-methodology with a set of 38 success factors, three perspectives were identified: relationship first, early involvement of the right people, and structure first. Since every participant group (process, cost, and design management) is present in every perspective, it is shown that the perspectives are independent of the companies departments.
The results of this research are placed in the broader context of collaboration in general[1] by comparing the results with another Q-study. The study of (Suprapto et al., n.d.) identified practitioner's perspectives on collaboration in construction projects based on theoretical success factors. In this study, three perspectives are identified. The first is called *focus on relations* and this group believes that collaboration should be relationally oriented, the second is called *focus on structure*, and they believe that collaboration should be structurally oriented. The last perspective is called *focus on manager's capabilities*, and this group believes in capable leaders. After comparison between the two studies, it can be concluded that the perspective *relationship first* matches with *focus on relations* and that *structure first* matches with *focus on structure*. However, the *focus on manager's capabilities* does not match with *early involvement of the contractor* and therefore the is considered unique for this research and therefore for contractor's in bouwteams. Nonetheless, one of the main characteristics of collaboration in a bouwteam is the early involvement of the contractor.
From this, it is assumed that *relationship first* and *structure first* represent collaboration in general, and the perspective *early involvement of the right people* is specific for contractors involved in bouwteams. The experts also emphasized this. In order to draw any conclusions about this, more research is required.

As stated before, contractors seem to know how they would design collaboration to achieve successful project delivery. This was also emphasized by the experts who argued that the strategies can be implemented without any

[1] independent of a client or contractors side or the utility and building or infrastructure sector

changes within the organisation. However, the question remains whether contractors act the way that they indicate and whether they maintain the collaborative attitudes from the identified perspectives. Van Riggelen (2019) substantiates this since she pointed out that only initiating a collaborative relationship is not enough, maintaining it during the process is of the essence. Since a bouwteam is dynamic and developing over time, it is a challenge to retain a collaboration attitude. Besides, it is believed that that contractor's perspectives regarding collaboration in bouwteams might change over time. By experience, success factors might become more or less essential dependent on the development of the bouwteam the contractor is involved in, possibly resulting in a change of perspective. This makes it even more challenging to maintain the collaborative attitude as defined by the perspectives.

8.1.3 Designed strategic framework

It was decided to design strategies for three simplified client types and to keep the strategies itself general. This is both the strength and weakness of the strategic framework. It is a strength because it is a clear and concise overview that can be consulted during (the start of) a bouwteam project. Since the overview is simple and implementation is general, it can be used as a starting point for every bouwteam project. However, at the same time, the overview has a weakness because every bouwteam project is unique, and possible strategies and approaches cannot be generalised in one overview. For every new project, a suitable strategy has to be developed, and the overview might not be adequate. The choice has been made to keep the strategic overview simple and thus multi-purpose because 1) not enough detailed information is available of client types that could be present to make specific and comprehensive strategies, 2) in this way the strategies are accessible and comprehensible for everyone, and 3) each project is unique, a manual for each possible project would result in an infinite overview which is not practical to use and therefore keeping it general makes this strategic framework practical in its use and shows the added value. Due to the bouwteam specific content of the strategies and the approach from a contractor's perspective, the results cannot be compared with current literature.

One of the aspects of the strategic framework is the match between client types and contractor's perspectives. This means that for the contractor, it is important to be aware of the perspectives of personnel. During analysis, it was noticed that there is no correlation between the participant groups and the identified perspectives. This means that every perspective is present within a participant group, making it easier to select people to involve. However, even though the perspectives are scattered over personnel, how can the contractor select the right people for the bouwteam? It is believed that senior management has the knowledge to select competent people with the right perspective, but this has not been taken into account in this research. The process of selecting the right people is left to the contractor, but it is important to note that it is valuable to create a working environment where different perspectives are encouraged, even though they may not correspond one to one with perspectives from senior management.

8.1.4 Final remark

Even though the performed research aimed at identifying contractor's perspectives of collaboration in bouwteams and designing a way on how to influence it, the question remains whether the results are bouwteam specific. The bouwteam is an upcoming approach giving participants room to collaborate under a contract in which not everything is defined yet. This creates opportunities for development of a project, but are these benefits restrictive to the use of the bouwteam approach? In other words: do we need a bouwteam to achieve the desired outcomes of collaboration between client and contractor, or can we use the principles of collaboration valued as most essential to deliver projects successfully? This is, of course, a hypothetical question because it was not researched nor can it be compared to literature and therefore, it cannot be easily answered. However, the researcher believes that applying the principles and values for collaboration as identified, can in and of itself result in successful project delivery. Since the perspectives show similarities with the research of Suprapto et al. (n.d.), it is expected that collaboration in the construction industry can be similar in different contracting strategies. During the Q-interviews, the importance of collaboration was recognized by almost all participants, and it was highlighted that the success factors could apply to other contracting strategies as well. This means that the principles as identified in this research could be used in, e.g. design and construct, traditional contracting or even a DBFM contract. But in order to achieve this, depending on the strategy, either the client or the contractor must initiate collaboration, show a collaborative attitude, and both parties must be willing to collaborate. However, from the results of this research, it is concluded that the contractor values a clear defined scope above all other aspects, along with mutual trust. This is expected due to the contractual and monetary risks a contractor takes during projects in case of unclarity. Implementing the collaborative principles from this research in other contracting strategies may result in an unclear scope and hence creating increased risks for the contractor, which may not be beneficial for successful project delivery from a contractor's perspective. Implementing collaborative principles in other

contracting strategies may be beneficial, but for the contractor, it is most important to ensure a clearly defined scope when collaborating in order to deliver projects successfully.

8.2 Implications of the research

The research broadened the knowledge of client-contractor collaboration in bouwteams. Contractors now have an indication on which viewpoints are present among people when collaboration in bouwteams and how these could be used depending on the client involved. This section gives insights into how the results of this research can be used in bouwteams in practice. The aim of this is to show contractors how awareness of contractor's perspectives of success factors, client characteristics and possible strategies can contribute to client-contractor collaboration. An overview of the implications is shown in figure 8.1, and the different steps are elaborated below.
During the expert meetings conducted it came forward that senior management is involved in each bouwteam project. They think about the strategy to apply for a client and about who can be involved from the contractor's organization; and interaction between *who is the client, who is available*, and *how to approach the bouwteam* emerges.

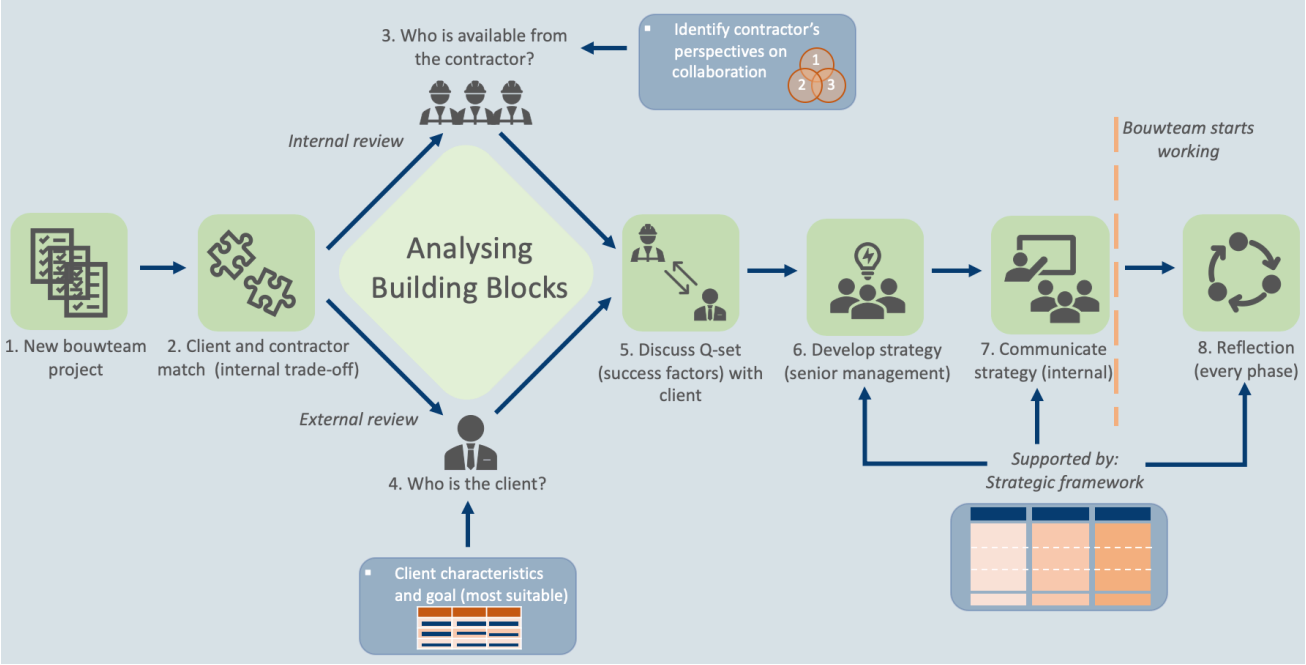

Figure 8.1: Practical implications for influencing client-contractor collaboration in bouwteams

- *Step 1:* In the first step, a new bouwteam project arrives at the contractor's organisation. This can either be through a tender for bouwteams or via one-to-one conversations with the client. The documents are received by the contractor and evaluated.
- *Step 2:* It is advised to have a matching client and contractor that fit the corporate culture of the organisation that believe from each other that they both want to deliver the best possible project with common goals (participant 3 and 21). To increase the likelihood of successful project delivery, it is recommended that the contractor carefully considers whether to start a bouwteam project. This is substantiated by Kamara et al. (1999) since every client organisation differs in size, composition and the nature of their business ranging from small involved clients to large multinational corporations. In doing so, it is important to understand why the client made a case for a bouwteam project and to define common and realistic goals. An internal trade-off should be made whether the project is accepted and if so, the contractor can proceed with step 3, 4, and 5.
- *Step 3:* For the contractor, it is advised to identify the perspectives of personnel regarding collaboration in bouwteams. This is necessary for the development of a strategy as step six. Ideally, the application of Q-methodology, as used in this study, is facilitated to identify perspectives. However, as was mentioned during the interviews, an obstacle for involving the right people at the right moment is the availability of personnel. Therefore, the contractor should be aware of who is available from the organisation and could participate in the bouwteam project. By combining the perspectives with the availability of personnel, the appropriate people can be selected to collaborate in the bouwteam.

If the use of the Q-methodology is challenging to facilitate or is too time-consuming, it is recommended to develop and quick and easy tool to extract perspectives. However, such a tool is not developed in this research.

- *Step 4:* In this research, three client types are identified for the utility and building sector. The contractor can determine the type of client involved in the bouwteam project based on the determined client characteristics. In doing so, contractors should try to identify the client type that has the most overlap with the real client. After that, he can, at its own discretion and depending on the project, use the characteristics for the next step.
- *Step 5:* After the contractor identified the contractor's perspective and client characteristics, it is interesting to talk to the client itself. In doing so, it is recommended to bring the identified set of success factors considered as most important for collaboration in bouwteams and to talk about them. The aim of this is to determine which success factors are most important for the client. The contractor can design and adjust his strategy accordingly, and during the process, he can fall back on the success factors both parties value for collaboration.
- *Step 6:* During step six, the contractor can combine the information from step three, four and five, to his own discretion, to develop a strategy to approach the bouwteam project. In doing so, the strategic framework can be used as a reference, to brainstorm and as a source of inspiration to create awareness. If the organisation allows it, personnel could be invited to provide input for the creation of the strategy.
- *Step 7:* If senior management developed the strategy they have in mind, it is valuable to communicate it to the organisation. In doing so, the framework can be used as a communication tool since it is expected that people are familiar with the framework. During this step, it is recommended to involve the whole organisation that will be part of the project (before the work starts). During the expert consultation, it was highlighted that it is valuable to take time to create awareness instead of immediately starting to work, and this step can contribute to this.
- *Step 8:* Finally, when the bouwteam starts working, it is recommended to reflect upon the strategy applied during the transition of phases to maintain awareness of the collaborative attitude. In doing so, people can reflect upon what works and what does not (and why) and whether the strategy is still appropriate. Hence, this information is also valuable for future bouwteam projects.
  Since the approach is based on the client's characteristics and attitude, this step is also useful to reflect upon a possible change in the attitude of the client. If the client changes his attitude or viewpoint, the contractor's approach might not fit anymore and needs to be changed as well.

8.3 Limitations

This research has some limitations that are highlighted below. They should be taken into account when using the outcomes.

Q-set

A limited number of statements is part of the Q-set and therefore, part of the research. In chapter 4, the importance of selecting a representative Q-set is highlighted. Statements are extracted from literature and in doing so, the researcher determined which references are included in the Q-concourse. By taking underlying references into account, a larger number of references is used indirectly. Statements are systematically selected to be part of the Q-set with the help of the number of references. Even though the selection process has been a quantitative approach and guidelines were followed, it cannot be guaranteed that no personal interpretation was part of the selection process. Therefore, representativeness of the Q-set is tested by independent employees of Ballast Nedam before and during the Q-interviews. A few participants indicated missing statements of which some were part of the Q-concourse. Overall, the participants argued that the Q-set was representative of collaboration.

The Q-interview

Interpretation of the statements determines the perspective of a participant. During set up of the Q-interview, attention was paid to the formulation of statements to balance too much or too less excess meaning. During the interviews, it came forward that there are some statements with too much excess meaning, as, e.g. *performance management*, resulting in an unclear or ambiguous success factor. By conducting the Q-interviews face-to-face, the degree of unclarity is limited. Upfront, all participants have been informed that they should give meaning to the statement in a way they believe is applicable, and if any statement was unclear, it was emphasised to inform the researcher. Since there is a high number of participants per perspective, it is expected that the individual interpretations are similar and have not affected the perspectives.
The post-sorting interviews mainly focused on the positive extremes of the sorting scheme because of the desire to determine interpretation of the success factors. The most extreme negative side was also taken into account, resulting in information on the statements placed at +4, +3, and -4. Nonetheless, there is often a reason for the position of

statements placed in the middle of the scheme. They can either be placed there due to limitations in space or because they belong there. Due to time limitations of the interview and the importance of focusing on individual statements, no questions were asked for statements placed in the middle.
Finally, some bias can be present due to poorly formulated questions. For this research, that would be the question in which participants are asked *how to implement a success factor*. During the interviews, many different ways of implementation were given, making it sometimes hard to compare them.

Interpretation of the results

Interpretation of the perspectives leads to a degree of uncertainty. Since the researcher interprets and describes each perspective, some researcher bias will be present. When the results were shared with the participants, most of them agreed with the interpretation. Nonetheless, some comments were made on specific sentences they did not agree with. By explaining to them why the results were interpreted in such a way, they understood the reasoning behind it. As a result, it is expected that the amount of researcher bias is limited. However, since all participants are from Ballast Nedam or its subsidiaries, unnoticed organisational bias can be present.

The contractor's perspective

The entire research is conducted from a contractor's perspective. However, client and contractor are dependent upon each other and are obliged to work together. Therefore, a client's perspective or a combined (client and contractor's) perspective is valuable as well but is left out of this research. This results in the limitation that this research only focused on one side of the 'problem'.

Strategic framework

The matches between client types and contractor's perspectives per bouwteam phase are the researcher's interpretation of the information gathered. Therefore, some researcher bias is present in designing the strategies. By using as much information from the Q-interviews as possible for matching the perspectives and implementation of the success factors, it is tried to limit the degree of researcher bias. The strategic framework is validated by conducting expert consultations in which experts are asked about the logic and correctness. However, a degree of uncertainty must always be taken into account when using the results. It goes beyond the scope of this research to investigate how the strategic framework can be implemented in practice.

8.4 Validity

This research has been carried out, as described in chapter 2. However, before continuing to the conclusion, the validity of the results is questioned, both internally as the validity of the strategies and externally as the generalizability of the results.

Validity of the strategies

By looking into the validity of the strategies, the underlying questions whether the results represent the actual situation is answered. For all elements from this study, the Q-interviews, the contractor's perspective, and the client characteristics, it is tried to limit researcher bias as indicated in the research design. However, since this research is a combination of both qualitative and quantitative research, the possibility remains that researcher bias occurs. Due to the taken precautions, it is expected that researcher bias is limited and that the elements used for designing of the strategies are valid.
However, the client-specific strategies are an interpretation of the researcher and are not (yet) validated in practice. Nonetheless, the expert consultation was used to validate the correctness of the interpretation of the results.

Generalizability of the results

The essence of a Q-study is replicability of the survey instead of reliability of the outcomes, as is the case in traditional surveys where input from as many respondents is gathered (Van Exel & De Graaf, 2005). Q-methodology is used to identify what is currently said about a topic and therefore, the method is not suitable to identify perspectives over time; it is only exploratory. (Watts & Stenner, 2005; Stephenson, 1993; Brown, 1993). This results in perspectives that cannot be generalised to the entire population. The perspectives are extracted from a strategically selected group of participants that do not represent the population. However, it is argued by (Steelman & Maguire, 1999) that similar results will be obtained if the Q-set is retested with a different P-set. For this research, it is assumed that the results are valid. To be sure if the results can be generalised as well, a retest or R-study with a survey can be conducted.

9 Conclusion & recommendations

This chapter gives the answer to the main research question defined for this research. First, the five sub-questions and the main research question are answered in section 9.1. Next, recommendations for Ballast Nedam and future research are mentioned in section 9.2.

9.1 Conclusion

This aim of this research was to reveal perspectives regarding client-contractor collaboration in bouwteams to provide strategies and recommendations to influence collaboration. The five sub-questions are answered and contribute to identifying in what way contractors can influence client-contractor collaboration in bouwteams.

9.1.1 Sub-conclusions

The answer to the first sub-question, *what does client-contractor collaboration in bouwteams entail?*, is based on a literature review. In a bouwteam, contractors are invited early on in the design phase to advice the client, using their practical know-how and expertise, resulting in client-contractor collaboration. The main advantage is that the final design, at the end of the bouwteam, has increased feasibility (in terms of costs and constructability) compared to a project following the traditional contracting strategy. Collaboration between client and contractor is valuable to reach the end-goals of a bouwteam: a feasible design and a signed building contract for the execution phase with the involved contractor. Even though the client is project owner, client and contractor are dependent upon each other to deliver the project successfully, emphasising the necessity for collaboration. In a bouwteam, client-contractor collaboration is defined as *a process in which client 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.*
The added value for contractors in the bouwteam process is an increased probability of being awarded the building contract. Underlying drivers are improved constructability of the design (beneficial for execution), reduced risks, and income from non-construction related activities. However, non-construction related incomes are only a small percentage of the total project cost and do not make a difference for the contractor. For the contractor it is most beneficial that the chance of obtaining the building contract is higher. Furthermore, it can be concluded that it is desirable to establish a collaborative relationship between client and contractor early. However, only establishing the relationship is not enough to guarantee successful project delivery. During the process, it is important to maintain the collaborative relationship which can be done by focusing on six elements of collaboration: capability, contract, joint working, relational attitude, team working and team integration. By maintaining and supporting collaboration through balancing the elements, it is expected that the bouwteam approach is more beneficial than other contracting strategies. Nonetheless, this is only the case if the bouwteam approach is suitable for the project and both client and contractor value collaboration in a project.

In order to answer the second sub-question, *what are success factors for collaboration in bouwteams?*, a literature review and two interviews are conducted to gather success factors. The fundamental idea behind this research is that good collaboration is necessary for bouwteams to achieve successful project delivery, and for that, success factors can be used. The factors are categorised with the help of the six elements of client-contractor collaboration, and from the categorised list, a 'balanced' set of 38 success factors is selected. These success factors are considered to be the most important for client-contractor collaboration in bouwteams and are as follows:

Nr.	Success factor	Category
1.	Sufficient resources for collaboration	*Capability*
2.	Early involvement of external stakeholders	*Capability*
3.	Contractor's track-record in terms of innovation	*Capability*
4.	A continued involved project team leader	*Capability*
5.	Early involvement of contractors	*Capability*
6.	Team leader's leadership ability	*Capability*
7.	Contractual incentives (positive and negative)	*Contract*
8.	Clear definition of roles before the bouwteam starts working	*Contract*
9.	Fair risk allocation	*Contract*
10.	Specified payment arrangements	*Contract*
11.	Financial range is agreed upfront by client and contractor	*Contract*
12.	Defined scope of the bouwteam	*Contract*
13.	Shared risks	*Joint working*
14.	Agreed process for dispute resolution	*Joint working*
15.	Performance management	*Joint working*
16.	Joint planning with all participants	*Joint working*
17.	Joint problem solving	*Joint working*
18.	Propose solutions when raising problems	*Joint working*
19.	Support of senior management from both sides	*Relational attitude*
20.	Long-term orientation of the contractor	*Relational attitude*
21.	Understanding each other's objectives	*Relational attitude*
22.	Project team leader's adaptability to changes in the project	*Relational attitude*
23.	Transparency	*Relational attitude*
24.	Win-win attitude	*Relational attitude*
25.	Strive for equality in behaviour and duties for client and contractor	*Relational attitude*
26.	Development of common processes and tools	*Team integration*
27.	Integrated project teams	*Team integration*
28.	Separate conversations in small groups per discipline	*Team integration*
29.	Unrestricted cross-sharing of information in the project	*Team integration*
30.	Equitable relation and respect for all	*Team integration*
31.	Involving the right people at the right moment	*Team integration*
32.	Regular meetings	*Team working*
33.	Mutual trust	*Team working*
34.	High level of commitment	*Team working*
35.	Good communication	*Team working*
36.	Alignment of objectives	*Team working*
37.	Have an elaborated project start-up	*Team working*
38.	Evaluate the bouwteam during the project	*Team working*

Table 9.1: Final Q-set

Though literature covered the subject of client-contractor collaboration, and the importance of collaboration is recognised in the construction industry, the contractor's viewpoint in bouwteams has not yet been identified. With the help of a Q-study, the view of contractors is captured in order to answer sub-question three: *what are perspectives of contractors on specified success factors for collaboration in bouwteams*. Three perspectives were found and can be described as follows:

1. *Relationship first*: The first perspective focuses on the relationship between 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 orientation of the contractor is subordinate to the other success factors because the bouwteam needs to focus on their current tasks.
2. *Early involvement of the right people*: This perspective is about involving the right competent people early in the project of which senior management and the project team leader can be part. 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. 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.

3. *Structure first*: This perspective focuses on identifying and determining the variables of the bouwteam. The scope and roles need to be defined early to give structure to provide clarity for the bouwteam. Efficient communication can contribute to this, as long as the only necessary information is shared. Once the project has been formulated, the focus can shift to the relationship between client and contractor. This group of people is more willing to share occurring risks to deliver the project successfully.

Overall, the perspectives agreed that establishing *mutual trust* and *defining the scope* early in the process is essential for collaboration in bouwteams. One must attempt to create an environment in which bouwteam participants can trust each other. It stands out that a clearly defined scope is especially of importance for the contractor as part of the front-end definition. It is desirable to define the scope early to ensure that the contractor's position is safeguarded. At the same time, payment arrangements are valued as less essential by all three perspectives since bouwteam participants have an intrinsic motivation to deliver work in a bouwteam and must not be focused on payments.
Due to the differences between the perspectives, it is expected that one perspective can be more applicable than another in a given situation. *Relationship first* and *structure first* are recurring in literature and probably represent collaboration in general while *early involvement of the right people* is specific for contractors involved in bouwteams. Nonetheless, both perspective one and three have a (different) collaborative attitude and highlight the importance of either relational attitude or contractual aspects. From these remarks, it is concluded that perspective one and three are most important for establishing collaboration in bouwteams, while perspective two is valuable to safeguard the position of the contractor.

With the help of the designing of a strategic framework, the fourth sub-question, *what strategies can be applied by contractors to influence client-contractor collaboration in bouwteams?*, can be answered. Three client-specific strategies, based on the contractor's perspectives and implementation of the success factors identified, are designed to influence client-contractor collaboration in bouwteams. Different clients need different approaches because they have different characteristics, drivers and goals. Figure 9.1 gives an overview of the strategies that could be applied per client type with a focus on the most essential success factors.

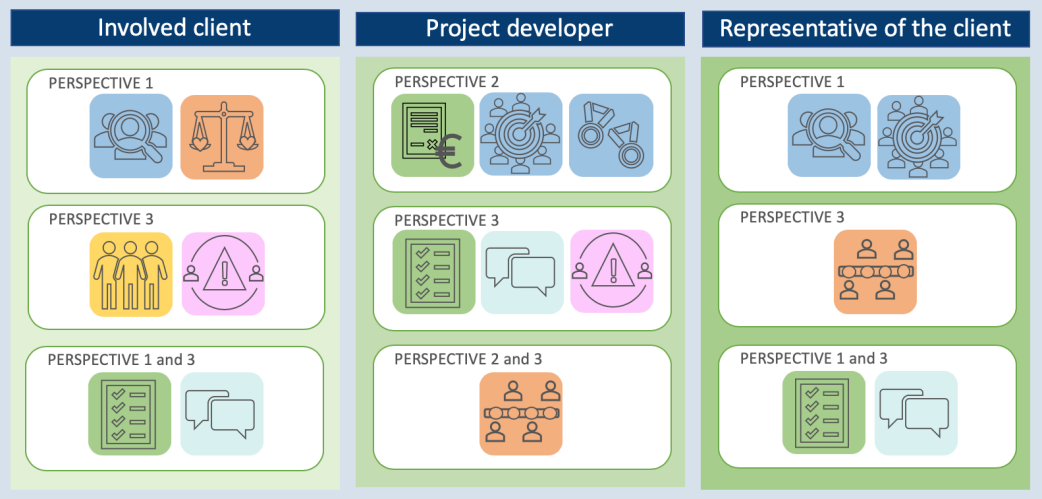

Figure 9.1: Strategic framework for influencing client-contractor collaboration in bouwteams

To conclude, the strategic framework indicates that there is always one perspective considered as the best fit, but a second one is advantageous to complement and connect to the first one. Involving people from perspective three is valuable for every client type to safeguard the position of the contractor due to the structure- and contract-oriented focus. Depending on the expected attitude of the client, based on his characteristics, either perspective one or perspective two can be a complementary fit. In the case of an relationship-focused, committed and involved client, perspective one is a fit, and in the case of an expertise- and result-focused client, perspective two is a fit. To enhance collaboration for the contractor, the right fit of contractor's perspective and client type help to achieve successful project delivery.

With the help of three expert consultations the fifth sub-question, *how do experts relate to the strategic framework*

and its application in practice?, is answered. The client types and contractor's perspectives, as identified in this research are representative for bouwteam projects in the utility and building sector. From the contractor's perspectives, perspective one and three, *relationship first* and *structure first*, are considered most appropriate for collaboration in bouwteams.
The strategies designed by the researcher were found, in general, significant and helpful. However, the risk-averse attitude of the representative of the client was underestimated; the representative and the contractor can collaborate as partners, but only to a certain level. Nonetheless, the current designed strategy seems adequate to collaborate with a representative, except for the use of the success factor *shared risks*. The strategic framework can be useful to create awareness among people regarding collaboration in bouwteams, or it could be used as a reference or guideline at the start of a bouwteam project to support the contractor to achieve successful project delivery. However, it stands out that no adaptions or changes are necessary to implement the strategy.

9.1.2 Main research question

Finally, with the help of the answers to the sub-questions, the main research question defined for this research can be answered. The main research question was as follows:

In what way can contractors influence client-contractor collaboration in bouwteams to achieve successful project delivery?

This research provides a first step in identifying a way to influence client-contractor collaboration from a contractor's perspective. Based on the results of the Q-study, the strategies designed and the expert consultation conducted, it can be concluded that the combined results are a way to influence client-contractor collaboration in bouwteams as shown in figure 9.2.

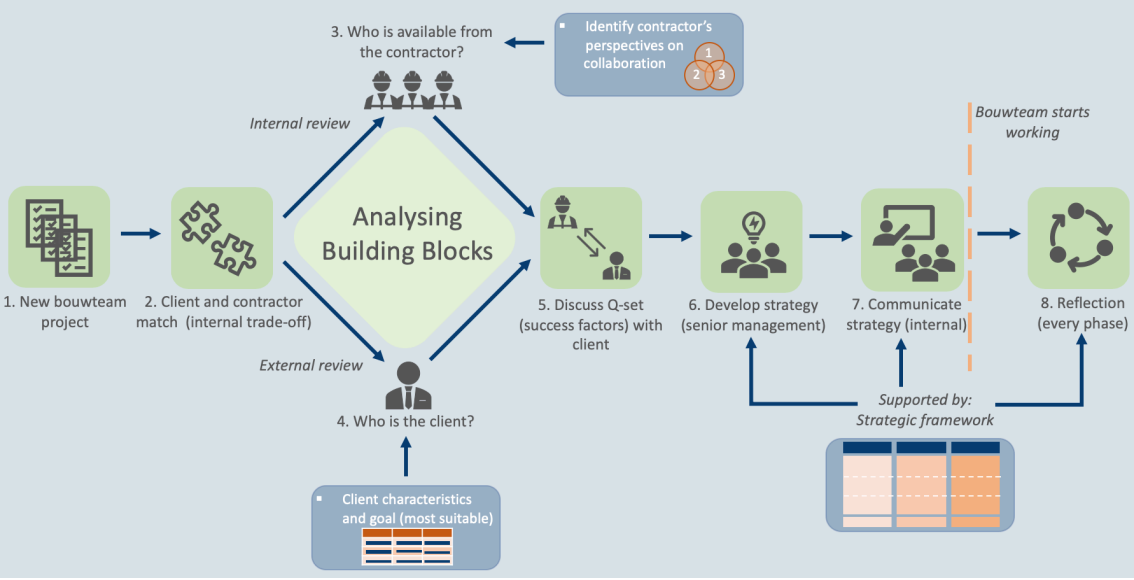

Figure 9.2: Practical implications on how to influence client-contractor collaboration in bouwteams

If the client and contractor understand and respect each other and show mutual trust while collaborating, it is expected that bouwteams are successful and achieve the desired benefits. In general, it can be concluded that it is of importance to involve suitable and competent people in the bouwteam for which perspective one and three are most representative for a collaborative attitude.
For the contractor, it is important to define the scope early and clearly for successful project delivery. To achieve this, the contractor can identify the client characteristics of the client involved and determine the perspectives of available personnel. The contractor's perspectives are a valuable reference for the contractor because they represent his playing field. As described in steps three, four and five of the overview, the contractor can determine which perspectives are most appropriate for the interests of the client to establish good collaboration. With those insights, the contractor can develop a strategy and communicate this internally. For this, the strategic framework can be used as a guideline to give insights into possibilities and considerations. Depending on the client, the contractor can

choose the right perspectives to deploy to influence client-contractor collaboration to achieve successful project delivery. Nonetheless, in the end, defining the scope is one of the most important success factors for collaboration for the contractor, independent of the strategy to be developed.

However, one has to question whether the bouwteam is a necessary approach for collaboration between client and contractor in a project. Even when this is not the case, the contractor's perspectives can still be used since the collaboration principles from a contractor's perspective are similar. Finally, the implementation of the success factors is, however, only applicable to Ballast Nedam because the implementation methods have been defined by the participants involved in this research.

9.2 Recommendations

Based on the answer to the main research question and the discussion of chapter 8, recommendations are identified for practice and for future research.

Recommendations for practice

- For bouwteam projects in practice at Ballast Nedam, it is recommended to develop a quick and easy tool, based on this Q-study, to determine people's perspective regarding collaboration. With this knowledge, the right people can be selected in order to fit the most suitable strategy to help increase collaboration for successful project delivery.
- Furthermore, it is recommended for Ballast Nedam to start every bouwteam with the implications of this research. After deciding whether the client matches the contractor, contractor's perspectives and client characteristics can be determined. With this knowledge, appropriate personnel with the right perspectives can be assigned. As a result, a strategy can be developed using the designed strategic framework consisting of success factors that contribute to influencing client-contractor collaboration. It is advised to communicate this strategy internally to make people aware of the applied strategy. During the bouwteam phase, it is recommended to reflect on the strategy during each phase transition.
- Specifically for Ballast Nedam, it is recommended to focus on mutual trust as one of the most essential success factors to establish collaboration. Since it is essential for all three perspectives, a contractor can always focus on this factor. In doing so, the entire internal organisation can be included to let people experience the belief of mutual trust between client and contractor. This is useful to influence the attitude and vibe within Ballast Nedam positively. It is recommended to create a vision with Ballast Nedam Building Projects regarding collaboration in bouwteams with a focus on mutual trust. In doing so, it is advised to allow everybody to express their opinion even though this might be different per person. Together, one organisation-specific vision can be created to be used for every future bouwteam and bouwteam tender.

Recommendations for future research

- The main recommendation for future work is a more in-depth validation of the designed strategic framework and implications since it is likely that the developed strategies help contractors to influence collaboration, but have not yet been tested. Even though the framework aims to create awareness among and give reference to the contractor's employees to influence client-contractor collaboration in bouwteams, it is important to validate whether the results can be implemented easily. Further research ideally analyses several bouwteam projects and compares them to the designed framework and implications in order to create a more valid model. Ideally, any further improvements are generic and simple as well to allow for maintaining the framework generic for easier implementation and adaptability to each unique bouwteam.
- Replication of this research with a different Q-set can create more awareness of contractors regarding bouwteams. Since the main focus of this research was on client-contractor collaboration in bouwteams, only success factors for collaboration were included. As a consequence, other success factors that might be relevant for bouwteam projects as well are out of scope. Generic perspectives regarding success factors of bouwteam projects are valuable as well for contractors. In doing so, the choice can be made to include both client and contractor to determine perspectives shared by them since they are dependent upon each other in the project.
- The research is limited to the design phase of a project, in which the bouwteam approach can be applied. In doing so, the tendering phase upfront is not taken into account while it is argued that this can influence the collaborative attitude of bouwteam participants. A tender can be used to find the right type of contractor to participate in bouwteams, and in doing so, different tender methods can be applied. It is expected that the selection criteria used determine the contractor's attitude and the openness showed and are not always non-award based as preferable. Therefore, it is assumed that collaboration between client and contractor is not

limited to the bouwteam itself. It is interesting to investigate the relation between the tender and design phase and the design and execution phase, to assess how the tender phase influences a collaborative attitude during the bouwteam phase and whether the collaborative relationship build and maintained in the bouwteam phase is still present during execution.

- In this research, client types are linked to contractor's perspectives in bouwteam projects. In doing so, the behaviour of bouwteam participants is not taken into account while this affects client-contractor collaboration. Attitudes of people are defined by their behaviour and therefore, establishing good collaboration depends on willingness to invest in collaboration.
  The client's perspective regarding client-contractor collaboration in bouwteams can contribute to establishing and maintaining collaboration as well. However, this research only took the contractor's perspective into account. To adequately determine the interaction between client and contractor, it is recommended to identify the client's perspectives regarding collaboration in bouwteams as well. To be able to compare the client's with the contractor's perspectives, it is advised to use the same approach, including the same Q-set, as applied in this study. Furthermore, the same research can be conducted for a mixed P-set consisting of client and contractor to determine shared perspectives.
- It has been argued that it is unknown whether the contractor's perspectives can change over time due to experiences. It is recommended to study contractor's perspectives in several bouwteam projects at different moments in time. Suprapto's RECAP-tool (Suprapto (2016)) might be used for this, provided that it is adapted to collaboration in bouwteams and the contractor's perspective only.
- Finally, it is recommended to reflect upon the use of bouwteam projects in the infrastructure sector since this research only focuses on the utility and building sector. During exploratory talks at Ballast Nedam, it came forward that they are interested in ways to apply the bouwteam contracting strategy in infrastructure projects as well. It could be a start to identify whether the same or similar perspectives regarding collaboration in bouwteams exist.

Reflection

My time at Ballast Nedam started on the 7th of October 2019 with the goal to perform a research towards bouwteams in the infrastructure sector. In careful deliberation with Ballast Nedam, I discovered that large infrastructure projects do not use the bouwteam approach yet. Since I was still interested in the topic, I extended my view and came to the subject of investigating bouwteam projects in the utility and building sector. Since the economy is performing well and the construction industry is in a cyclical upturn, many projects use the bouwteam approach. By introducing my subject on the first day, many people recognized the importance and showed great interest in my research to be.

In the weeks before my kick-off, I had many exploratory conversations at Ballast Nedam. The people I talked to pointed me in several directions and it was quickly observed that opinions on bouwteams significantly differ. I became interested in the attitude of people and with help of my supervisors at the Delft University of Technology (Marian and Leonie) I narrowed down the scope to client-contractor collaboration in bouwteams. My desire was to conduct my research from a contractor's perspective and this became the unique part of my study.

Upfront, I envisioned that conducting the interviews as Q-methodology suggested would be more straightforward than it actually was. The different viewpoints of the participants came forward but at the same time it raised questions on related topics to collaboration in bouwteams. It emphasized the importance of this topic, the large scope of it and the great personal influence. Discussions arose and too many ideas arose that could not all be included in this research. Luckily, my supervisors helped in this regard to stick with the predetermined scope. In doing so, I was reluctant in stating opinions and conclusions but they supported me during this process.

If I could do it all over again, I would take more time for my considerations. During the research I came to the conclusion that, sometimes, I made too quickly decisions and it persecuted me later on. An examples of this is the clarity of the Q-set. While the Q-set seemed clear enough for me as the researcher of this subject, it was not always as straightforward for other people.

Photo credits

Titel page: Galaxytower under construction, photo by Ballast Nedam.

Part 1: Mall of the Netherlands under construction, photo by Matthijs Keller.

Part 2: Artist impression of Cooltower, photo by Ballast Nedam.

Part 3: Schiphol A-pier under construction, photo by John Gundlach | Flying Hollland.

Part 4: Artist impression of Feringa Building, photo by Ballast Nedam.

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PART IV
Appendices

A

Background information of bouwteams

In this appendix, supporting information is given for chapter 3 by focusing on the background of ECI, the definition of bouwteams, competences and responsibilities and finally a contractual revision.

A.1 Background of Early Contractor Involvement

Improvement of integration of construction knowledge, value for money and project delivery time are concepts of importance for the construction industry (Song et al., 2009; Scheepbouwer & Humphries, 2011). Early contractor involvement (ECI) is an alternative relationship-based approach anticipating on the aforementioned concepts. Early Contractor Involvement (ECI) has been officially introduced in 2001 in the United Kingdom by the Highways Agency (Eadie & Graham, 2014). Since then different countries, with amongst others the Netherlands, have applied ECI in different variants. However, the project delivery approach is not a quick fix for the problems the construction industry is currently facing (Song et al., 2009). In this section, the focus lies first on the general concept of ECI. After, the focus shifts to the application of ECI in the Netherlands, known as the bouwteam approach.

Early Contractor Involvement (ECI) is a relationship-based project delivery approach in which a contractor is involved in the early phases of a project to advise on the design (Francis & Kiroff, 2015; Whitehead, 2009). By doing so, the contractor advises on constructability, costs and planning. The objective from the client involved in ECI is to get advice from a contractor by working together with client and consultant(s) in the bouwteam (Wondimu et al., 2016; Rahman & Alhassan, 2012; Scheepbouwer & Humphries, 2011). In doing so, the separation between the design and execution phase is removed, and collaboration among different parties is encouraged. Scheepbouwer & Humphries (2011) argue that with this objective in mind, the main goal of ECI is to achieve value for money. Since the value for money is a vague concept, the main goal is subdivided into three sub-goals:

- *Increasing value:* In the early phases of a project, involvement of primary project elements for generating value and savings is high. With ECI, most savings of a project are captured during front-end development with the help of innovative solutions. The innovative solutions are conceived by collaboration of client, contractor and consultant(s) during the design phase.
  Additionally, value is increased by using nonprice based criteria for the selection of a contractor. In doing so, the focus lies on the capabilities of the contractors instead of the price of the project (Scheepbouwer & Humphries, 2011; Rahman & Alhassan, 2012; Eadie & Graham, 2014; Lenferink et al., 2012; Grooters, 2018).
- *Reducing risks:* Extra value for money is provided by locking in risk management strategies. With the help of a project planning, a design and an execution plan, awareness and understanding of risks in the project increases. With ECI, risks can be identified and managed early in the project cycle (Eadie & Graham, 2014; Scheepbouwer & Humphries, 2011; Whitehead, 2009).
- *Improving constructability:* In ECI, the contractor can use its construction knowledge and experience to increase the constructability of a project. As a result of this, certainty on price increases, time is gained and risks due to inconsistencies, ambiguities and conflicts between design and construction can be identified early on (Song et al., 2009; Eadie & Graham, 2014; Whitehead, 2009; Lenferink et al., 2012).

The goals of ECI can be achieved in a context appropriate for the project delivery approach in which there is room for innovation, open-book accounting and open and honest communication between client, consultant(s) and the involved contractor (Lenferink et al., 2012; Scheepbouwer & Humphries, 2011). Additionally, Scheepbouwer & Humphries (2011) argue that the parties involved in ECI differ in opinions regarding the strategy that is followed and the benefits belonging to a strategy, what might result in conflicts between client, contractor and consultant(s).

A.2 Detailed definition of the bouwteam

In section 3.2 the following definition for the bouwteam approach is given:

> 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 a building contract. To this end each of the participants performs the tasks related to their experience and expertise while retaining their independence and responsibility.

The most important elements in this definition are described for the understanding of the definition:

- *Temporary collaboration agreement:* The bouwteam is a temporary collaboration between bouwteam participants. The agreement only applies to the design phase. After the goal of the bouwteam has been reached, the bouwteam is dismantled. An underlying goal of the bouwteam is that the project will be executed by the involved contractor if there is agreement on the price.
- *Participants*: At least client, contractor and designer are present in a bouwteam. Dependent on the size and complexity of the project, the number of bouwteam participants can be expanded with e.g. consultants and calculators. However, the essence of the bouwteam remains early involvement of the contractor to advice the client during the design phase. Therefore, a contractor should always be present in a bouwteam.
- *Cooperate:* In a bouwteam, cooperation between bouwteam participants is essential to reach the defined goal. Bouwteam participants should work together to produce a feasible design. Collaboration between client and contractor, called client-contractor collaboration, has a large contribution to the overall collaborative relationship between bouwteam participants.
- *Feasible design and risk log*: Together, client, contractor and designer work on the best possible feasible design. Feasibility of the design is defined in financial and constructability aspects. These are important aspects for both client and contractor. The contractor can use his knowledge and experience to influence the feasibility of the design. In doing so, risks are identified during the process and are collected in a risk file. In a bouwteam project, risks can be allocated and mitigated before the execution of the project.
- *Independence and responsibility and experience and expertise:* It is expected from bouwteam participants that they each perform the tasks related to their expertise. In doing so, the bouwteam participants are responsible for the work related to this. Additionally, they should advise on the work of other bouwteam participants. This is seen as the strength of the bouwteam approach; participants are working together to complement and improve each other towards the best possible design.

A.3 Competences in a bouwteam

In the bouwteam agreement of Duurzaam Gebouwd (2019) consideration 1, it is mentioned that the bouwteam participants should upfront discuss and define the competencies and qualifications required from bouwteam participants. Bouwteam participants should define the expected needed capacity. This is done to increase the potential of the bouwteam to be successful (Chao-Duivis, 2012). Grooters (2018) researched the division of competences in a bouwteam. In the process, two models were identified: one model with the current division of competences and one model with an ideal situation of division of competences. In this research, the division of competences of the current application is used for the understanding of the bouwteam approach, see table A.1. However, the division of competences is always project-specific and depends on the required knowledge, skills and needs of the client in a project (Grooters, 2018).

A.4 Bouwteam UAV and bouwteam UAV-gc

Over the years, the bouwteam approach evolved, and at the moment a distinction can be made between two types of bouwteams: Bouwteam UAV and bouwteam UAV-gc. Bouwteam UAV is often called traditional bouwteam since this approach is the original intention of the bouwteam approach.

In a traditional bouwteam, bouwteam participants work together during the entire design phase. During the design phase the DNR 2011[1] applies to all types of consultants. The bouwteam participants work together towards a final design accompanied with building specifications on which the involved contractor makes an offer. When the bouwteam participants agree on the price offered by the involved contractor, the bouwteam agreement is dismantled,

[1] DNR 2011 (De Nieuwe Regeling 2011) stands for The New Regulation and defines the relationship between client and architect, engineer or consultant during the design phase of a project.

Client	Consultant	Contractor	Collaboratively
Contract management Cost expertise	Skills of designing	Knowledge of technology and constructions Coordinating bouwteam Communication management	Proposing design optimisations Dispute management Information management Integral risk management Legal knowledge Knowledge management Quality management Setting up bouwteam Planning management Permit management

Table A.1: Division of competences in current bouwteams (table from Grooters (2018))

and a building contract based on UAV (2012)[2] is set up for the execution phase. In the Netherlands, the UAV (2012) is a standardised regulation used for traditional project delivery approaches. The main characteristic of the regulation is that the client remains responsible for the design during execution.

In bouwteam UAV-gc, bouwteam participants work together during the design phase until and including final design (FD). When this is the case, the DNR 2011 does not apply during the design phase. Instead, bouwteam participants work on the basis of UAV-gc (2005)[3] towards a specification of requirements and an elaborated final design. The involved contractor bases his offer on these deliverables and when the bouwteam participants agree of the price offered, the bouwteam agreement is dismantled. A building contract is set up for the execution phase, based on the UAV-gc (2005). In the Netherlands, the UAV-gc (2005) is a standardised regulation used for integrated project delivery approaches. The main characteristic of UAV-gc (2005) is that tasks and responsibilities are combined and apply to one single party: the party to be contracted. One of these responsibilities is design responsibility that shifts towards the contractor.

It should be noted that a third type of bouwteam can be implemented as well. In this type of bouwteam, the UAV-gc (2005) applies to the design phase and the construction phase. As a result of this, the relationships between bouwteam participants shifts and the way price negotiation is approached changes as well. At the moment, no contract model represents a bouwteam completely based on UAV-gc (2005) (Duurzaam Gebouwd, 2019).

A.5 Contractual reflection

For the application of bouwteams, VGBouw developed a standardised contract model in 1992 (VGBouw, 1992). Currently, the contract model is often modified to fit the characteristics of a project. Chao-Duivis (2012) and Van Wijck (2018) argue that the 1992 bouwteam contract model is outdated and needs to be revised. Therefore, Bouwgenootschap published a consultation document in May 2019 including a new standardised contract model for bouwteam agreements with a new definition for bouwteams (Duurzaam Gebouwd, 2019). In this section, the bouwteam agreements used in practice are reflected upon. In doing so, a reflection of Ballast Nedam upon the contract model of Duurzaam Gebouwd (2019) is included as well. This document was handed in by the developers of the 2019 contract as feedback, after which the developers are currently revising the version of May 2019.

Chao-Duivis (2012) reflected and assessed the VGBouw standardised bouwteam contract by assessing the model to eleven statements. The results from this study are use as a starting point for the contractual reflection in this research. The contractual reflection is divided in two parts. First, the focus lies on the activities during the design phase and in the second part the focus lies on price negotiations and price.

[2]UAV 2012 (Uniforme Administratieve Voorwaarden) stands for Uniform Administrative Conditions and can be applied to the execution of construction projects, it arranges the contractual relationship between client and contractor.

[3]UAV-gc (Uniforme Administratieve Voorwaarden voor Geïntegreerde Contracten) stands for Uniform Administrative Conditions for Integrated Contracts and can be applied to construction projects that are executed as an integrated project. In integrated contracts, more than one task is outsourced to a contractor. The contract arranges the contractual relationship between client and contractor

In general, it is argued by Chao-Duivis (2012) that the contract 0f 1992 reads conflicting. Sometimes there is referred to the parties between whom the contract is concluded: client and contractor, and sometimes there is referred to all parties present in a bouwteam, including client and contractor but also consultant(s), designer, experts etc. The reflection of Ballast Nedam upon the contract model of Duurzaam Gebouwd (2019) argues that the conflict still present in the revised contract model. The contract does not focus on the client and the contractor in particular, but also on other bouwteam participants.
Furthermore, it is argued by Chao-Duivis (2012) that an bouwteam agreement is an supporting contract. It is used for preparation of a building contract, the final goal of a bouwteam. But, this will only be achieved if price negotiations are successful.

A.5.1 Part 1: Bouwteam activities

Intention of the bouwteam

In the preamble (section 4, 5 and 6) from the contract of VGBouw, it is stated that contractors need to "provide specific experience and expertise on implementation and costs in order to optimise the price-quality ratio of the design". It is stated by Chao-Duivis (2012) that this implies that the contractor is not involved during the entire design phase; the contractor is only involved by implementation and cost-related aspects. In the new standard contract of Duurzaam Gebouwd this section of the preamble has been removed, resulting in not implying anymore that the contractor is only involved at the end of the design phase.
Furthermore, in the preamble (section 2 and 3) of the contract of 1992, it is stated in the section that the client wants to deliver the project via a bouwteam and that other bouwteam participants should be qualified for the bouwteam. In these two sections, the reason for collaborating in a bouwteam, from the client's perspective is not made clear. This has been clarified in the standard contract of Duurzaam Gebouwd, in which the client is obliged to give a reason for using a bouwteam (in section 6 of the preamble). Furthermore, the qualification of bouwteam participants is tested by a tender (in section 3 and 4 of the preamble).

Collaboration in the bouwteam

Chao-Duivis (2012) states that the standard contract of VGBouw defines that there should be collaboration in a bouwteam, but ways to collaborate are not further explained. The answer to the 'how should we collaborate' is therefore not defined and left in the middle for the organisation's interpretation. However, in the revision of Duurzaam Gebouwd an article is included in which is stated that the attitudes and behaviour of bouwteam participants should be focused on collaboration (article 2.4). In doing so, participants should focus on flexibility, transparency, realising the project objective, respect each other's objectives, talk about problems, take responsibility and be proactive.

Goal of the bouwteam

The main goal, as formulated in both contracts, is to collaborate. In doing so, the project is prepared for execution by using experience and expertise of bouwteam participants. However, it should be noted that a bouwteam can lead to conflicting interests because the contractor is the leading party during construction while the designer has a dominant role during the design phase (Chao-Duivis, 2012). This can lead to tension between bouwteam participants. Therefore, besides the goal of the bouwteam, attention should be paid to mutual relationships. Chao-Duivis (2012) states that a new model should focus on the aspects of "creating a team". The model of VGBouw fails by not including this aspect, but the revised model fails as well.

In the goal, formulated by Duurzaam Gebouwd it is stated: *"The goal of the bouwteam is to arrive at an acceptable end product for the client (...)"*. According to the reflection of Ballast Nedam, this implies that contractor is responsible for construction drawings. After the drawings are made, the client should first agree with the drawings before the end goal can be reached. This results in an unbalanced situation in which the client leads the project but does not take responsibility for the end-product.

Composition of the bouwteam

The bouwteam is a multidisciplinary team, but the question arises who should be part of a bouwteam. Both contracts lack information on how a bouwteam should be assembled and which parties should be part of a bouwteam. In both contracts, the client can fill in which participants are part of the bouwteam (Article 2 of the 1992 contract and article 3 of the 2019 contract). In the contract of Duurzaam Gebouwd they can specify themselves what the responsibilities are and which experiences and expertise are necessary for the bouwteam.

Roles of client and contractor

The basic division of roles between the contractor and the client is laid down in both contracts (Article 5 and 6 of the 1992 contract and article 4 and 5 of the 2019 contract. Optionally, tasks can be removed or added to the contract (depending on the project). However, it is stated by Chao-Duivis (2012) that it is important that there is still flexibility in case of new insights.

Liability

In bouwteams, situations occur in which organisations come up with an idea and party B assess the idea and if the idea is valuable, the idea is taken over by party B. When this situation occurs, the contract of 1992 defines in article 12 that there is a shift of liability. This can cause difficulties because it is not always clear who is responsible for the idea. However, this regulation stimulates participants to be innovative without being cautious because of risks. In the contract of 2019 of Duurzaam Gebouwd, this article is removed, and some general articles about liability are included. These are mainly focused on the client, who is allowed to review every decision (Article 8, (DuurzaamGebouwd, 2019)).

A.5.2 Part 2: Price formation

Chao-Duivis (2012) raises the question if there is a good price-quality ratio because there is only one contractor that make an offer for execution. However, the offer might be higher compared to a situation with more competition but in advance execution often runs smoothly (Van Riggelen, 2019).

price negotiations

In article 17 of the contract of VGBouw (1992), it is specified upfront what percentages are applied for general costs, profit and risk, and it is specified which costs are included in the percentages. The contract of Duurzaam Gebouwd (2019), on the other hand, does not specify any costs or percentages upfront related to price negotiations. In article 9.6 of the 2019 contract, there is specified which subjects are included in price negotiations. However, Chao-Duivis (2012) recommends to specify the general costs, profit and risks upfront to create transparency and openness between bouwteam participants.

Termination of the contract

When client and contractor agree on the price, the building contract is signed. However, when the parties cannot agree, the bouwteam agreement is dismantled. Furthermore, the parties can specify in both contract additional reasons for ending the bouwteam agreement (Article 22 of the 1992 contract and article 10 of the 2019 contract). In the contract of VGBouw, a procedure is included when parties do not agree on the price. When this is the case, an external cost consultant can be hired. Chao-Duivis (2012) argues that such a regulation is not necessary for a bouwteam.

A.5.3 Concluding remarks

After comparing both contracts and reviewing the comments made by Ballast Nedam on the contract of Duurzaam Gebouwd (2019), it came forward that the contract has overlapping articles. It is stated that the starting point of the contract of Duurzaam Gebouwd (2019) is to establish a balanced relationship focused on collaboration between bouwteam participants. However, Ballast Nedam questions if there is a balance between bouwteam participants from a contractor's perspective because the responsibility of consultants for advice is not regulated as in the 1992 model. Ballast Nedam is of the opinion that the new model creates more responsibilities for a contractor, resulting in an increasing risk profile. While Chao-Duivis (2012) argues that bouwteams are popular due to lower risks van responsibilities for a contractor.

B

Q-methodology

In this appendix, detailed information is given about the steps followed in Q-methodology. In section B.1, the first two steps are explained, including the formation of the Q-concourse (step 1) and the definition of the Q-set (step 2). Thereafter, the creation of the P-set is given in section B.2, followed by the Q-procedure in section C.1.

B.1 Step 1 & 2: Collecting statements and defining the Q-set

First, more information is given about success factors from literature and their references. After that, more information is given about the success factors from interviews, and their interviewees and the final Q-concourse is showed in the third section.

B.1.1 Success factors of collaboration from literature

To collect success factors of collaboration in the construction industry, different researches are read. A quick-scan has been conducted, after which the papers from table B.1 are read in-depth. While doing so, the underlying references of the papers are taken into account as well. This is done to prevent the replication of success factors mentioned in different papers by the same original author. After collecting all success factors from the papers, it is decided if all researches are relevant. In doing so, it is concluded that success factors from the papers of A. P. Chan et al. (2004) and Black et al. (2000) should be excluded from the research because these papers are referred to in other, more recent, papers as well. It is assumed that the success factors from the excluded papers are used in the more recent papers. However, the reference Chan et al. (2004) is referred to in other references as well, by Adelback & Johansson (2013) and Xue et al. (2010). However, while reading the paper in-depth in came forward that there are some success factors included in Chan et al. (2004) that are not included in the other references. Therefore, it is decided to include Chan et al. (2004) in the literature study. However, the success factors referred to by Xue et al. (2010) and Adelback & Johansson (2013) that are clearly traceable to Chan et al. (2004) are only included once in the Q-concourse, referring to Chan et al. (2004). Furthermore, only the human-related factors from Chan et al. (2004) are included in the Q-concourse when relevant for this research.

References	Journal	Related to	Goal of the paper	Underlying references
Adelback & Johansson (2013)	Master of Science Thesis	Large infrastructure projects	The goal of this paper is to identify factors that contribute to project success from a contractor's perspective.	Chan et al. (2004)
Akintoye & Main (2007)	Engineering, Construction and Architectural Management	Construction projects	The goal of this paper is to describe UK's contractor's perception of collaborative relationships in the construction industry.	Bresnen & Marshall (2000); Särkilahti (1996); Leverick & Littler (1993); Spekman et al. (1996); Anslinger & Jenk (2004); Kumaraswamy (1996); Luck (1996).

Chan et al. (2004)	Journal of Construction, Engineering and Management	Construction projects	The goal of this paper is to conduct interviews on success factors deducted from seven major management journals.	Chua et al. (1999); D. H. Walker (1995); D. W. Chan & Kumaraswamy (1997); Songer & Molenaar (1997); Dissanayaka & Kumaraswamy (1999); Hassan (1995)
Nasir & Hadikusumo (2018)	Journal of Management in Engineering	Construction projects	The goal of this paper is to develop a model to manage client-contractor relationships in the construction industry, focusing on contract management functions.	Davis-Blake et al. (1999)
Rahman & Kumaraswamy (2005)	Journal of construction Engineering and Management	Construction projects	The goal of this paper is to examine the importance of a set of factors for Collaborative Working Arrangements (CWA) and to assess the relative importance of various factors for CWA.	M. M. Rahman & Kumaraswamy (2004); A. P. Chan et al. (2004)
Rahman et al. (2014)	Procedia - Social and Behavioral sciences	Construction industry	The goal of this paper is to identify the view of contractors on the importance of collaboration in the construction supply chain.	Stiles (1995)
Suprapto (2016) p.28; p.62	Dissertation	Capital projects	This dissertation shows that collaboration requires shared relational attitudes between client and contractor.	Aarseth et al. (2012); Alderman & Ivory (2007); Anderson Jr & Polkinghorn (2010); Baiden & Price (2011); Bayliss et al. (2004); Berends (2007); Black et al. (2000); Bosch-Rekveldt (2011); Bresnen & Marshall (2002); A. P. Chan et al. (2004, 2006); P. R. Davis & Walker (2007); Drexler & Larson (2000); Barlow (2000); Ross (2003); Laan et al. (2011); Lui & Ngo (2004); Meng (2012); Ng et al. (2002); Pinto et al. (2009)
Suprapto et al. (2016)	International journal of project management	Capital projects	The paper shows an analysis of 113 projects with a result that suggested that through relational attitudes and teamworking quality are important.	Meng (2012); Pinto et al. (2009); M. Rahman & Kumaraswamy (2008); Smyth et al. (2010); Suprapto et al. (2015); Hoegl & Gemuenden (2001); Young & Poon (2013)
Thompson & Sanders (1998)	Journal of Management and Engineering	Construction projects	The paper shows the different degrees of partnering; from competition, to cooperation, to collaboration and ending with coalescence.	X

Wondimu et al. (2016)	Journal of management in Engineering	Infrastructure projects	The goal of this research is to propose suitable approaches to implement Early Contractor Involvement.	X
Van Riggelen (2019)	Master of Science Thesis	Infrastructure projects	The goal of this research is to define how the benefits of bouwteams can be achieved in construction projects.	X
Xue et al. (2010)	Journal of management in engineering	Construction projects	The goal of this paper is to present a definition of collaborative working underpinned by the principle of collaboration.	Chan et al. (2004); Yeomans et al. (2006); Hauck et al. (2004); Chan et al. (2004); Xue et al. (2010); Yeung et al. (2007); Jefferies (2006); A. P. Chan et al. (2004)

Table B.1: Detailed list of references read in-depth to collect success factors

The remaining references are used to collect success factors of collaboration in the construction industry. To set up the Q-concourse, all mentioned success factors of collaboration are collected from the references. In doing so, no distinction is yet made between relevant and irrelevant statements, and they are taken over as literal as possible to reduce researcher bias (Minkman et al., 2017). The goal of this is to collect a broad collection of statements that covers the whole subject of interest. After that, the statements are critically examined to determine which are valuable for this research and which are not, based on the aspects of client-contractor collaboration and bouwteams, identified in section 3.1 and 3.2. A statement is relevant for this research when one of the following applies:

- The success factor is related to the design phase of a project and therefore to one of the bouwteam phases;
- The success factor applies from the moment the contractor is involved in negotiations about the bouwteam agreement;
- The success factor applies from the moment both client and contractor have the intention to collaborate in a bouwteam.

After the removal of irrelevant statements, a word count is done to determine which ones are reoccurring in literature. The top five mentioned words are trust (16), communication (10), joint (10), commitment (9) and performance (9). The words *project team, client* and *contractor* are all often mentioned as well, but these are considered to be too generic and could be included in many of the statements. Furthermore, double counting is not yet taken into account at this stage, meaning that identical or similar statements are still present in the Q-concourse and therefore in the word count. However, the word count reflects the importance of themes of collaboration since they are mentioned more often than others. Next, similar or identical statements are merged into one, and after this, the collection of statements remaining is the Q-concourse from literature. To make the Q-concourse clear and understandable for the Q-interviews, some statements are rewritten (see table B.2). In doing so, the aim is to stay as close as possible to the original text, and if no adaptions are necessary for understanding, the statement is taken over literally. This process resulted in a Q-concourse of 147 statements extracted from literature. The high number of unique statements can be explained by the different levels of detail present among them; from general to specific statements. By removing irrelevant and combining similar factors the Q-concourse results in 147 success factors.

B.1.2 Success factors of collaboration from interviews

Two interviews are conducted with employees of Ballast Nedam. The goal of the interviews is to identify success factors of collaboration in bouwteams from a contractor's perspective. These success factors are desired because success factors from literature are mainly focused on a client's perspective or a combination of a client's and contractor's perspective regarding collaboration in collaborative projects. However, this research only focuses on the contractor's perspective of collaboration in bouwteams. Therefore, adding success factors from two interviews to the Q-concourse is valuable for the research. A short explanation is given of the two interviewees:

- *Interview 1:* The first interview is conducted with the Head of the architectural department at Building Design and Engineering. The interviewee has been working for over twelve years at Ballast Nedam and is therefore found suitable to interview. He is involved in monitoring costs, assigning people, addressing problems in projects. Additionally, he has the responsibility (together with some other employees) over design & engineering in which (market) developments, business plans and visions are formulated. Furthermore, the interviewee has experience with working in bouwteams, recently and in the past. In doing so, the interaction between the different disciplines

is experienced.

- *Interview 2:* The second interview is conducted with the director of Asset Management of Ballast Nedam. Currently, the interviewee is involved in PPP projects but has experienced bouwteam projects in his over 13 years of experience at Ballast Nedam. Among others, he was involved in the tender department of Ballast Nedam. During his experience, he noticed that the popularity of bouwteams is dependent on the situation of the market.

From the interviews, 67 success factors of bouwteams are extracted. These success factors are taken over as literally mentioned as possible. After extracting the success factors from the interviews, identical or similar factors are combined into one success factor. Thereafter, all success factors are categorized in the elements of collaboration with the help of the example factors mentioned in section 3.1.

B.1.3 Q-concourse

The success factors from literature and the interviews are combined into one Q-concourse. This Q-concourse consists of 192 success factors of collaboration in bouwteams. The Q-concourse is displayed in table B.2. In the table, it is indicated from which reference(s) the success factor is extracted. Furthermore, the success factors are displayed per category. In doing so, a success factor can only belong to one category.

In the table, two types of marks are used to indicate:

- "grey coloured row": Indicates which success factors are included in the Q-set.
- "*": Indicates from which success factors the formulation of the factor is (slightly) changed.

Success Factor	Adelback & Johansson (2013)	Akintoye & Main (2007)	Chan et al. (2004)	Nasir & Hadikusumo (2018)	Rahman & Kumaraswamy (2005)	Rahman et al. (2014)	Suprapto (2016)	Suprapto et al. (2016)	Thompson & Sanders (1998)	Van Riggelen (2019)	Wondimu et al. (2016)	Xue et al. (2010)	Interview 1	Interview 2	Total
Capability															
Proper design present at the start of the bouwteam													x		1
Internal project kick-off to appoint right people for the right reasons													x		1
Responsibilities are carried by the party responsible														x	1
Attention is paid to the type of client														x	1
A flexible management style		x													1
Sufficient time resources for collaboration	x*	x													2
Sufficient budgetary resources for collaboration	x*	x													2
Adequate staff resources	x*	x	x*												3
Early involvement of the stakeholders							x*					x	x		3
Feedback capabilities	x														1
A early involved project team leader	x		x												2
A continued involved project team leader	x		x				x								3
Knowledge of the client of execution	x*		x												2
Size of the client's organization			x												1
Client's emphasis on quick construction			x												1
Ability of the client to make decision			x								x*				2
Early involvement of contractors	x*										x*		x		3
Qualification of the contractors							x*				x				2
Competent internal team							x								1
Project management capability							x*				x				2
Technical capability							x*				x				2
Financial capacity							x*								1

Contractor's team capability						x					1
Contractor's track-record in terms of innovation			x*								1
Technical skills of the project team leaders		x						x*			2
Organizing skills of the project team leaders	x*	x									2
Coordinating skills of the project team leaders	x*	x									2
Motivating skills of the project team leaders (leaders experience)	x	x*		x							3
Contract											
Positive contractual incentives					x*				x*	x	3
Negative contractual incentives					x*				x*	x	3
Gain-share arrangement									x		1
Pain-share arrangement									x		1
Control mechanisms	x									x*	2
Proper compensation for the contractor's contribution								x			1
Clear appraisal criteria on deliverables					x						1
Clear appraisal criteria on behavioral performance					x						1
Clear definition of roles before the bouwteam starts working	x*				x*					x	3
Clear definition of responsibilities					x						1
Fair risk allocation				x*	x			x*			3
Clear agreements about the price							x				1
Specified payment arrangements					x*					x	2
Financial range is agreed upfront by client and contractor									x		1
Defined end goal of the bouwteam									x	x	2
Defined scope of the bouwteam					x				x	x	3
End of the bouwteam is defined									x		1
Defined how to proceed after the bouwteam ends										x	1
Formal contract									x		1
Joint Working											
Shared risks		x							x		2
High performance teams									x		1
Clear allocation of risks				x							1
Agreed process for dispute resolution				x	x*	x*					3
Responsiveness of the contractor to changes		x*	x								2
Focus on technically advantageous solutions	x										1
Performance management		x*			x						2
Joint planning with all participants	x*						x				2
Joint decision-making						x			x*		2
Joint problem solving				x	x	x			x*		4
Joint risk management					x	x					2
Joint effort towards continuous improvement						x					1
Clear project planning		x*									1
Effective safety program	x										1
Innovative solutions	x	x*									2
Performance measurement				x*					x		2
Substantiate origin of risks										x	1
Express and discuss issues together										x	1
Design a process how to interact with each other										x	1
Propose solutions when raising problems										x	1

Maintain a balance between time, cost, and quality											x	1
Defined process for decision-making											x	1
Relational Attitude												0
Support of senior management	x*				x*	x*				x		4
Long-term orientation	x		x*	x*	x*							4
Understanding of each other's individual roles	x											1
Long-term relationships					x*				x			2
Flexibility					x*				x			2
Open and transparent communication			x*		x							2
Understanding each others' objectives			x		x*						x	3
Make compromises on unclear issues			x									1
Professional attitude			x*									1
Development of a partnering culture			x									1
Traditional owner, contractor and subcontractor hierarchy			x									1
Learning from the relationship		x										1
Project team leader's commitment to meet cost, time and quality	x											1
Project team leader's adaptability to changes in the project	x				x*				x*			3
Inter-organizational trust					x	x						2
Transparency					x				x*			2
No blame culture					x							1
Multi-level collaboration				x								1
Engagement in the project team					x							1
Emotional attachment in the project team					x							1
Get people to believe in the project team					x*							1
Trust from successful relationships					x							1
Treat owner's objectives as the objectives from everyone		x			x							2
Understanding of cultural differences					x							1
Individual attitudes are more important than culture					x							1
Collaborative attitude of project members (willingness to collaborate)			x*		x						x	3
Ignore long-term orientation					x							1
Win-win attitude		x*			x			x*		x	x	5
Interdependence					x							1
Strive for equality in behaviour and duties for client and contractor							x				x	2
Open budget estimation							x		x*			2
Collaboration with different races to gain benefits				x								1
The reasons for collaborating in a bouwteam should be clear to the potential contractor							x					1
Determine general costs (staartkosten) at the beginning of project start-up							x					1
Tolerate each others roles											x	1
Involvement of like-minded people in design optimisation										x		1
Active influence of the contractor on the design										x		1
Active attitude										x		1
Client's principles are clear										x		1
Show that perspectives are understood from one another										x		1

Compliment each other								x			1
Listen to each other without interrupting								x	x		2
Take initiative in working together								x			1
Express interests during project start-up									x		1
Discuss fundamental requirements during project start-up									x		1
Separation of business and private relationships									x		1
Relations are maintained by senior management									x		1
Stay open-minded by slowing down drawing of conclusions									x		1
Team Integration											
Development of common processes and tools	x*						x*	x			3
Cost estimation as a parallel activity to designing						x					1
Communication of conflict resolution strategies								x			1
Enhancement of communication methods								x			1
Evenly distribution of benefits		x									1
Support of collaborative arrangements								x			1
Integrated project teams			x*		x			x			3
Risk awareness				x							1
Compatible organizational culture				x							1
Contractor understands owners business			x								1
Share of business plans						x					1
Development of project team culture over time				x	x						2
Healthy competition within the team					x						1
Reward for team performance					x						1
Dedicated structure	x*				x						2
Work together at 1 location						x					1
Competence trust					x						1
Separate conversations in small groups per discipline							x*		x		2
Seamless operation without organizational boundaries					x						1
Unrestricted cross-sharing of information				x*	x	x			x*	x*	5
Equitable relation and respect for all					x				x*		2
Collective responsibility for all project outcomes				x	x						2
Execution of the project is part of the bouwteam									x		1
Involving the right people at the right moment						x*			x		2
Clear reporting									x		1
Specified limits of information sharing									x		1
Specified composition of the bouwteam									x		1
Assign a process manager responsible for collaboration and integration						x					1
Invest time in project start-up						x					1
Use of working sessions based on specialisms										x	1
Right type of people involved										x	1
Face-to-face contact as a primary tool									x	x	2
Team Working											
Regular meetings				x*			x		x		3
High level of trust		x			x			x*			3
Regular team-building activities				x*		x					2
Shared vision					x	x					2
Frequent informal meetings				x							1

Common viewpoint on collaboration								x			1
Mutual trust			x		x			x			3
High level of commitment		x		x	x			x*			4
Good communication		x			x	x		x			4
Cooperation					x			x			2
Alignment of objectives			x		x					x	3
Trust-based relationship between client and contractor	x				x*		x				3
Make everyday tasks efficient	x	x*									2
Continuously coordinate activities			x		x						2
Use full potential of knowledge and expertise	x				x*						2
Align efforts to expected priority					x	x					2
Affective trust among team members	x*				x	x					3
Encourage teamwork				x							1
Collaboration with same race to complement each other				x							1
Communication among project team members				x							1
Develop trust by friendship				x*							1
Develop trust by proven performance					x						1
Consistency in displaying trust and confidence					x						1
Team identity					x						1
Support each other in anticipating unforeseen events					x						1
Participation within the team					x						1
Have an elaborated project start-up with a focus on processes							x			x	2
Have an elaborated project start-up with a focus on people							x			x	2
Evaluate the bouwteam during the project							x			x	2
Mutual support						x					1
Discuss expectations from each other during project start-up							x				1
Pay extra attention to inexperienced bouwteam participants							x				1
Responding to clients' need		x									1
Efficient communication									x		1
Develop trust by talking to each other									x		1
One person is responsible for integrality									x		1
One person per discipline reports to person responsible for integrality (per organization)						x*			x		2
Collaboration through all processes of the bouwteam									x		1
Early use of questionnaires to discuss unclarities									x		1
Problems that can be substantiated are mentioned, others not									x		1
Trust in each other									x		1
One person maintains the overview										x	1
Commitment of bouwteam participants										x	1

Table B.2: Final Q-set of success factors of collaboration in bouwteams

B.1.4 Definition of the Q-set

From the Q-concourse a set of success factors is extracted that forms the Q-set. The goal of this process is to include at least 6 success factors per category. However, the Q-set should cover the subject of interest from all different aspects identified in chapter 3. The final Q-set consists of 38 success factors and is shown in table 4.2. For the

establishment of the Q-set, several considerations are made per category described in 4.2. In table B.2, the highlighted success factors represent the success factors included in the Q-set.

B.2 Step 3: Selecting the P-set

Table B.3 shows an overview of the participants included in the P-set. In the P-set a distinction is made between process management, design management and cost management. In process management tender managers, plan developers, and project managers are included, in design management MEP-engineers, and design-engineers are included and in cost management calculators, and scheduling and logistics experts are included. For each participant, their participant group, function, company and name are given.
In the column of companies, three different companies can be displayed. The first one is Ballast Nedam, the company supporting the research. Heddes and Laudy are partners of Ballast Nedam and are construction and development companies.

Nr.	Group	Function	Company	Experience
1.	Process Management	Tender Manager	Ballast Nedam	Over 20 years
2.	Process Management	Tender Manager	Ballast Nedam	5-10 years
3.	Process Management	Tender Manager	Ballast Nedam	10-15 years
4.	Process Management	Tender Manager	Ballast Nedam	5 - 10 years
5.	Process Management	Plan Developer	Ballast Nedam	Over 20 years
6.	Process Management	Tender manager	Ballast Nedam	10- 15 years
7.	Process Management	Project Manager	Laudy	10 - 15 years
8.	Process Management	Plan Developer	Laudy	Over 20 years
9.	Process Management	Project Manager	Laudy	10 - 15 years
10.	Process Management	Plan Developer	Heddes	15-20 years
11.	Design Management	MEP[1]	Ballast Nedam	15-20 years
12.	Design Management	MEP	Ballast Nedam	5 - 10 years
13.	Design Management	MEP	Ballast Nedam	10 - 15 years
14.	Design Management	MEP	Ballast Nedam	10 - 15 years
15.	Design Management	Design & Engineering	Ballast Nedam	15 - 20 years
16.	Design Management	Design & Engineering	Ballast Nedam	15 - 20 years
17.	Design Management	Design & Engineering	Ballast Nedam	10 - 15 years
18.	Cost Management	Calculator	Ballast Nedam	15 - 20 years
19.	Cost Management	Scheduling & Logistics	Ballast Nedam	15 - 20 years
20.	Cost Management	Scheduling & Logistics	Ballast Nedam	15 - 20 years
21.	Cost Management	Procurement	Ballast Nedam	15 - 20 years
22.	Cost Management	Calculator	Laudy	Over 20 years
23.	Cost Management	Calculator	Heddes	Over 20 years
24.	Cost Management	Calculator	Heddes	15 - 20 years
25.	Cost Management	Scheduling & Logistics	Ballast Nedam	Over 20 years
26.	Cost Management	Calculator	Ballast Nedam - Over 20 years	

Table B.3: Selected P-set

B.3 Step 4: Collect Q-sorts

After the Q-set and the P-set are defined, the Q-sets can be sorted by the P-set what is called Q-sorting. A Q-sort is a viewpoint regarding the subject of interest, collaboration in bouwteams, defined by a participant. In this step, the P-set sorts the success factors according to a predefined Q-sorting process. In doing so, they prioritize the success factors based on the condition of instruction formulated (Van Exel & De Graaf, 2005). The process and procedures for collecting Q-sorts are given in appendix C, giving the summaries of the performed Q-sorting processes and interviews are given as well.

B.4 Step 5: Q-analysis

In using Q-methodology, clusters of perspectives of participants that have a similar ranking are generated. To achieve this, Q-analysis is performed on the collected Q-sorts. The steps of Q-analysis are given in section B.4.1 until and including section B.4.4.

B.4.1 Correlation matrix

At first, a correlation matrix is created reflecting the relationship of a Q-sort with every other Q-sort. The correlation matrix shows similarities and differences between different perspectives (Q-sorts) (Watts & Stenner, 2005; Van Exel & De Graaf, 2005). The correlation matrix of this research is shown in table B.4. The viewpoints produced by the participants during the Q-interviews are shown, representing 100% of the meaning and variability of the research. Removing any of the Q-sorts from the correlation matrix, would alter the meaning of the results. Watts & Stenner (2012). In the correlation matrix, nearly all correlations are positive; meaning that there is consensus between the participants. The few negative correlations indicate that some participants have a contradicting view. Furthermore, the height of the correlation indicates whether there is a high degree of consensus or contradiction. All contradicting correlations are low, indicating that there is a minimal contradiction between the participants. Additionally, there are many correlations between 0.35 and 0.55, indicating that there is some degree of consensus between participants. These participants similarly sorted the Q-set, but not close to identical (they are not yet highly inter-correlated).

Table B.4: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Tender manager	1.00	0.39	0.68	0.46	0.36	0.30	0.63	0.20	0.36	0.25	0.55	0.40	0.16	0.45	0.40	0.56	0.28	0.50	0.41	0.65	0.50	0.66	0.39	0.48	0.53
2. Tender manager		1.00	0.32	0.06	0.22	0.29	0.38	0.05	0.11	0.13	0.36	0.39	0.03	0.23	0.28	0.09	0.41	0.39	0.16	0.33	0.32	0.46	0.27	0.16	0.60
3. Tender manager			1.00	0.26	0.43	0.25	0.53	0.03	0.41	0.24	0.58	0.33	0.14	0.52	0.06	0.61	0.36	0.51	0.39	0.52	0.47	0.41	0.34	0.46	0.48
4. Plan developer				1.00	0.32	0.12	0.37	0.32	0.23	0.02	0.57	0.54	0.07	0.33	0.04	0.35	0.35	0.39	0.40	0.42	0.25	0.35	0.36	0.25	0.23
5. Plan developer					1.00	0.29	0.06	0.31	0.15	0.05	0.37	0.27	0.12	0.01	0.04	0.44	0.33	0.09	0.11	0.15	0.17	0.35	0.19	0.11	0.32
6. Tender manager						1.00	0.07	0.06	0.28	0.11	0.09	0.17	0.10	0.08	0.27	0.04	0.36	0.18	0.07	0.19	0.29	0.28	0.15	0.29	0.32
7. Project manager							1.00	0.18	0.42	0.44	0.54	0.51	0.43	0.35	0.38	0.57	0.36	0.57	0.56	0.67	0.51	0.53	0.54	0.46	0.46
8. Plan developer								1.00	0.02	0.13	0.25	0.33	0.11	0.05	0.25	0.15	0.36	0.21	0.05	0.02	0.09	0.32	0.38	0.30	0.31
9. Project manager									1.00	0.46	0.40	0.37	0.33	0.23	0.22	0.19	0.28	0.42	0.42	0.54	0.60	0.41	0.31	0.55	0.43
10. Project manager										1.00	0.32	0.29	0.40	0.20	0.38	0.09	0.40	0.43	0.39	0.45	0.54	0.28	0.24	0.46	0.39
11. Manager MEP											1.00	0.62	0.33	0.42	0.09	0.37	0.46	0.62	0.62	0.53	0.41	0.50	0.58	0.46	0.46
12. Manager MEP												1.00	0.38	0.39	0.20	0.26	0.51	0.70	0.43	0.58	0.40	0.46	0.49	0.45	0.42
13. Design leader													1.00	0.22	0.39	0.08	0.21	0.52	0.25	0.56	0.24	0.26	0.32	0.26	0.08
14. Design leader														1.00	0.04	0.24	0.32	0.45	0.48	0.52	0.16	0.09	0.35	0.36	0.35
15. Design leader															1.00	0.17	0.15	0.32	0.12	0.43	0.33	0.44	0.19	0.46	0.36
16. Design leader																1.00	0.07	0.30	0.31	0.45	0.34	0.34	0.30	0.32	0.31
17. Design leader																	1.00	0.46	0.35	0.42	0.33	0.43	0.37	0.25	0.38
18. Calculator																		1.00	0.55	0.57	0.52	0.55	0.51	0.60	0.54
19. S&L coordinator																			1.00	0.56	0.41	0.25	0.46	0.36	0.36
20. S&L coordinator																				1.00	0.60	0.54	0.40	0.42	0.38
21. Facade coordinator																					1.00	0.54	0.30	0.53	0.47
22. Calculator																						1.00	0.25	0.49	0.54
23. Calculator																							1.00	0.45	0.30
24. Calculator																								1.00	0.48
25. S&L coordinator																									1.00

B.4.2 Factor extraction

After extraction and observation of the correlation matrix, by-person factor analysis is conducted. Similar Q-sorts are grouped to one factor, and each factor represents the shared perspective of a group of participants. Part of the factor analysis is factor extraction with the aim *"to explain as much as we can about the relationships that hold between the Q-sorts in the group through the identification of, and by reference to, any sizeable portions of common or shared meanings"* (Watts & Stenner, 2012). Factor extraction is a data reduction method that reduces complexity. By extraction, a set of factors is derived representing groups of Q-sorts (variables) that lead to the key perspectives of a group of participants. For factor extraction, two alternative methods can be applied: Centroid Factor Analysis (CFA) or Principal Component Analysis (PCA). The difference between the methods is that CFA focuses on the commonality of Q-sorts and not on the individual sorts resulting in the best possible solution while PCA focuses on both the commonality among Q-sorts and on individual sorts resulting in the mathematically best solution (Webler et al., 2009; Watts & Stenner, 2012). According to Watts & Stenner (2005) and Webler et al. (2009) both methods give similar results and could both be used for factor analysis. In this research, there is chosen to conduct PCA to get the mathematical best solution possible.

For the PCA, the first step is to extract a number of factors. The default setting of PCA is to extract eight factors, and therefore eight factors are extracted. An unrotated factor loadings matrix is the result of the PCA and is depicted in table B.5. In the matrix, each Q-sort (row) has a factor loading on each factor. If a factor loading is squared, it indicates what extent a factor can explain a viewpoint (e.g. Factor 1 accounts for 59,7% (0.7724*0.7724) of the variance of Q-sort 1).

Participant	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	h2
1. Tender manager	0.7724	0.2313	0.0143	-0.2819	0.1842	-0.1361	0.0164	0.1041	0.7933
2. Tender manager	0.4893	0.1795	0.3081	-0.0533	-0.4062	-0.5867	-0.0408	-0.0388	0.8818
3. Tender manager	0.6940	0.2578	-0.1814	-0.4281	-0.0798	0.0221	0.1103	-0.0762	0.7891
4. Plan developer	0.5300	0.3554	-0.3347	0.2998	0.0828	0.2156	-0.2026	0.1307	0.7205
5. Plan developer	0.3582	0.7033	0.1387	0.0156	0.0372	0.1936	-0.1435	-0.1866	0.7366
6. Tender manager	0.3174	0.2271	0.5384	-0.1372	-0.2812	0.2624	-0.1389	0.5384	0.9181
7. Project manager	0.7788	-0.1438	-0.1275	-0.0929	0.2217	-0.1993	-0.0249	-0.0527	0.7444
8. Plan developer	0.3058	0.2626	0.2792	0.6708	0.3355	0.0550	0.2690	-0.1095	0.8903
9. Project manager	0.6144	-0.2575	0.0865	-0.2014	-0.0723	0.4807	-0.0336	-0.0560	0.7324
10. Project manager	0.5208	-0.5543	0.2117	0.0443	-0.1695	0.1980	0.1214	-0.283	0.7881
11. Manager MEP	0.7738	0.1454	-0.2765	0.1813	-0.0849	0.0457	-0.0074	-0.1419	0.7587
12. Manager MEP	0.7258	0.0275	-0.1057	0.3781	-0.0922	-0.0538	-0.1550	0.0457	0.7192
13. Design leader	0.4384	-0.5894	-0.1093	0.2233	0.2492	-0.1262	-0.2838	-0.0025	0.7600
14. Design leader	0.5161	-0.0565	-0.5322	-0.0918	-0.2835	-0.1919	0.2709	0.1630	0.7785
15. Design leader	0.4324	-0.3054	0.5469	-0.0335	0.3702	-0.2369	-0.0030	0.2250	0.8242
16. Design leader	0.5184	0.3915	-0.2331	-0.3392	0.5033	-0.0340	0.0091	-0.0304	0.8469
17. Design leader	0.5910	0.1084	0.1361	0.3624	-0.4135	0.0367	-0.1892	-0.0454	0. 7210
18. Calculator	0.8030	-0.1855	-0.0743	0.1533	-0.0765	-0.1009	0.0513	0.0312	0.7278
19. S&L coordinator	0.6437	-0.1560	-0.3952	-0.0535	-0.1766	0.1370	-0.0003	0.0210	0.6482
20. S&L coordinator	0.8004	-0.2232	-0.1340	-0.1604	0.0700	-0.0696	-0.3422	0.1015	0.8713
21. Facade coordinator	0.6938	-0.1679	0.2183	-0.2565	-0.0087	0.2483	-0.0791	-0.1990	0.7307
22. Calculator	0.7120	0.1296	0.3561	-0.0109	0.1563	-0.1013	-0.1971	-0.1787	0.7562
23. Calculator	0.6214	0.0156	-0.1829	0.3314	0.0666	-0.0060	0.2277	0.2658	0.6566
24. Calculator	0.6892	-0.1645	0.1628	-0.0297	0.1479	0.2430	0.4337	0.1768	0.8289
25. S&L coordinator	0.6891	0.1408	0.2994	-0.0888	-0.1963	-0.1582	0.3298	-0.1858	0.7990

Table B.5: Unrotated factor matrix

In table B.5 the last column depicts *communality*. Communality indicates how much the Q-sort has in common with the other Q-sorts in the research. If communality of a Q-sort is high, it means that the Q-sort is typical of representative for the group. However, is a communality is low, it means that the Q-sort is atypical and cannot be associated with any of the extracted factors because there is not enough common ground (Watts & Stenner, 2012). In this research, there are no low communalities.
Furthermore, it is visible that factor 1 identifies a large portion of the Q-sorts. This is because this is the first principal component identified that the participants have in common. It shows the highest variability in the data and in every study the first factor identifies a large part of the Q-sorts (Watts & Stenner, 2012; Van Duin et al., 2018). The factors

succeeding the first one are always smaller since there is less common ground to identify. The % shows the portion of common ground identified per factor explained variance in table B.6.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Eigenvalue	9.5897	2.1192	1.9541	1.5939	1.3391	1.1353	0.9114	0.7802
Variance explained [%]	38	8	8	6	5	5	4	3
Cumulative variance explained [%]	38	47	55	61	66	71	75	78

Table B.6: Eigenvalues and Variance of factors from Centroid Factor Analysis

In Q-methodology a number of factors to continue the research with should be determined. The criteria given by Webler et al. (2009) are taken into account while determining the appropriate number of factors and are *simplicity, clarity, distinctness and stability*. Furthermore, Watts & Stenner (2012) identified common rules of thumb that can be applied to determine the number of factors to continue the research with. The rules of thumb are applied and it is decided which factor to retain.

Eigenvalues (Kaiser-Guttman criterion)

The first criterion is the Kaiser-Guttman criteria that suggests that factors with an eigenvalue larger than 1.00 should be extracted and others not. This is because factors with an eigenvalue smaller than 1.00 explain less variance than they add (Watts & Stenner, 2005; Webler et al., 2009). However, the downside of this rule of thumb is that it often leads to an extraction of too many factors (Watts & Stenner, 2005; Kline, 1994).
In table B.6, the eigenvalues of the eight factors are shown. Applying the Kaiser-Guttman criterion results in retaining factor 1 (EV=9.5897), factor 2 (EV=2.1192), factor 3 (EV=1.9541), factor 4 (EV=1.5939), factor 5 (EV=1.3391) and factor 6 (EV=1.1353).

Significantly loading of Q-sorts

The third rule of thumb of Walker & Lloyd-Walker (2012) is outlined by Brown (1980) as well. It is argued only to accept those factors that have two ore more significant factor loadings. In this research, the desired level of statistical significance is 0.05 resulting in the following formula: $1.96\ (1/)$ in which N displays the number of items in the Q-set. In this research N = 38, resulting in a significant loading factor of 0.3179. However, it is also possible to use a statistical significance of 0.01, resulting in a significant loading factor of 0.418. Table B.7 shows the number of significant loadings per factor per statistical significance level.

Factor	# of loadings > 0.317	# of loadings > 0.418	Pass or fail (>0.317)	Pass or fail (>0.418)
Factor 1	23 loadings	21 loadings	Pass	Pass
Factor 2	5 loadings	3 loadings	Pass	Pass
Factor 3	6 loadings	3 loadings	Pass	Pass
Factor 4	6 loadings	2 loadings	Pass	Pass
Factor 5	5 loadings	2 loadings	Pass	Pass
Factor 6	2 loadings	2 loadings	Pass	Pass
Factor 7	3 loadings	1 loading	Pass	Fail
Factor 8	1 loading	1 loading	Fail	Fail

Table B.7: Overview: Significantly loadings of Q-sorts

Applying the significantly loading of Q-sorts rule results in the retaining of factor 1, 2, 3, 4, 5, 6 and 7 at 0.05 significance and factor 1, 2, 3, 4, 5 and 6 at the 0.01 significance interval. However, factor 4, 5 and 6 are on the borderline of passing this rule of thumb since they have two significant loadings for the 0.01 significance level. The same applies for factor 6 at the 0.05 significance level.

Humphrey's rule

The fourth rule of thumb is Humphrey's rule. This rule says that *"a factor is significant if the cross-product of its two highest loadings exceeds twice the standard error"*. The formula can calculate the standard error: $(1/)$ in which N displays the number of items in the Q-set. In this research N = 38, resulting in a standard error of 0.162. Twice the

standard error is therefore 0.324. In table B.8, the results from applying Humphrey's rule is shown. Since the rule can be applied in two ways, strict and less strictly, both outcomes are given.

Factor	Cross-product of highest loadings	Pass or fail (2xS.E.)	Pass or fail (1xS.E.)
Factor 1	0.8030 * 0.8004 = 0.6427	Pass	Pass
Factor 2	0.7033 * 0.5894 = 0.4145	Pass	Pass
Factor 3	0.5469 * 0.5384 = 0.2945	Fail	Pass
Factor 4	0.6708 * 0.4281 = 0.2871	Fail	Pass
Factor 5	0.5033 * 0.4135 = 0.2081	Fail	Pass
Factor 6	0.5867 * 0.4807 = 0.2820	Fail	Pass
Factor 7	0.4337 * 0.3298 = 0.1430	Fail	Fail
Factor 8	0.5384 * 0.2832 = 0.1534	Fail	Fail

Table B.8: Overview: Humphrey's rule

Applying the strict Humphrey's rule results in the retaining of factor 1 and factor 2. However, when the Humphrey's rule is applied less strictly, it results in the retaining of factor 1, factor 2, factor 3, factor 4, factor 5 and factor 6.

Scree plot

The last rule of thumb is the Scree plot. The Scree plot is a plot of the eigenvalues of the eight factors. The plot is designed for PCA and not for the CFA method. Therefore, this rule of thumb can only be applied when using PCA and the eigenvalues of PCA. A scree plot shows a line graph of the eigenvalues and the point where the slope changes, is the number of factors that should be retained. Figure B.1 shows the scree plot of this research. In the plot, the point at which the line changes slope is after factor 2. Applying the rule of thumb for the scree plot results in retaining factor 1 and factor 2.

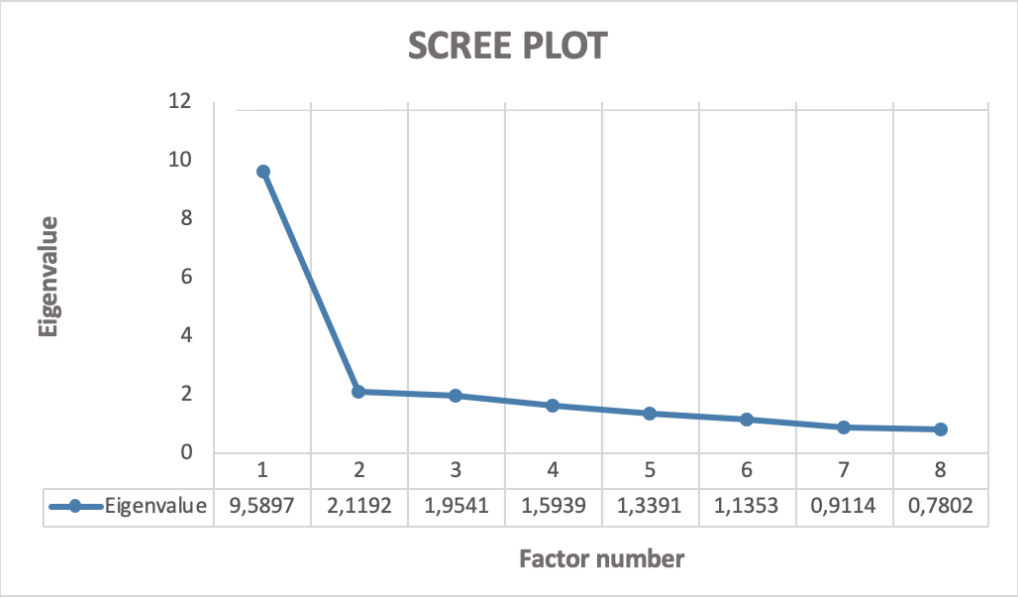

Figure B.1: Scree plot of eigenvalues of PCA

Conclusion: factor extraction

Deciding on how many factors to retain after conducting PCA is a complicated matter. In the above sections, four different rules of thumb from Watts & Stenner (2012) are applied. In table B.9 an overview is given of the results from the rules of thumb. The table shows that different solutions are possible, ranging from a two-factor solution to a 7-factor solution. When strictly applying the rules of thumb, the solution space lies in between a two-factor solution and a 6-factor solution. Therefore the different acceptable solutions are conducted before deciding on how many factors are extracted. In doing so, the number of factors should have a cumulative explained variance of at least

50% since this is similar to other researches. Furthermore, it is stated by Watts & Stenner (2012) that one factor should be extracted for every 6-8 participants.

Rule of thumb	# of factors	Factor numbers
Eigenvalues (Kaiser-Guttman criterion)	6 factors	Factor 1, 2, 3, 4, 5, and 6
Significantly loading Q-sorts (>0.317)	7 factors	Factor 1, 2, 3, 4, 5, 6 and 7
Significantly loading Q-sorts (>0.418)	6 factors	Factor 1, 2, 3, 4, 5 and 6
Humphrey's rule (strict)	2 factors	Factor 1 and 2
Humphrey's rule (less strict)	5 factors	Factor 1, 2, 3, 4 and 5
Scree plot	2 factors	N.A.

Table B.9: Overview: Results from rules of thumb

B.4.3 Number of factors for analysis

To determine the number of factors suitable for this research, the results of a two-factor, three-factor, four-factor, five-factor and six-factor solution are are analyzed and compared. For a factor solution to be valid, the following rules are applied:

1. Cumulative explained variance is at least 50% (Suprapto, 2016)
2. Valid factors that have at least two significant Q-sorts (Brown, 1980), determined by the following rules:
   - A Q-sort loads significantly if the factor loading is $>$ 0.317 (in the case of a significance interval of 0.05), calculated by 1.96 $(1/$; where N $= 38$ (Suprapto, 2016).
   - The highest squared factor loading explains more than half of the common variance, f2>h2/2 where h2 is the communality of a Q-sort (Suprapto, 2016).
3. The number of defining sorts for the total number of factors, more defining sorts are better (Van Exel & De Graaf, 2005).
4. The number of distinguishing statements per factor, more distinguishing statements are better (Van Exel & De Graaf, 2005; Watts & Stenner, 2012).

For all factors, it is determined whether the rules comply or not. In doing so, the Z-scores of the factor solutions including the "flagged" Q-sorts are given (indicated with an "X").

	Factor 1	Factor 2
p1	0.4139	0.6919X
p2	0.2400	0.4627X
p3	0.3382	0.6586X
p4	0.1513	0.6199X
p5	-0.2102	0.7607X
p6	0.0810	0.3818X
p7	0.6718X	0.4194
p8	0.0485	0.4002X
p9	0.6272X	0.2246
p10	0.7584X	-0.0576
p11	0.4729	0.6295X
p12	0.5171X	0.5101
p13	0.7213X	-0.1391
p14	0.4191X	0.3066
p15	0.5252X	0.0664
p16	0.1184	0.6388X
p17	0.3630	0.4788X
p18	0.7178X	0.4049
p19	0.5803X	0.3192
p20	0.7413X	0.3754
p21	0.6254X	0.3443
p22	0.4380	0.5761X
p23	0.4480X	0.4308
p24	0.6196X	0.3437
p25	0.4135	0.5689X
EV	25	22
Defining sorts	13	12
Distinguishing statements	27	-
Valid factor?	Yes	Yes

Table B.10: Two-factor solution

Looking at the cumulative explained variance (CEV), the two-factor solution explained 47%. This is below the required CEV of 50%, and therefore the two-factor solution fails on rule 1. However, both factors are acceptable since they have at least two factors that are > 0.418 and the highest squared factor loading explains more than half of the common variance (indicated with an "X").
The two-factor solution shows that all Q-sorts are either part of factor 1 or part of factor 2, resulting in a total of 25 defining Q-sorts, the maximum score. Finally, the fourth rule focusses on the number of distinguishing statements. Since there are only two factors, only the number of distinguishing statements for factor one are given. The other part of the statements is similar for factor 1 and 2. The rule says that a high number of distinguishing statements is desirable, but in this case, this number is over 70% of the total number of statements. Therefore, it is assumed that this rule does not apply to this factor because the number of factors is too small.
To conclude, the two-factor solution passes rule two and three and fails for rule one. The result of rule four is inconclusive.

	Factor 1	Factor 2	Factor 3
p1	0.5892X	0.2432	0.4940
p2	0.1848	0.1882	0.5450X
p3	0.6733X	0.1386	0.3293
p4	0.6921X	-0.0620	0.1904
p5	0.3655	-0.3420	0.6258X
p6	-0.0714	0.1014	0.6533X
p7	0.5744X	0.5210	0.2052
p8	0.1034	0.0137	0.4791X
p9	0.2855	0.5655X	0.2237
p10	0.0488	0.7789X	0.1192
p11	0.7570X	0.2543	0.2419
p12	0.5753X	0.3577	0.2824
p13	0.1948	0.6965X	-0.1688
p14	0.6894X	0.2230	-0.1668
p15	-0.1590	0.5970X	0.4446
p16	0.6278X	-0.0770	0.2763
p17	0.3470	0.2669	0.4334
p18	0.5430	0.5789	0.2338
p19	0.6558X	0.4018	-0.0579
p20	0.5695	0.5958X	0.1706
p21	0.2795	0.5637X	0.4017
p22	0.2903	0.3614	0.6601X
p23	0.5515X	0.2939	0.1712
p24	0.3143	0.5471X	0.3613
p25	0.3156	0.3281	0.6140X
EV	22	18	15
Defining sorts	10	7	6
Distinguishing statements	18	18	14
Valid factor?	Yes	Yes	Yes

Table B.11: Three-factor solution

Looking at the cumulative explained variance (CEV), the three-factor solution explains 55%. This is above the required CEV of 50%, and therefore the three-factor solution passes rule 1. Furthermore, all three factors are acceptable since they have at least two factors that are > 0.418 and the highest squared factor loading explains more than half of the common variance (indicated with an "X").
The three-factor solution shows that almost all Q-sorts are either part of factor 1, 2 or 3. Only participant 17 and participant 18 do not load on any factor because of the factor scores of participant 17 on factor 1 and factor 3 are close to each other (respectively 0,3470 and 0,4334). This participant can load on factor 1 and on factor 3, but has not one dominant perspective. Furthermore, the factor scores of participant 18 of factor 1 and 2 lie close to each other as well (respectively 0,5430 and 0,5789). The same applies to this participant; there is not one dominant perspective. This solution results in a total of 23 defining Q-sorts, close to the maximum score. Finally, the fourth rule focusses on the number of distinguishing statements. All factors have more than ten distinguishing statements, a high number.
To conclude, the three-factor solution passes all rules.

	Factor 1	Factor 2	Factor 3	Factor 4
p1	0.6316X	0.1429	0.5293	0.1740
p2	0.1639	0.0997	0.5414X	0.1987
p3	0.7791X	0.0540	0.3908	0.0412
p4	0.4642	-0.0768	0.0222	0.6223X
p5	0.2721	-0.4327	0.4974	0.3655
p6	-0.0335	-0.0049	0.6766X	0.0446
p7	0.5563	0.4722	0.2497	0.2394
p8	-0.2414	-0.0153	0.2560	0.7526X
p9	0.3501	0.5091X	0.3310	0.0225
p10	0.0400	0.7533X	0.2192	0.0898
p11	0.5827	0.2194	0.1482	0.5652
p12	0.3323	0.3300	0.1643	0.6599X
p13	0.1009	0.7248X	-0.1288	0.2219
p14	0.6694X	0.2323	-0.1590	0.1843
p15	-0.1321	0.5225	0.5377	0.0276
p16	0.6944X	-0.1448	0.2858	0.0811
p17	0.1260	0.2192	0.3174	0.5884X
p18	0.4160	0.5412	0.2196	0.4404
p19	0.6215X	0.3953	-0.0357	0.2324
p20	0.5871	0.5468	0.2483	0.1698
p21	0.3602	0.4775	0.5144	0.0260
p22	0.2369	0.2553	0.6559X	0.3150
p23	0.3368	0.2807	0.0646	0.5773X
p24	0.2889	0.4814	0.4069	0.2207
p25	0.2966	0.2240	0.6267X	0.2475
EV	18	15	15	13
Defining sorts	5	3	4	5
Distinguishing statements	8	10	7	8
Valid factor?	Yes	Yes	Yes	Yes

Table B.12: Four-factor solution

Looking at the cumulative explained variance (CEV), the four-factor solution explains 61% which is above the required CEV of 50%, and therefore the four-factor solution passes rule 1. Furthermore, all four factors are acceptable since they have at least two factors that are > 0.418 and the highest squared factor loading explains more than half of the common variance (indicated with an "X").
The four-factor solution shows that almost two-third of the Q-sorts load on one of the factors (17 defining Q-sorts). However, participant 5, 7, 11, 15, 18, 20, 21 and 24 do not load on any factor. In some cases this is because participants load on multiple factors, or because they do not load on at all. Compared to the two-factor solution and the three-factor solution, the number of defining Q-sorts is relatively small. Finally, the fourth rule focusses on the number of distinguishing statements. All factors have more than five distinguishing statements. This number is small in comparison to the two-factor solution but is more significant in comparison to the five-factor and six-factor solution. Therefore, this factor solution passes the fourth rule.
To conclude, the four-factor solution passes rule 1, 2 and 4 but fails on rule 2 since the number of defining Q-sorts is relatively low.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
p1	0.3039	0.6627X	0.3205	0.0838	0.3499
p2	0.2168	0.0463	0.6835X	0.0302	0.1312
p3	0.4608	0.6114	0.3535	-0.1841	0.1601
p4	0.5547	0.3350	0.0445	0.4351	-0.0681
p5	0.0765	0.4974	0.4527	0.3573	-0.2405
p6	-0.1083	0.0778	0.7115X	0.0344	0.1220
p7	0.4443	0.4140	0.0559	0.1048	0.5642
p8	-0.0091	0.0461	0.1011	0.8819X	0.1131
p9	0.2980	0.1556	0.2653	-0.1224	0.5465X
p10	0.2595	-0.2343	0.2227	-0.0477	0.6928X
p11	0.7068X	0.2822	0.2111	0.2732	0.1949
p12	0.6118X	0.0697	0.2322	0.4183	0.2867
p13	0.3061	-0.1026	-0.2823	0.1611	0.6735X
p14	0.7566X	0.1514	0.0342	-0.1979	0.0774
p15	-0.2549	0.1366	0.1774	0.2221	0.7437X
p16	0.1808	0.8866X	-0.0478	0.1024	0.1150
p17	0.4862	-0.1420	0.5441	0.3307	0.1413
p18	0.5911	0.1073	0.2240	0.1961	0.5143
p19	0.7093X	0.1646	0.0635	-0.1020	0.2903
p20	0.5091	0.3356	0.1285	-0.0295	0.5915
p21	0.2154	0.2749	0.3783	-0.0704	0.5943X
p22	0.1084	0.3776	0.4486	0.3196	0.4663
p23	0.5321X	0.1438	0.0545	0.3977	0.2628
p24	0.2375	0.2505	0.2241	0.1625	0.5963X
p25	0.2528	0.2354	0.6243X	0.1098	0.3310
EV	18	12	12	8	17
Defining sorts	5	2	3	1	6
Distinguishing statements	2	3	4	5	4
Valid factor?	Yes	Yes	Yes	No	Yes

Table B.13: Five-factor solution

Looking at the cumulative explained variance (CEV), the five-factor solution explains 67%. This is above the required CEV of 50% and therefore the five-factor solution passes rule 1. However, only four factors are acceptable since there is one factor that has only one significantly loading Q-sort.

The five-factor solution shows that almost two third of the Q-sorts load on one of the factors (17 defining Q-sorts). However, participant 3, 4, 5, 7, 17, 18, 20 and 22 do not load on any factor. In some cases this is due to the fact that participants load on multiple factors but it can also be because they do not load on any factor at all. Compared to the two-factor solution and the three-factor solution, the number of defining Q-sorts is relatively small. Finally, the fourth rule focusses on the number of distinguishing statements. No factor has more than 5 distinguishing statements. In comparison to the two-factor, three-factor and four-factor solution this is a small number of distinguishing statements. Therefore, this factor solution fails on this rule.

To conclude, the five-factor solution passes rule 1 but fails on rule 2, 3 and 4 since there is an invalid factor, the number of defining Q-sorts is relatively low, and the number of distinguishing statements per factor is low.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
p1	0.2979	0.6949X	0.0910	0.0997	0.3495	0.2650
p2	0.1989	0.0978	0.0454	-0.0178	0.9094X	-0.0132
p3	0.4362	0.6091	-0.1586	-0.1496	0.2579	0.3096
p4	0.5843X	0.2903	-0.1766	0.4391	-0.0925	0.0637
p5	0.0933	0.4210	-0.5066	0.4299	0.2056	0.1072
p6	-0.1271	0.0369	-0.3433	0.1559	0.4140	0.5271
p7	0.4435	0.4891	0.4368	0.0725	0.2162	0.2494
p8	0.0498	0.0340	0.1006	0.8861X	0.0841	0.0032
p9	0.2738	0.1563	0.0521	-0.0147	-0.0250	0.7907X
p10	0.2395	-0.1817	0.3711	-0.0011	0.1462	0.6661X
p11	0.7167X	0.2826	0.0137	0.2615	0.1697	0.2183
p12	0.6302X	0.0906	0.1648	0.3896	0.2685	0.1916
p13	0.3162	-0.0050	0.7224X	0.1031	-0.0601	0.2082
p14	0.7390X	0.1795	0.0765	-0.2666	0.1521	-0.0027
p15	-0.2514	0.2343	0.5967	0.2335	0.3567	0.3430
p16	0.1901	0.8915X	0.0008	0.1120	-0.0407	0.0282
p17	0.4910	-0.1538	-0.1000	0.3449	0.4504	0.2943
p18	0.5913	0.1625	0.3346	0.1719	0.3053	0.3368
p19	0.6948X	0.1790	0.0916	-0.1053	0.0024	0.3370
p20	0.4957	0.4006	0.3665	-0.0365	0.1997	0.4028
p21	0.1922	0.2994	0.1278	0.0178	0.2030	0.7074X
p22	0.1141	0.4146	0.1762	0.3538	0.4594	0.3650
p23	0.5547X	0.1628	0.1925	0.3688	0.0909	0.1364
p24	0.2351	0.2776	0.2271	0.2284	0.0931	0.6047X
p25	0.2395	0.2621	0.0179	0.1367	0.6213X	0.3530
EV	18	12	8	8	10	14
Defining sorts	6	2	1	1	2	4
Distinguishing statements	1	1	3	2	4	3
Valid factor?	Yes	Yes	No	No	Yes	Yes

Table B.14: Six-factor solution

Looking at the cumulative explained variance (CEV), the six-factor solution explains 71%. This is above the required CEV of 50% and therefore the six-factor solution passes rule 1. However, only four factors are acceptable since there are two factor that have only one significantly loading Q-sort.
Looking at the third rule, the six-factor solution shows that almost two third of the Q-sorts load on one of the factors (16 defining Q-sorts). However, participant 3, 5, 6, 7, 15, 17, 18, 20 and 22 do not load on any factor. In some cases this is due to the fact that participants load on multiple factors but it can also be because they do not load on any factor at all. Compared to the two-factor solution and the three-factor solution, the number of defining Q-sorts is relatively small. Finally, the fourth rule focusses on the number of distinguishing statements. No factor has more than 5 distinguishing statements. In comparison to the two-factor, three-factor and four-factor solution this is a small number of distinguishing statements. Therefore, this factor solution fails on this rule.
To conclude, the six-factor solution passes rule 1 but fails on rule 2, 3 and 4 since there are two invalid factors, the number of defining Q-sorts is relatively low, and the number of distinguishing statements per factor is low.

B.4.4 Factor rotation

After factor extraction, the chosen number of factors are rotated. Factors are rotated to make the data structure clearer and to maximize variance (Watts & Stenner, 2012; Zabala & Pascual, 2016). The goal of factor rotation is to associate participants with only one factor. The mapping of factor rotation takes place within a space defined by the number of extracted factors. According to Watts & Stenner (2005), each factor has its own unique position or combination of spatial coordinates, resulting in unique viewpoints. A Q-sort can adopt a unique viewpoint by positioning itself in the factor space. Each Q-sort has a factor loading in between -1 and +1 per factor. The total of the factor loadings is the communality as described earlier. Each Q-sort has an association (unrotated factor loading) with factor 1, factor 2 and factor 3 resulting in a position in the factor space (Watts & Stenner, 2012). By rotation, the optimal position of the axis is determined. An example of the process of factor rotation is visualized in figure B.2.

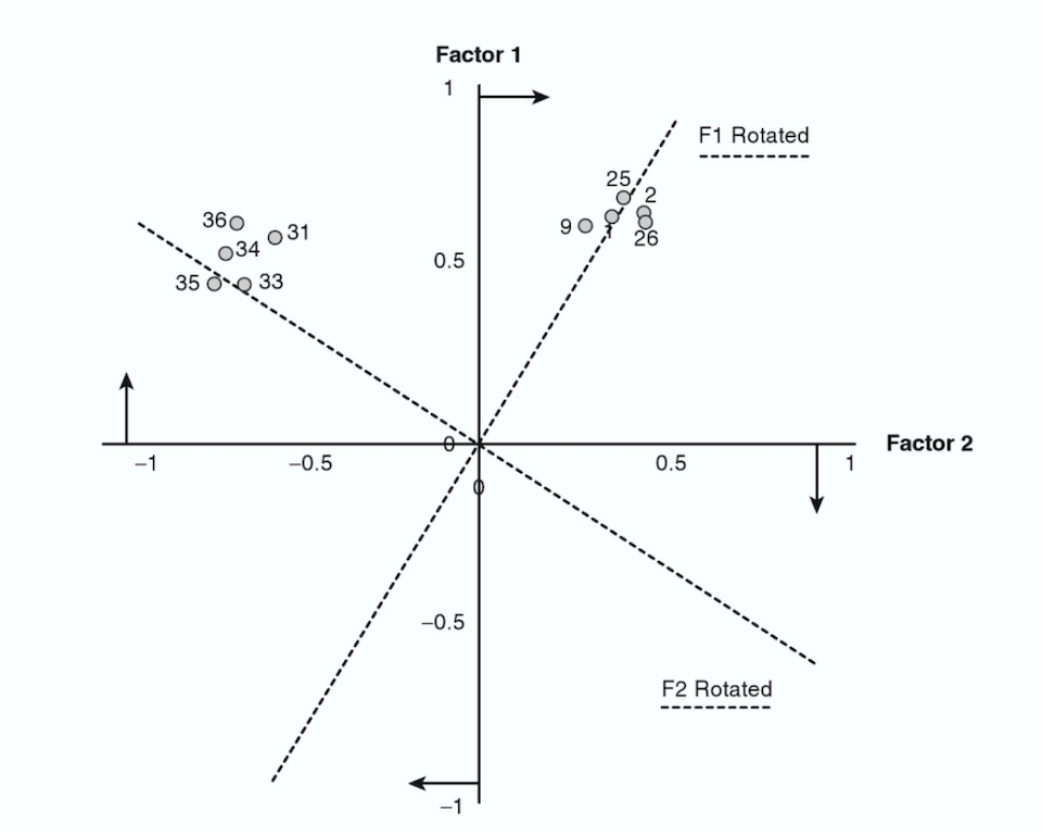

Figure B.2: Example of factor rotation (figure by Watts & Stenner (2012)

Within factor rotation, two methods can be applied: Varimax rotation or Manual rotation. Varimax rotation is based on the mathematically optimal results while manual rotation is a judgemental method. The second method is only applied if there is specific and relevant knowledge available of the participants and for testing hypothesis (Zabala & Pascual, 2016; Webler et al., 2009). In this research, no specific or relevant knowledge is available and therefore. Varimax rotation is applied. However, it is argued by Watts & Stenner (2012) that the methods cannot replace each other and therefore, Varimax rotation is followed by Manual rotation. One or two adjustments will be made to the Varimax solution to ensure that the maximum possible number of Q-sorts loads on a single factor.

Varimax rotation

Varimax rotation uses an algorithm that tries to rotate the factors in such a way that most individuals are related to only one factor (Webler et al., 2009). By rotating, the results are rotated around a central axis (per two factors), and it changes the position of observation to maximize the loading of a Q-sort on a factor. However, this does not change the results of the analysis (Watts & Stenner, 2012). Since there is chosen for the three-factor solution, the factor rotation is conducted for three factors.
After conducting Varimax rotation, 23 participants were marked as a single loader (they only load high on one factor). Ten participants load on factor 1, 7 on factor 2 and 6 on factor 3. Participant 17 and 18 load on multiple factors and are therefore not marked as a single loader.

Manual rotation

A manual rotation follows the Varimax rotation in order to optimize the solution found by Varimax rotation. Since two participants did not load on any factor, it was determined if a better solution could be derived. From both participants, it is expected that they can influence client-contractor collaboration due to their roles in a bouwteams. Especially participant 17 is expected to be of importance due to its managing role during the design phase of the bouwteam.
For the manual rotation, there is focused on the rotated factor loadings of participant 17 and participant 18. The factor loadings of participant 17 are respectively 0.3470, 0.2668 and 0.4334 for factor 1, 2 and 3. Since the factor loadings are the highest for factor 1 and 3, the focus lies on rotating these factors. Varimax rotation already found the mathematically best solution; therefore, manual rotation is limited to -5 degrees and +5 degrees. After conducting all

rotations, it came forward that rotation of -1 degrees results in a single load of participant 17 on factor 3. With this rotation, no participants were removed as single loaders, and no changes occurred between the factors. Thereafter, there was looked at the possibilities for rotation participant 18. The factors loadings of this participant are respectively 0.543, 0.5789 and 0.2338 for factor 1, 2 and 3. Since the loadings are the highest for factor 1 and 2, the focus lies on rotating these factors. However, manual rotation did not generate more satisfying results for participant 18.
To conclude, the Varimax rotation with an extra manual rotation of -1 degrees for factor 1 and 3 results in the most optimal solution in which the highest number of Q-sorts is included. This solution is used for final interpretation of the perspectives. The rotated factor loadings are given in table B.15. In this table, the participants that load on a factor are "flagged" (indicated with an "X"). The purpose of flagging is to indicate which Q-sorts are part of a factor. Next, the weighted average of the flagged Q-sorts are used for the final description of a factor. Furthermore, its purpose is to maximize the differences between factors. A factor is flagged if the factor loading is larger than the 0.01 significance level (factor loading > 0.418) and if the factor is much larger than the other loadings (Zabala & Pascual, 2016; Webler et al., 2009).

	Factor 1	Factor 2	Factor 3
1. Tender manager	0.5804X	0.2432	0.5042
3. Tender manager	0.6675X	0.1386	0.3410
4. Plan developer	0.6887X	-0.0620	0.2025
7. Project manager	0.5707X	0.5210	0.2152
11. Manager MEP	0.7527X	0.2543	0.2551
12. Manager MEP	0.5703X	0.3577	0.2924
14. Design leader	0.6922X	0.2230	-0.1547
16. Design leader	0.6229X	-0.0770	0.2873
19. S&L coordinator	0.6568X	0.4018	-0.0465
23. Calculator	0.5484X	0.2939	0.1808
9. Project manager	0.2816	0.5655X	0.2287
10. Project manager	0.0468	0.7789X	0.1201
13. Design leader	0.1977	0.6965X	-0.1654
15. Design leader	-0.1667	0.5970X	0.4418
18. Calculator	0.5389	0.5789	0.2433
20. S&L coordinator	0.5665	0.5958X	0.1805
21. Facade coordinator	0.2724	0.5637X	0.4065
24. Calculator	0.3079	0.5471X	0.3667
2. Tender manager	0.1753	0.1882	0.5481X
5. Plan developer	0.3545	-0.3420	0.6320X
6. Tender manager	-0.0827	0.1014	0.6519X
8. Plan developer	0.0950	0.0137	0.4809X
17. Design leader	0.3394	0.2669	0.4394X
22. Calculator	0.2788	0.3614	0.6650X
25. S&L coordinator	0.3048	0.3281	0.6194X
Explained Variance	22	18	15

Table B.15: Rotated factor loadings after Varimax and Manual rotation

In the optimized three-factor solution the cumulative explained variance is 55%, which is above the minimal desired 50%. After Varimax rotation and Manual rotation, 10 participants load on factor 1, 7 participants load on factor 2 and 7 participants load on factor 3. Furthermore, the reliability coefficient of all factors is above 0.8 and the standard error of the Z-scores are all lower than 0.19. A low standard error and a high reliability coefficient represent a reliable factor with reliable factor scores (Brown, 1980). However, the correlation between the different factors is relatively high, shown in table B.16. This indicates that there is a certain degree of overlap between the factors. The highest correlations are between factor 1 and 2 and factor 1 and 3. This indicates that the participants value collaboration in a bouwteam in a similar way, but there are descending success factors as well. The correlations between the factors are taken into account when the factors are interpreted. For each factor, the Z-scores are given in the factor arrays in section B.5. According to Zabala & Pascual (2016), the Z-score *"indicates the relationship between statements and factors, it shows how much each factor agrees with a statement"*. Furthermore, the factor array shows the ideal Q-sort of a factor. This is the Q-sort that is, hypothetically, filled in by a participant who loads 100% on a factor. With

	Factor 1	Factor 2	Factor 3
Factor 1	1.0000	0.5714	0.5746
Factor 2		1.0000	0.4685
Factor 3			1.0000

Table B.16: Correlations between factor scores

help of the factor arrays, the perspectives are interpreted and described. In doing so, the average of the 25 Q-sorts is calculated as well and compared with the individual factors, displayed in table B.17

Success factor	Average score	Factor 1	Factor 2	Factor 3
1. Sufficient resources for collaboration	0	0	-1	-1
2. Early involvement of external stakeholders	-1	0	0	-2
3. Contractor's track-record in terms of innovation	-3	-3	-1	-2
4. A continued involved project team leader	-1	-1	0	-1
5. Early involvement of contractors	0	0	2	-1
6. Team leader's leadership ability	1	0	1	2
7. Contractual incentives (positive and negative)	-2	-2	0	-2
8. Clear definition of rules before the bouwteam starts working	2	2	-1	3
9. Fair risk allocation	0	0	0	1
10. Specified payment arrangements	-4	-3	-4	-3
11. Financial range is agreed upfront by client and contractor	1	0	2	1
12. Defined scope of the bouwteam	3	2	2	4
13. Shared risks	3	-1	-2	2
14. Agreed process for dispute resolution	-1	0	-3	0
15. Performance management	-3	-2	-2	-1
16. Joint planning with all participants	0	1	1	0
17. Joint problem solving	1	1	0	0
18. Propose solutions when raising problems	1	1	1	1
19. Support of senior management from both sides	-2	-1	0	-3
20. Long-term orientation of the contractor	-2	-4	-2	1
21. Understanding each other's objectives	2	2	3	0
22. Project team leader's adaptability to changes in the project	-1	-2	0	1
23. Transparency	2	3	1	1
24. Win-win attitude	1	1	3	0
25. Strive for equality in behaviour and duties for client and contractor	-2	-2	-3	0
26. Development of common processes and tools	-1	-1	-2	-1
27. Integrated project teams	0	0	1	1
28. Separate conversations in small groups per discipline	-1	-1	-1	-1
29. Unrestricted cross-sharing of information in the project	0	1	-1	-4
30. Equitable relation and respect for all	0	2	0	1
31. Involving the right people at the right moment	2	0	4	2
32. Regular meetings	-1	-1	-1	-2
33. Mutual trust	4	4	2	2
34. High level of commitment	1	1	1	0
35. Good communication	3	3	0	3
36. Alignment of objectives	1	1	1	0
37. Have an elaborated project start up with bouwteam participants	0	-1	0	0
38. Evaluate the bouwteam during the project	0	0	-1	0

Table B.17: Factor array of the three-factor solution

B.4.5 Quantitative description of the factors

Participant groups per factor

This section focuses on the division between participants from *process management, design management* and *cost management* over the three factors. Each factor has defining participants from each participant group, shown in table B.18. Furthermore, the participants per group are relatively evenly distributed over the various factors so this indicates that there is no clear pattern of participants groups within the factors.

Factor 1	Factor 2	Factor 3
1. Tender manager	9. Project manager	2. Tender manager
3. Tender manager	10. Project manager*	5. Plan developer
4. Plan developer	13. Design leader	6. Tender manager
7. Project manager	15. Design leader	8. Plan developer
11. Manager MEP*	20. S&L coordinator	17. Design leader**
12. Manager MEP	21. Facade coordinator	22. Calculator*
14. Design leader	24. Calculator**	25. S&L coordinator
16. Design leader		
19. S&L coordinator		
23. Calculator**		

*indicates the participant with the highest factor loading
**indicates the participant with the lowest factor loading

Table B.18: Division of participants over the factors

Z-scores and Q-sort value

Each statement received a Z-score during analysis by PQMethod that can be used to compare statements from different factors. The highest and lowest Z-scores possible are equal to the extremes of the sorting scheme (respectively +4 and -4). Additionally, the ideal Q-sort per factor (a factor array) was conducted by PQMethod and to place the three factor arrays in perspective the average Q-sort value of all 25 Q-sorts was calculated (see table B.17.

Looking at the first factor, *mutual trust* received the highest Z-score (2,516) and *long-term orientation of the contractor* received the lowest Z-score (-1,931). The height of the score indicates that the defining participants particularly agree on the most essential statement but agree less on the least essential one. Furthermore, the three statements on the "minus" side (-4, -3) lie relatively close to each other, suggesting that the statements are valued equally (these are *long-term orientation of the contractor, specified payment arrangements* and *contractor's track-record in terms of innovation*).

If the focus shifts to the Q-sort values of factor 1, there are only four statements that differ more than one place from the average Q-sort. These are *shared risks* (avg.: 3, F1: -1), *long-term orientation of the contractor* (avg.: -2, F1: -4), *equitable relation and respect for all* (avg.: 0, F1: 2) and *involving the right people at the right moment* (avg.: 2, F1: 0).

In factor 2, the opposite occurs. The lowest Z-score is equal to -2.734 for the statement *specified payment arrangements* a relatively high Z-score, indicating that the defining participants highly agree with each other. However, on the "plus" side the Z-score of the highest four statements lie within 0.3 from each other. This indicates that the position of the statements is insignificant because they could all be placed on the outside. Besides, the highest Z-score is only 1.622 for *involving the right people at the right moment*. These observations point out that the defining participants agree more on the least essential statements than on the most essential ones.

Looking at the Q-sort values of factor 2, there are eleven statements that differ more than one place from the average Q-sort. Since this is a high number of factors, the focus lies on the success that differ at least three places. These are *clear definition of roles before the bouwteam starts working* (avg.: 2, F2: -1), *shared risks* (avg.: 3, F2: -2) and *good communication* (avg.: 3, F2: 0). It is striking that the first two factors even switch from essential to not essential.

Lastly, the highest Z-score of factor 3 is 2.061 for *defined scope of the bouwteam* and the lowest Z-score is -1.826 for *unrestricted cross-sharing of information in the project*. Both scores are not very high, but also not as low as in factor 2. In this factor, the four statements from the "minus" side have Z-scores that are close together (0.3), including the least essential statement. This indicates that the statements are valued as least essential, but the participants do not agree on one statement in particular.

The Q-sort values of factor 3 show six statements that differ more than one place from the average Q-sort. Since there are three factors differing more than two points, these are highlighted and are *long-term orientation of the contractor* (avg.: -2, F3: 1) and *Unrestricted cross-sharing of information* (avg.: 0, F3: -4).

There is a tipping point where the Z-score changes from positive to negative; from most essential to least essential. In all 3 factors this tipping point is centralized within the Q-sorts which confirms that distribution of the statements is correctly assessed.

Distribution of categories

Besides distribution of the statements per factor, there is also a distribution of categories over the factor arrays since the Q-set consisted of 6 categories of collaboration in bouwteams.
In factor 1, nearly all *capability* related statements are valued neutral with only one outlier at -3 (*contractor's track-record in terms of innovation*) indicating that capabilities of client and contractor are not essential. Additionally, all *joint working* related statements are placed between +1 and -2, therefore acknowledged as a neutral category. Furthermore, in the distribution of the categories no significant difference or pattern was found thus there is no preference for statements from a category to establish collaboration.
Continuing with factor 2, it stands out that *contractual* related statements are valued neutral and essential, except one one statement because it is placed on -4. Additionally, both *capability* and *team working* related statements are also valued as neutral or essential (from -1 till 2). Furthermore, in the distribution of the other three categories no significant difference or pattern was found thus *team integration, relational attitude* and *joint working* related statements are all valued as not essential, neutral and essential.
Finally, in the third factor it is remarkable that all *capability* related statements are valued as -1 or -2 expect one. The outstanding statement is *team leader's leadership ability*. Additionally, all *joint working* related statements are valued as neutral or essential (from -1 till 2). Most striking in the third factor is that *contractual* related statements range from -3 till +4 indicating that there are both essential and not essential contractual aspects. Furthermore, in the distribution of the other three categories no significant difference or pattern was found since they range from -4 till +3 and it is concluded that the defining participants do not prefer a particular category.

B.5 Step 6: Identify perspectives

To establish shared perspectives among the participants, the factors are interpreted using characterising, consensus and distinguishing statements. Characterising statements are success factors placed on the extremes of the sorting scheme (-4, -3, +3 and +4) because these describe the core belief of a factor. Consensus statements are success factors that are valued equally within all three perspectives and are coloured gray in the factor arrays. To determine if there is a consensus statements, the Z-scores should approximate each other. Lastly, distinguishing statements are success factors that have a distinct Z-score in comparison with the other factors. Furthermore, the results from the post-sorting interviews are used in addition for interpretation. The description of the three perspectives is given in chapter 5.

Perspective 1: Relationship first

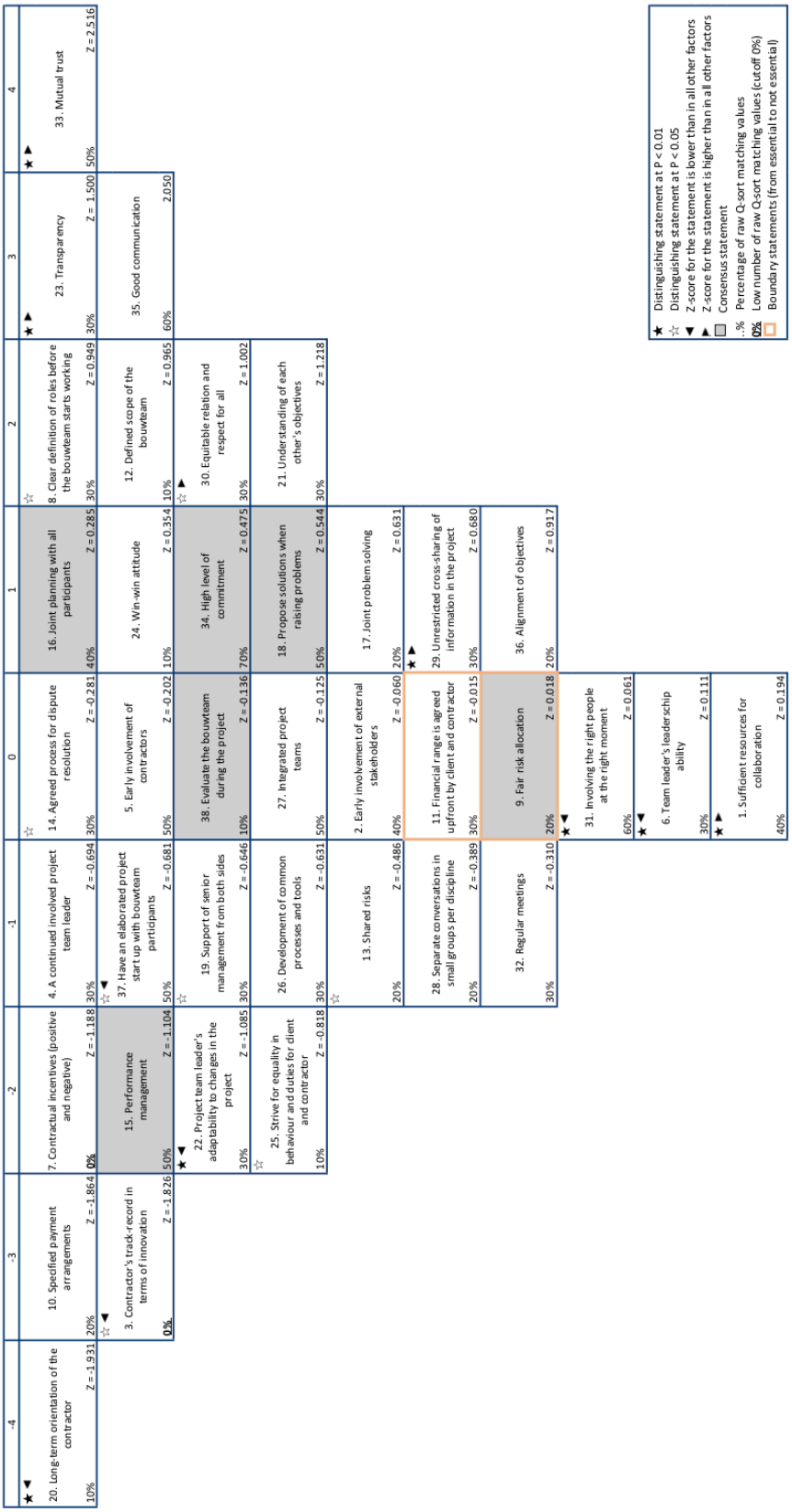

Figure B.3: Factor array of factor 1

Perspective 2: Early involvement of the right people

Figure B.4: Factor array of factor 2

Perspective 3: Structure first

Figure B.5: Factor array of factor 3

B.5.1 Consensus statements

During analysis by PQMethod, six consensus statements were identified. A consensus statement is determined based on the Z-scores when it is "not distinguishing between any of the identified factors" (Van Exel & De Graaf, 2005).

Nr.	Success factor	Factor 1		Factor 2		Factor 3	
		Q-SV	Z-SCR	Q-SV	Z-SCR	Q-SV	Z-SCR
9	Fair risk allocation	0	0.02	0	-0.18	1	0.42
15*	Performance management	-2	-1.10	-2	-1.18	-1	-0.85
16	Joint planning with all participants	1	0.29	1	0.63	0	0.11
18*	Propose solutions when raising problems	1	0.54	1	0.79	1	0.66
34*	High level of commitment	1	0.47	1	0.52	0	0.26
38	Evaluate the bouwteam during the project	0	-0.14	-1	-0.57	0	0.11

Table B.19: Consensus statements

B.5.2 Descending factor array of differences.

For each combination of two factors, the differing factors array are calculated by PQMethod. The difference between the Z-scores of factor X and factor Y is given for each success factor. In table B.20, B.21, and B.22 the differences between each set of factors is given.

Nr.	Success factor	Factor 1		Factor 2		Difference
		Q-SV	Z-SCR	Q-SV	Z-SCR	
35	Good communication	3	2.050	0	0.309	1.741
29	Unrestricted cross-sharing of information in the project	1	0.680	-1	-0.815	1.496
14	Agreed process for dispute resolution	0	-0.281	-3	-1.725	1.444
30	Equitable relation and respect for all	2	1.002	0	-0.316	1.318
8	Clear definition of roles before the bouwteam starts working	2	0.949	-1	-0.339	1.288
33	Mutual trust	4	0.194	2	-0.828	1.122
1	Sufficient resources for collaboration	0	0.194	-1	-0.828	1.022
10	Specified payment arrangements	-3	-1.864	-4	-2.734	0.869
23	Transparency	3	1.500	1	0.670	0.830
25	Strive for equality in behaviour and duties	-2	-0.818	-3	-1.472	0.654
26	Development of common processes and tools	-1	-0.631	-2	-1.282	0.651
13	Shared risks	-1	-0.486	-2	-1.028	0.543
38	Evaluate the bouwteam during the project	0	-0.136	-1	-0.567	0.430
36	Alignment of objectives	1	0.917	1	0.527	0.391
17	Joint problem solving	1	0.631	0	0.352	0.280
2	Early involvement of external stakeholders	0	-0.060	0	-0.290	0.231
9	Fair risk allocation	0	0.018	0	-0.180	0.198
32	Regular meetings	-1	-0.310	-1	-0.425	0.116
15	Performance management	-2	-1.104	-2	-1.184	0.080
28	Separate conversations in small groups per discipline	-1	-0.389	-1	-0.422	0.034
34	High level of commitment	1	0.475	1	0.525	-0.050
12	Defined scope of the bouwteam	2	0.965	2	1.181	-0.216
18	Propose solutions when raising problems	1	0.544	1	0.788	-0.244
16	Joint planning with all participants	1	0.285	1	0.630	-0.345
21	Understanding of each other's objectives	2	1.218	3	1.593	-0.375
37	Have an elaborated project start-up with bouwteam participants	-1	-0.681	0	-0.179	-0.502
19	Support of senior management from both sides	-1	-0.646	0	-0.115	-0.532
6	Team leader's leadership ability	0	0.111	1	0.935	-0.824
27	Integrated project teams	0	-0.125	1	0.787	-0.913
4	A continued involved project team leader	-1	-0.694	0	0.280	-0.974
11	Financial range is agreed upfront by client and contractor	0	-0.015	2	0.973	-0.988
20	Long-term orientation of the contractor	-4	-1.931	-2	-0.855	-1.077
7	Contractual incentives (positive and negative)	-2	-1.188	0	-0.093	-1.095
24	Win-win attitude	1	0.354	3	1.461	-1.107
22	Project team leader's adaptability to changes in the project	-2	-1.085	0	0.167	-1.252
3	Contractor's track-record in terms of innovation	-3	-1.826	-1	-0.537	-1.288
5	Early involvement of contractors	0	-0.202	2	1.194	-1.396
31	Involving the right people at the right moment	0	0.061	4	1.622	-1.561

Table B.20: Descending factor array for differences between factor 1 and factor 2

Nr.	Success factor	Factor 1		Factor 3		Difference
		Q-SV	Z-SCR	Q-SV	Z-SCR	
29	Unrestricted cross-sharing of information	1	0.680	-4	-1.826	2.506
2	Early involvement of external stakeholders	0	-0.060	-2	-1.510	1.450
33	Mutual trust	4	2.516	2	1.231	1.284
19	Support of senior management from both sides	-1	-0.646	-3	-1.749	1.102
32	Regular meetings	-1	-0.310	-2	-1.307	0.997
21	Understanding of each other's objectives	2	1.218	0	0.246	0.972
1	Sufficient resources for collaboration	0	0.194	-1	-0.57	0.761
36	Alignment of objectives	1	0.917	0	0.194	0.723
23	Transparency	3	1.500	1	0.800	0.700
17	Joint problem solving	1	0.631	0	-0.026	0.657
28	Separate conversations in small groups per discipline	-1	-0.389	-1	-1.028	0.640
30	Equitable relation and respect for all	2	1.002	1	0.416	0.586
5	Early involvement of contractors	0	-0.202	-1	-0.584	0.382
35	Good communication	3	2.050	3	1.761	0.289
34	High level of commitment	1	0.475	0	0.261	0.213
16	Joint planning with all participants	1	1.218	0	0.111	0.174
4	A continued involved project team leader	-1	-0.694	-1	-0.853	0.159
24	Win-win attitude	1	0.354	0	0.301	0.052
7	Contractual incentives (positive and negative)	-2	-1.188	-2	-1.203	0.015
18	Propose solutions when raising problems	1	0.544	1	0.662	-0.118
10	Specified payment arrangements	-3	-1.864	-3	-1.664	-0.201
38	Evaluate the bouwteam during the project	0	-0.136	0	0.106	-0.243
15	Performance management	-2	-1.104	-1	-0.847	-0.257
26	Development of common processes and tools	-1	-0.631	-1	-0.315	-0.316
9	Fair risk allocation	0	0.018	1	0.415	-0.397
27	Integrated project teams	0	-0.125	1	0.317	-0.443
14	Agreed process for dispute resolution	0	-0.281	0	0.224	-0.505
8	Clear definition of roles before the bouwteam starts working	2	0.949	3	1.532	-0.582
25	Strive for equality in behaviour and duties	-2	-0.818	0	-0.231	-0.587
3	Contractor's track-record in terms of innovation	-3	-1.826	-2	-1.215	-0.610
22	Project team leader's adaptability to changes in the project	-2	-1.085	-1	-0.395	-0.691
31	Involving the right people at the right moment	0	0.061	2	0.945	-0.883
37	Have an elaborated project start-up with bouwteam participants	-1	-0.681	0	0.205	-0.886
11	Financial range is agreed upfront by client and contractor	0	-0.015	0	0.893	-0.907
6	Team leader's leadership ability	0	0.111	2	1.022	-0.911
12	Defined scope of the bouwteam	2	0.965	4	2.061	-1.097
13	Shared risks	-1	-0.486	2	1.201	-1.686
20	Long-term orientation of the contractor	-4	-1.931	1	0.414	-2.345

Table B.21: Descending factor array for differences between factor 1 and factor 3

Nr.	Success factor	Factor 2		Factor 3		Difference
		Q-SV	Z-SCR	Q-SV	Z-SCR	
5	Early involvement of contractors	2	1.194	-1	-0.584	1.778
19	Support of senior management from both sides	0	-0.115	-3	-1.749	1.634
21	Understanding each other's objectives	3	1.593	0	0.246	1.347
2	Early involvement of external stakeholders	0	-0.290	-2	01.510	1.219
24	Win-win attitude	3	1.461	0	0.301	1.159
4	A continued involved project team leader	0	0.280	-1	0.853	1.133
7	Contractual incentives (positive and negative)	0	-0.093	-2	-1.203	1.110
29	Unrestricted cross-sharing of information in the project	-1	-0.815	-4	-1.826	1.010
32	Regular meetings	-1	-0.425	-2	-1.307	0.882
3	Contractor's track-record in terms of innovation	0	-0.537	-2	-1.215	0.678
31	Involving the right people at the right moment	4	1.622	2	0.945	0.677
28	Separate conversations in small groups per discipline	-1	-0.422	-1	-1.028	0.606
22	Project team leader's adaptability to changes in the project	0	0.167	-1	-0.395	0.562
16	Joint planning with all participants	1	0.630	0	0.111	0.519
27	Integrated project teams	1	0.787	1	0.317	0.470
17	Joint problem solving	0	0.352	0	-0.026	0.378
36	Alignment of objectives	1	0.527	0	0.194	0.333
34	High level of commitment	1	0.525	0	0.261	0.263
33	Mutual trust	2	1.393	2	1.231	0.162
18	Propose solutions when raising problems	1	0.788	1	0.662	0.127
11	Financial range is agreed upfront by client and contractor	2	0.973	0	0.893	0.080
6	Team leader's leadership ability	1	0.935	2	1.022	-0.086
23	Transparency	1	0.670	1	0.800	-0.131
1	Sufficient resources for collaboration	-1	-0.828	-1	-0.57	-0.261
15	Performance management	-2	-1.184	-1	-0.847	-0.338
37	Have an elaborated project start-up with bouwteam participants	0	-0.179	0	0.205	-0.384
9	Fair risk allocation	0	-0.180	1	0.415	-0.595
38	Evaluate the bouwteam during the project	-1	-0.567	0	0.106	-0.673
30	Equitable relation and respect for all	0	-0.316	1	0.416	-0.732
12	Defined scope of the bouwteam	2	1.181	4	2.061	-0.881
26	Development of common processes and tools	-2	-1.282	-1	-0.315	-0.967
10	Specified payment arrangements	-4	-2.734	-3	-1.664	-1.070
25	Strive for equality in behaviour and duties for client and contractor	-3	-1.472	0	-0.231	-1.241
20	Long-term orientation of the contractor	-2	-0.855	1	0.414	-1.268
35	Good communication	0	0.309	3	1.761	-1.452
8	Clear definition of roles before the bouwteam starts working	-1	-0.339	3	1.532	-1.871
14	Agreed process for dispute resolution	-3	-1.725	0	0.224	-1.949
13	Shared risks	-2	-1.028	2	1.201	-2.229

Table B.22: Descending factor array for differences between factor 2 and factor 3

C

Q-interviews

This appendix shows the interview procedure used to collect Q-sorts and summaries of the post-interviews. The procedure is set up in both Dutch and English. In this report, only the English version is published.

C.1 Q-procedure

First of all, thank you for participating in this research regarding collaboration in bouwteams. To research client-contractor collaboration in bouwteams, the Q-methodology is applied. In Q-methodology, you are asked to prioritize success factors in a predetermined sorting scheme. The collected data gets treated anonymously. In any possible future publication, the results can never be traced back to individuals who participated in the research.

In this Q interview, you will be asked for your opinion towards collaboration in bouwteams. First, some general questions are asked including a few project-related ones. For project-related general questions, I am asking you to take the last completed bouwteam project into mind. Please use this project as a reference in answering the questions.

1. For what organization do you work?
   .....
2. What is your function within your organization?
   .....
3. What is your gender?
   - Male
   - Female
   - Other
4. What is your highest education degree obtained?
   .....
5. How many years of relevant work experience do you have in the construction industry?
   - 0-5 years
   - 5-10 years
   - 10-20 years
   - over 20 years
6. In how many bouwteam projects have you been involved (including the bouwteam project you are currently involved in, if this is the case)?
   .....
7. Were you/are you directly involved with client-contractor collaboration in bouwteam projects?
   - Yes
   - No
   - Other.....

8. Were you present at bouwteam meetings during bouwteam projects?
    - Yes
    - No
    - Other.....

Before the survey is continued, a definition is given for a bouwteam. This definition is as follows:

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 a building contract. To this end, each of the participants performs the tasks related to their experience and expertise while retaining their independence and responsibility.

With this definition in mind, you can now start the Q sorting process. Please use your bouwteam project as a reference when you are asking yourself the question "Essential for collaboration in a bouwteam to achieve successful project delivery is...". Please follow the guidelines:

1. Thirty-eight success factors of collaboration in bouwteams are printed on cards. You have received the set of cards and a sorting scheme.
2. Decide for each success factor whether you believe the factors is "essential for collaboration", "not essential for collaboration" or "neutral". When decided, sort the cards into three piles. The first pile is the pile of success factors you believe are essential. The second pile is the pile of success factors you believe are not essential, and the third pile is the pile of neutral success factors.
   Before continuing to step 3, the researcher records the distribution of the cards.
3. 3. After all the cards are sorted into three piles, take the pile of "essential". Choose the two success factors that you most agree with and put them in the column of "+4". After that, you select four cards that you agree with most after the first two, place these cards in the column of "+3". Continue with this process until all cards from the pile are placed on the sorting scheme.
   Please respect the format indicated; cards can only be placed on marked boxes.
4. 4. Repeat step 3 for the pile of "not essential", starting on the "-4" side.
5. Take the last pile of "neutral" and put the cards in the remaining empty boxes.
6. 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, please fill in the numbers of the success factors in the table below:

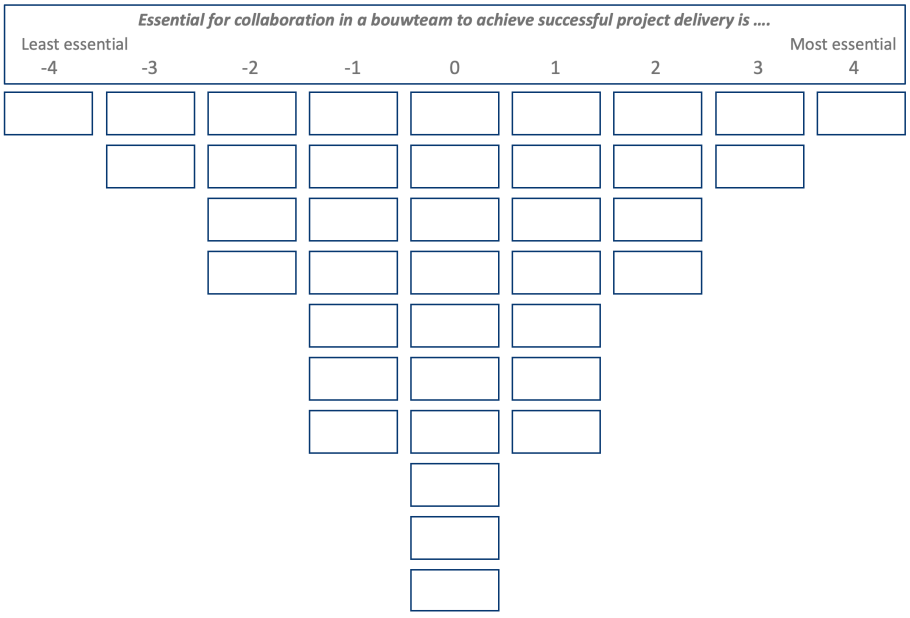

Figure C.1: Q sorting scheme

Nr.	Success factor (English)	Success factor (Dutch)
1.	Sufficient resources for collaboration	Voldoende middelen voor samenwerking
2.	Early involvement of the stakeholders	Vroegtijdige betrokkenheid van stakeholders
6.	Contractor's willingness to innovate	Bereidheid van de aannemer om te innoveren
4.	A continued involved project team leader	Een blijvend betrokken projectleider
8.	As early involvement of contractors as possible	Zo vroeg mogelijke betrokkenheid van de aannemer
6.	Team leader's leadership ability (Technical, Organizational, Coordination, Motiviational, Experienced)	Vermogen van de projectleider om leiding te geven (Technisch, Organisatorisch, Coördinerend, Motiverend en Ervaren)
7.	Contractual incentives (positive and negative)	Contractuele stimuleringsmaatregelen (positieve en negatieve incentives)
8.	Clear definition of roles before the bouwteam starts working	De rollen zijn duidelijk gedefinieerd voordat het bouwteam start
9.	Fair risk allocation	Eerlijke risicoverdeling
10.	Specified payment arrangements	Gespecificeerde betalingsregelingen
11.	Financial range is agreed upfront by client and contractor	Opdrachtgever en aannemer hebben vooraf de financiële bandbreedte bepaald
12.	Defined scope of the bouwteam	Gedefinieerde scope van het bouwteam
13.	Shared risks	Gedeelde risico's
14.	Agreed process for dispute resolution	Overeengekomen proces voor het oplossen van conflicten
15.	Performance management	Prestatie management
16.	Joint planning with all participants	Gezamenlijke planning met alle bouwteam deelnemers
17.	Joint problem solving	Gezamenlijke probleemoplossing
18.	Propose solutions when raising problems	Oplossingen voorstellen bij het aankaarten van problemen
19.	Support of senior management	Ondersteuning van het senior management
20.	Long-term orientation of the contractor	Lange termijn focus van de aannemer
21.	Understanding each others's objectives	Elkaars doelstellingen begrijpen
22.	Project team leader's adaptability to changes in the project	Aanpassingsvermogen van de projectleider
23.	Transparency	Transparantie
24.	Win-win attitude	Win-win houding
25.	Strive for equality in behaviour and duties for client and contractor	Streven naar gelijkheid in gedrag en taken voor opdrachtgever en aannemer
26.	Development of common processes and tools	Ontwikkelijk van gemeenschappelijke processen en instrumenten
27.	Integrated project teams	Geintegreerd projectteam
28.	Closed conversations in small groups per discipline	Gesloten gesprekken per discipline in kleine groepten
29.	Unrestricted cross-sharing of information	Ongehinderde uitwisseling van informatie
30.	Equitable relation and respect for all	Rechtvaardige relatie en respect voor elkaar
31.	Positioning of the right people at the right moment	Positionering van de juiste mensen op het juiste moment
32.	Regular meetings	Regelmatige vergaderingen
33.	Mutual trust	Wederzijds vertrouwen
34.	High level of commitment	Hoge mate van betrokkenheid
35.	Good communication	Goede communicatie
36.	Alignment of objectives	Afstemming van doelstellingen
37.	Have an elaborated project start-up	Een uitgebreide project start-up
38.	Evaluate the bouwteam during the project	Evalueer het bouwteam tijdens het project

Table C.1: Q-set translated to Dutch

Post-sorting questions
For the success factors placed at "+4" (2x) and "-4" (2x) the following questions are asked:

a. Can you indicate which success factors is placed in the box of +4/+3/-4?
b. Can you explain how you interpreted this success factor?
c. Can you explain why you placed the success factor in the box of +4/+3/-4?
d. Is the success factor in your opinion related to other participants in the bouwteam?
e. What resources are required to implement the success factor?
f. What are potential obstacles for implementing the success factor?
g. 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 factors chosen by the participant from the Q-set, and secondly for one additional success factor not yet included in the Q-set. The Q-interview is concluded by given the participant the opportunity to give additional information or additions to the interview if desired.

C.2 Summary of Q-interviews

Participant 1

Success factor 12: Defined scope of the bouwteam (+4)
The scope of the bouwteam is a clearly defined task and the end goal that is the point of departure for the bouwteam, defined by the client during the start-up phase. It is essential for collaboration because the start point and end goal must be clear to prevent the bouwteam from deviating from the main task. Sometimes you can deviate from the main task, but eventually, you have to return to the essential parts. It is important to constantly monitor whether the goal is achieved for which the bouwteam was set up. If this is not done, the next phase is entered unprepared.
For the implementation of this success factor, it is suggested to ensure that the scope is clear before the bouwteam agreement is signed. If not, this should be reported to the client and client and contractor should take about it, based on an equitable relationship. For this, there must be good communication and clearly defined roles. If during the bouwteam, it becomes clear that the formulated goals are not achieved, it should be discussed during 1-on-1 conversations with the client. In doing so, a short evaluation should be done to determine what is going well and where can the process be improved. However, a non-SMART formulated scope that is multi-interpretable can be an obstacle for achieving this success factor. Furthermore, if you see somebody has difficulties with achieving its tasks, then you should talk about it in the bouwteam with clear arguments to let the person recognise the situation.

Success factor 8: Clear definition of roles before the bouwteam start working(+3)
Primarily, each party must fulfil its role corresponding to its expertise. For this, responsibilities should be clear and assigned at the start-up of the bouwteam (e.g. who is responsible for design errors). Furthermore, it should be defined what is expected from bouwteam participants in order to avoid misunderstandings. All bouwteam participants should verify that interfaces are covered and that the role corresponds to the assignment of a participant.
If it is noticed that the roles do not match or are not lived by, the bouwteam should be evaluated, and it is up to the client to lead this evaluation. A good project leader recognises signals of mismatches between roles. During the evaluation, it can be controlled whether a participant fills the role as supposed to. When the situation occurs that the client missed something in the scope, an assumption or additional assignment should be made. In a bouwteam, it is often hard to monitor integrality of the design since the role of the contractor is not laid down in rules.

Success factor 30: Equitable relation and respect for all (+3)
In a bouwteam, all participants should treat each other equally in relation to the roles. Participants should not redirect tasks to other participants that cannot be responsible for it. However, this should apply to all projects and not bouwteams projects in particular. If this success factor is not covered, it is hard to implement factor 8 and 12.
The right people are needed in the project, and they should get to know each other in three steps. The first step focusses on getting to know each other personally by talking about personal life and creating an extensive and to the point project start-up. After that, participants should get to know each other professionally by talking about knowledge and skills to gain confidence in professionalism. The last step is defining processes and procedures to define how to complete the project with the core team. A hidden agenda, too little time or a start with the wrong starting points can be obstacles for developing an equitable relationship.

Success factor 10: Specified payment arrangements (-4)
As a bouwteam participant, a bouwteam agreement is signed, and the payment should be defined in it. In the

bouwteam, it should not be important how and when you get paid. Furthermore, even if the payment arrangement is specified, it should not be in detail.

Participant 2

Success factor 8: Clear definition of roles before the bouwteam start working (+4)
In the roles, responsibilities and tasks should be defined clearly by the client before the bouwteam agreement is signed. It is essential to make expectations clear, including what are people doing in the bouwteam and what are they responsible for. You do not necessarily have to understand from each other why the role division is.
Contractors have an opinion on how roles should be divided into a bouwteam to know where to get information from. By sharing experiences with the client, you can try to steer the role division. However, it is essential to be open and honest about it while discussing with the client. If it is noticed that the client expects more than is stated in the role, this should be discussed as well. It is recommended to make a project management plan (as part of the contract) in which the division of roles is laid down, including at least the bouwteam participants present at meetings, end products, meeting structure, information lines and responsibilities. Implicit formulation, experiences and reasoning from disciplines can be obstacles for a clear division of roles.

Success factor 9: Fair risk allocation (+3)
Discussions about risks can prevail during bouwteam meetings. In the end, it is essential to assign the risks to the participants who can bear it to prevent it from disrupting collaboration. Both client and contractor should implement and maintain this success factor. At the end of the bouwteam, during price negotiations, all risks should be known.
Upfront, it should be decided how to deal with risks that occur during the bouwteam to avoid discussions. It is recommended to share a risk file with project-related risks with the client and to indicate that these need to be discussed. Sometimes, these discussions should be held in private with the client, and sometimes with other bouwteam participants as well if it affects the others. An external stakeholder can influence project risks, forming an obstacle.

Success factor 35: Good communication (+3) Good communication is proactive communication and is generated by getting to know each other. It is important to know how the other participant works, what his preferences are and what is useful for him, in order to communicate efficiently. This is often underestimated in the construction sector because you constantly work in new project teams. Client and contractor have a mutual responsibility to implement good communication.
A kick-off where the whole bouwteam is present for a day-part is an opportunity to get to know each other. Furthermore, it can be useful to bring different team members from the contractor to bouwteam meetings to show the client who is working on the project. During the kick-off, a communication structure should be established that is checked during bouwteam meetings as part of the agenda. Obstacles for good communication are not following the communication structure and a bad connection to the client.

Success factor 10: Specified payment arrangements (-4)
Payment arrangements are always specified in a contract no matter what contract type. For a bouwteam, it should not matter when there is paid since it is a relatively small amount compared to the execution budget.

Participant 3

Success factor 21: Understanding each other's objectives (+4)
Understanding each other's objectives means living by them. A distinction should be made between 3 types of objectives; the objective of the client, the bouwteam and the organisation. Objectives should be aligned, but you should also define how to deal with them. The objectives should be defined, by both client and contractor, at a higher level within the organisation to pass them on to the project teams.
Understanding each other's objectives can be done by honestly expressing what your interest is and by asking others about it. Depending on the answer, an approach for the bouwteam should be formulated, and the intention to work together should be expressed. However, this is all based on good defined basic principles. Obstacles for understanding objectives are changing objectives during the project and a client that does not fit the contractor.

Success factor 36: Alignment of objectives (+3)
Before you can understand each other's objectives, the organisation objectives should be aligned first followed by the project objectives. In doing so, it is important to express the intention to collaborate.

Success factor 12: Defined scope of the bouwteam (+3)
The scope of the bouwteam covers who is responsible for what in the project. For this, it is essential to know the end-goal of a project to ensure that decisions are made during discussions that impact time and money.
The scope should be aligned according to the experiences of the participants. Furthermore, the scope should be included in detail in the bouwteam agreement since it is undesirable to have a multi-interpretable scope. The latter is also the main obstacle to this success factor. If it noticed that the scope is not defined clearly, the contractor should respond to this and talk to the client.

Success factor 7: Contractual incentives (positive and negative (-4)
Incentives are sometimes included in the contract to sidetrack the contractor. It is an incentive with a target the client has in mind, but this is not always relevant for the contractor. If incentives are related to the right target, it can contribute to collaboration, but this is often not the case.

Participant 4

Success factor 33: Mutual trust (+4)
If there is mutual trust and everybody is convinced that there is no desire for a better individual outcome, then the other success factors are no longer required. In bouwteams, the focus should lie on mutual trust between all participants, especially since there is often suspicion among organizations in the construction sector. However, in the end, you have to earn trust.
Mutual trust can be achieved by presenting an open budget and by being transparent in documents. Currently, many platforms have restrictions and are not completely transparent. Ways to implement mutual trust are good communication and giving responsibility to participants. If there is a loss of trust, you must return to the scope and common objective because you need each other to achieve the best result possible. An obstacle for mutual trust is the use of tender procedures because these are often assessed financially, giving the incentive to keep the finances closed. It is important to implement mutual trust as soon as possible and to invest in it afterwards.

Success factor 35: Good communication (+3)
communication is every form of communication exchanges. Participants have experience and expertise and often think they are talking about the same subject, while this can be something completely different, leading to miscommunication. In communicating, all parties are equal but one party has to take the lead. From the perspective of the contractor, this should be the contractor (in particular the design leader).
Implementation of this success factor can be through a bouwteam session at the start of the project to determine the "colour" a person is (defining its characteristics), to define how to approach people. The client should initiate this meeting and has to take everybody along. Furthermore, it is recommended to set up a platform for communication (an instrument or process). A reoccurring obstacle for good communication is the habit of people to immediately start working, while it is better to invest at the beginning of a project to benefit from this during the process. During the process, all participants should be convinced of the added value of good communication, imposing them does not work.

Success factor 23: Transparency (+3)
Transparency means having insight in everything from each other: documents, budget, figures, and motivations because with the help of transparency, mutual trust can be built.
For this success factor, it is important to raise your voice immediately if there is something wrong instead of letting the problem become worse. Furthermore, transparency can be enforced (easier than good communication). In practice, people are reluctant in giving insight into information related to financial aspects.

Contractor's track-record in terms of innovation (-4)
Innovation is not required for a bouwteam, because you can collaborate even without innovations. There is a chance that you do not get along well, but it is less important than the other success factors. It is important to bring in knowledge of execution to set up an integral design. For this, it is helpful to have a contractor who looks for integration in the project.

Participant 5

Success factor 14: Agreed process for dispute resolution (+4)
A conflict is stagnation in a process and therefore projects often take too long. If you keep having conflicts, the project does not get completed. Client and contractor need to set up the process for when a conflict occurs.

To set up a process for conflict resolution, you need to share your vision. By taking more responsibilities as the contractor, it can help you to get where you want to be and maybe develop the project faster. In doing so, everybody has their way of working, but as the contractor, you have to prevent that you impose what you think. It should be implemented in small steps and by suggesting solutions and telling why you are doing things as you are. Sometimes, you need to take the initiative (for your expenses), to generate insights that are needed. However, an easy process with an easy effect is preferred. Obstacles can be the attitude of participants (it has to be done in their own way), people dig in and are stubborn because, in their opinion, they are the only experts. During the bouwteam, people learn how to deal with conflicts, and in the end, right before signing the building contract, a specific process should be developed.

Success factor 26: Development of common processes and tools (+3)
The focus of this success factor is on abstract materials and software. You try to make sure that you understand each other by making agreements. Only the essentials should be agreed upon; the rest is superfluous. In doing so, everybody should participate because everyone is equal.
This can be implemented by drawing a number of main agreements on approximately two pages, including what the bouwteam thinks is needed in terms of processes and tools. Even though there are guidelines, sometimes you have to take things for granted as a contractor in the bouwteam.

Success factor 33: Mutual trust (+3)
Mutual trust does not mean that you understand each other, but it means that one person trusts that you will achieve the objective of the project with your knowledge. It is not necessary to respect each other, but if you have everyone in one place with the right disciplines and the focus on successful project delivery, then you can generate mutual trust in all phases of the project. In doing so, it is important to respect the role of other people. By showing you trust, you can stimulate the others to show their trust. But if you do not do it, the others do not have to do it either.
Respect the role and understand that the other person has its contract with a company. Furthermore, it is important to explain why you reacted the way you did. Culture, origin and private conditions can be obstacles for mutual trust.

Success factor 29: Unrestricted cross-sharing of information in the project (-4)
If you share information unrestricted with the other participants, you come across less respectful, or you have less understanding for the other person. In bouwteams, everyone has their own responsibility and place in the process, and you cannot judge each other's work unrestricted. It should be possible to keep something for yourself now and then and therefore, it is not desired to have unrestricted cross-sharing of information.

Participant 6

Success factor 12: Defined scope of the bouwteam (+4)
A defined scope is a defined roadmap, indicating the point of departure (point A) and the point of arrival (the end-goal of the bouwteam, point B). In the map, it should be clear where to begin, which milestones are present when pauses are appropriate, and what the end-goal is. The client is responsible for the scope but can ask his advisors for help.
Often, the client expects from the contractor to comment on the most optimal way to do the job: scheduling and cost-wise. In doing so, it in important to talk in statements and not about work performed. The contractor should prove the cost-wise effect of solutions. To ensure that you act in scope, you feel comfortable with, make a list in which it is defined who is responsible for what in what phase. If, for some reason, you are acting out of scope, make sure the client sees you are doing it. Additionally, it is recommended to note everything in meeting minutes to be able to refer to warnings made earlier.
If the contractor is involved too early, it can result in clashes because people start talking about things out of their scope. Furthermore, unforeseeability of the costs can be an obstacle as well. The costs can deviate and are dependent on design choices. To prevent this, make use of weekly or biweekly meetings with a focus on costs. Maybe, involve an independent cost consultant and make use of an item by item cost-list to track changes and decisions.

Success factor 18: Propose solutions when raising problems (+3)
It is easy to raise problems, but that does not solve anything, and everybody will solve it the easy way and come up with solutions that effects everybody. By only raising problems, the bouwteam becomes much more complex than it should be. The problem can be solved by having a separate meeting where the focus lies on problem-solving; parties

can raise problems they cannot deal with themselves and together the problems can be solved. Leadership ability is important, as well. This success factor is most important during the design phase.
It can be initiated by the attitude of the chairman to not focus on problems but on going from point A to point B. Even though the factor is most important during the design phase, the factor should be implemented during the start-up of a project. By involving the project leader of execution as well and not separating the execution phase from the bouwteam, an integrated process can be achieved.

Success factor 20: Long-term orientation of the contractor (+3)
Long-term is the end of the entire project, but could also be focusing on the relationship with the client to continue in other projects. The focus should lie on the first aspect of long-term orientation. The contractor should always target the final building, not only the end of the bouwteam, and therefore the focus should lie on the end or hand-over of the project. To ensure this, social activities should be implemented to keep the work joyful. However, since a different culture exists among employees, it is hard to implement this success factor. An obstacle could be a weakness of leadership because if people cannot be aligned, the focus can deviate from the scope and a long-term orientation. It is important to implement this factor at the beginning of a bouwteam.

Success factor 5: Early involvement of the contractor (-4)
If a contractor is too early involved, it can be counterproductive since interests can clash with other bouwteam participants. Too early involved is interpreted as during preliminary design.

Participant 7

Success factor 35: Good communication (+4)
Communication is 90% of the work and is not only calling, emailing or consulting but also reporting or responding to each other. Communication can often be improved to ensure that what is done is transferable. Good communication is a two-way process; the client should be aware of its objectives and communicate this. Communicating as such is difficult but eventually, the client is the main ling between bouwteam participants. As a contractor, you have influence as well, but it is mentioned less formal.
For a good bouwteam, it is important to first go along with the current way of working to experience how the system works. After that, attention could be paid to one-to-one talks with the client. Furthermore, a contractor should ask the client what he believes is important and why, and he could indicate that difficult questions will be asked that might be seen as annoying. If both the client and contractor understand this, then both parties can deal with it. To establish good communication, it is advised to share quotations and discuss them during bouwteam meetings. However, often, the client asks for this when trust is limited. It is a precondition that all bouwteam participants possess the same information. This could be established by using one communication platform. Often, the platform is not immediately taken over by the participants, so it is important to motivate people to use it. A large obstacle remains that contractors do not always dare to communicate things, especially new information, but this is an internal problem that influences the bouwteam.

Success factor 33: Mutual truest (+3)
In the first place, people can be trusted. If you show in your behaviour that you are not to be trusted, trust is broken. Eventually, mutual trust is necessary for a bouwteam process to be successful and is related to transparency. For mutual trust, it is important to stand behind the information shared and be able to explain why something is done a particular way.
A bouwteam is about managing expectations. It is often unpleasant to share bad news, but it is important that you inform each other. Focusing on solving problems together and communicating about the content could be a solution.

Early involvement of the contractor (+3)
Early involvement relates to the moment the final design is ready, but before it is handed into all authorities to ensure that there is still room to influence the design. Often, discussions arise about what is part of the scope, the design, the budget, and which level of quality is desired. It is difficult to say something about this when involved too early. However, being involved too late makes it hard to implement structural changes.
It is difficult to influence this success factor from a contractors position. It is the client that has to pay for the bouwteam, and he can say what he wants or does not want. One time you can do something about it, another time you cannot.

Success factor 10: Specified payment arrangements (-4)
You get paid or you do not get paid. Payment schemes indicate how much compensation is paid at which moment. It is beneficial to know about the payment schemes to be aware of the cash flows but it is not necessary for successful project delivery.

Participant 8

Success factor 31: Involving the right people at the right moment (+4)
A contractor must be able to involve the right people at the right moment, and not, as is often seen involve people to late. The bouwteam consists of a collection of people with a common goal, but the right knowledge must be present to complete the project successfully. Both client and contractor bring their consultants to the bouwteam.
Internally, a contractor should check which people are needed and whether they are available at the moment. If they are not available, it should be determined if they can be made available. Furthermore, the contractor should advise the client to involve certain people at certain moments. During the bouwteam, the evaluation between client and contractor is valuable to assess if the right people are present during bouwteam meetings. Especially near the end of the bouwteam, it should be monitored whether people still have enough time since often people get new assignments.

Success factor 35: Good communication (+3) Good communication is clear communication consisting of meeting minutes. Occasionally, activities outside of the bouwteam could take place where people get to know each other informally. These meetings can be used to become familiar with people's background, which can be used to explain their actions in the bouwteam. This is related to understanding each other's objectives.
Both client and contractor can have someone who is responsible for the set-up of good communication. Preference is given to implementation from the contractor's side. The focus lies preferably on reporting to ensure that contract documents can be made clear at a later stage and face-to-face communication. Mailing can be an obstacle because mails are often sent to many people who respond separately or not at all. A communication plan can be useful to counteract this. During the process, this can be maintained by evaluating good communication.

Success factor 6: Project team leader's leadership ability
This success factor is related to the project manager involved during the bouwteam and is referred to as a project team leader. The project team leader has to keep the objectives, planning and budget in mind to control whether the project can be realized. The most important characteristic of the project team leader is *organizational* to look at the bouwteam with a "helicopter view". During the preliminary design phase, a fitting project leader should be assigned and then this person should be supported by the rest of the project team.

Success factor 19: Support of senior management from both sides (-4)
In most bouwteam, senior management is often present during bouwteam meetings. Support from senior management is not necessary, as long as they are involved when needed but it could also be possible without. Less technically minded people can stagnate the bouwteam because they are budget-oriented and talk about finances. The focus of senior management can be shifted by determining budget-related aspects upfront. If this is determined early, mutual trust could be established easier.

Participant 9

Success factor 33: Mutual trust (+4)
A bouwteam is initiated to deploy construction expertise early in a project for better preparation and to keep costs under control. Sometimes, there is a double agenda at the client's side that does not promote collaboration because it feels unequal. The client does not always respect that the client has a business plan as well and want to be a healthy company, but if this is accepted, the best projects can be made.
A kick-off or doing something fun in the afternoon to get to know each other and gain confidence is advised before start working. It is about the conditions the bouwteam is working under. Issues about the price can be an obstacle while explaining and being honest can easily solve that. Sometimes, the client will show understanding when doing so. Discussing and talking about issues is a first step to create mutual trust, followed by honesty. However, in the end, it depends on the people part of the bouwteam. Especially, elderly people might be less able to deal with it. During start-up and price negotiations, mutual trust is most essential.

Success factor 19: Support of senior management from both sides (+3)
If senior management does not support the approach and does not communicate it to the team, then the project is doomed to fail. It is up to senior management to support the team and tell this to them. The factor can be

implemented by initiating regular board meetings in which the bouwteam project is updated and not only when problems arise. It depends on company culture, whether this is possible. During bouwteam start-up, trust must be expressed to the team and after, senior management should be informed regularly.

Success factor 21: Understanding each other's objectives (+3)
Both client and contractor have to accept why the other organisation exists. If you understand what each other's interests in the project are, it can be respected, and a successful project can be realised. Both client and contractor should be aware of this, but often the contractor is more interested while understanding each other can be initiated by the client. Talking to each other, in separate meetings, can help to understand each other. However, obstacles could be that there are people in the project that have a completely different attitude. The project team can be adapted to the client, and the project or fixed project teams can be established that fit a certain type of question.
Success factor 10: Specified payment arrangement (-4)
In bouwteams, there is often no problem with determining payment arrangements. It should not be an obstacle for good collaboration. The total price is most important, payment arrangements will come afterwards.

Participant 10

Success factor 24: Win-win attitude (+4)
By collaborating, people must be aware of each other's subjects of interest and what is needed from each other. If this is recognized from each other, a win-win attitude can be established, and people can complement each other. As a contractor, you have to show your added value to the bouwteam process: the client appreciates creativity and expertise. On the one hand, a contractor has feeling with the budget and, based on a preliminary design, he can take appropriate measures to stay within budget). When the budget and plan are realistic, it does not fail to come to an agreement.
This factor can be implemented by steering the client, right after preliminary design, in the right direction to stay within budget. For the client this information is useful while it is a relatively small effort for the contractor. Furthermore, it is beneficial for the contractor to steer the project to certain building methods, routing etc.

Success factor 5: Early involvement of the contractor (+3)
For the client, it is important that he has the feeling that his project becomes better by the early involvement of the contractor. By trying to present the client what your role can be in the bouwteam to arrive at a technical elaboration is valuable. On the other hand, it is good for the contractor to know where weaknesses lie; in doing so the client should be supported instead of pointing out mistakes.
The added value of a contractor lies in indicating what consequences are of choices to be made by the client. The ideal moment to get involved in a bouwteam is after preliminary design. It is recommended to do a preliminary design test to determine whether the design is as complete as necessary. Additionally, the contractor can give his vision on the project by indicating how the project can be build, which methods are used and which choices need to be made. In doing so, the bouwteam has a direction to start working on the final design with objectives and a planning. The client must highlight this to ensure that all bouwteam participants follow.

Success factor 11: Financial range is agreed upfront by client and contractor (+3)
Client and contractor should know the bandwidths the bouwteam is working in because sometimes you know too late what the real budget is resulting in a fatal bouwteam. As a contractor, it if preferable to let the client pronounce the budget to determine the starting point. However, it can occur that during the bouwteam process principles change, influencing the budget. The client type influences a bouwteam project.
Discussing the financial range early is a prerequisite for a good bouwteam. During the process, the client should be informed of the consequences of design choices and the budget should be monitored. It is the responsibility of the contractor to guide and steer the client through the process to ensure the plan still fits the budget. Asking the client for the budget is possible, but sometimes the contractor has to calculate the budget himself. When the financial range is not discussed early, vagueness arises, and functioning of the bouwteam decreases. In general, the contractor does not need to know the exact budget as long as a realistic number is given to ensure a clear goal with an efficient process.
Success factor 10: Specified payment arrangements (-4)
The emphasis should be less on payments arrangements because it is more about the relationship with the client. There are projects with a budget of 30 million euros for execution while the bouwteam costs are only 30.000 euros. That is out of proportion and therefore payment arrangements are less essential.

Participant 11

Success factor 11: Mutual trust (+4)
In the construction industry, there is little trust when collaborating. Often, it is expressed that there is trust, but behaviour indicates otherwise. Mutual trust is important to deliver the project as desired since success is as big as the weakest moment. Therefore, trust must be radiated from every level in the organization.
The way to create trust is taking the lead as a contractor to eliminate suspicion by showing what you are doing and by having no double agenda. Talking one-ton-one to discuss expectations can be helpful since not everybody talks out loud in large groups. When setbacks occur, all bouwteam participants should help and support each other.

Success factor 35: Good communication
Bad communication is communication by mail since it cannot carry the context as by face-to-face communication since feelings cannot be expressed. An e-mail is static, factual and without feeling and is, therefore, a dangerous communication tool.
To implement this factor, it is advised to make a clear division of roles and if necessary, take more time to provide information as complete as possible. Discuss communication as an agenda item, and if it is noticed that people do not understand communication, it should be made discussable. Furthermore, it can be indicated who communicate well with each other to avoid clashes. During the start-up of the bouwteam, agreements can be made that during the process might be adapted.

Success factor 23: Transparency (+3)
Transparency is being open and honest towards the client. A bouwteam is an intensive process in which people have expectations, but you should not fool each other (no trust and double agendas). People should be honest with each other and discuss it when people feel they are being fooled. People should have the freedom to say things they want to say, and this should be respected. However, interests that are not aligned can be an obstacle to a win-win attitude. If interests do not match, it might be better to stop the bouwteam process even though it is painful.

Success factor 3: Contractor's track record in terms of innovation
Innovations come and go, so it is not important to have a track record of innovations. It is more important than you are open to including innovations in the project. Furthermore, a solution can be good but not innovative.

Participant 12

Success factor 33: Mutual trust (+4)
By providing insights in each others process mutual trust can be established as a product. Traditionally, clients believe that contractors are frauds and contractors believe that the clients have different objectives and more money than is revealed. If there is no trust in the basics, you have a bad starting point for a bouwteam project.
By being transparent and showing exactly what you are doing, trust can be created and maintained. Furthermore, alternatives and options thought up by the contractor could be shared. If you feel that your trust is being betrayed, this should be addressed to the client; if done too late, the relationship is ruined. Sharing risks could contribute to ensure that certain profits are made in a bouwteam, beneficial for all participants. During the start-up phase and designing phase, mutual trust can be established, but it is essential that it is present during price negotiations. However, in the end, the type of client determines whether mutual trust is established.

Success factor 23: Transparency
Transparency is a means to build mutual trust. When much information is shared during the start op a bouwteam, the bouwteam can be better executed. By determining the cost percentages upfront and by including the client during price negotiations with subcontractors, the contractor shows its transparency. Furthermore, indicating profit and losses creates an understanding of each other's position, and finally, it can be beneficial to include subcontractors in the bouwteam as well.

Success factor 35: Good communication (+3)
Good communication is open, transparent and complete communication and can be realised by telling what you think to the other person and by indicating what you want to communicate. If you communicate the right way, trust in the contractor grows. Often an e-mail is sent quickly, but then only a small part of the message comes across, and by communication in the right way, the complete message comes across. All organisations should participate in establishing good communication.
In general, it is recommended to first call and afterwards sent an email to record it all. In particular cases of

unpleasant messages, it is recommended to call in advance.

Success factor 3: Contractor's track-record in terms of innovation
An innovation is not just a twist on an already existing process but is groundbreaking and rare. A bouwteam should not be about innovations because the clients want a client who knows how to build a building.

Participant 13

Success factor 5: Early involvement of the contractor
Early involvement of the contractor is ideally during preliminary design, but at least prior final design or detailed design. Often, a contractor gets involved when choices have been made, and the permit has been submitted, resulting in a nearly complete detailed design. The role of the contractor is then to minimise the clients risks and planning and to provide certainty of the price, and it is too late to make major changes in the project.
To implement this success factor, the commercial director has to be in touch with a client at an early stage, limiting the projects to commercial organisations only. It is up to management to respond to bouwteam projects in their network. When involved early, high-level discussions should be started about the design and additional risks in terms of manufacturability and technology. Integrated project teams can be helpful when involved early; people with a designing background should be involved at the contractors side and people with a technical background should be involved at the clients side. Not having the right people involved is an obstacle because you need each other to stay sharp.

Success factor 33: Mutual trust (+3)
Distrust is expressed through risks lists and contractual agreements. The contractor is often approached with suspicion because it is believed in advance that he delivers a higher price than expected. As a contractor, trust, openness and transparency could be shown to initiate mutual trust. Trust must grow but starts with a good connection and taking each other seriously. Roles should be defined clearly and sufficient resource (budget) should be available as a precondition for mutual trust.
As a contractor, you should show that you know what you are talking about since the other organisations need to know that you have the expertise required. One-to-one relationships could be built to gather information necessary for the relationship. However, consultants must have an appropriate assignment to modify the design.

Success factor 31: Involving the right people at the right moment (+3)
People who understand each other and have an affinity with the tasks should be put together. Ideally, extremes are not put together. The project team to be involved depends on the phase the bouwteam starts. If this is during preliminary design, then designers and design leaders are important to identify risks, but if it is later, project leaders for execution could be involved. Over time, more people are needed and larger teams will emerge.
An often made a mistake is to involve the calculation department to early while the level of detail depends on the phase of the bouwteam. However, the right people are not always available or not there.

Success factor 25: Strive for equality in behaviour and duties for both client and contractor
The essence is to involve the contractor due to his differing perspective and his execution-related expertise. A contractor wants to be informed by the client, so tasks do not have to be the same. In terms of behaviour, however, an equal attitude is preferable.

Participant 14

Success factor 29: Unrestricted cross-sharing of information in the project (+4)
Cross-sharing of information is sharing all information bouwteam participants are working on. If information is withheld, the value of a bouwteam is lost. However, if everybody is transparent and honest, people are open about what should be done. Showing what is received from subcontractors are why certain choices are made contributes to successful project delivery. Exchange of calculation models is often not done what can lead to difficult situations. Good communication is important as well and is achieved by putting everyone together to ensure there is less information lost, and transparency is increased. In the end, there is no certainty that the project is executed by the contractor involved what creates uncertainty and possible suspicion.

Success factor 36: Alignment of objectives (+3)
Determining each organization's goal in the project is essential for collaboration. These concerns objectives related to the bouwteam objectives. The intention of all bouwteam participants is to deliver the building, but you often the

client wants to get rid of his responsibility as soon as possible. If objectives are different, you think the bouwteam is under control while it is not.
Talking to each other verbally and asking each other why things are designed a certain way contributes to aligning objectives. In doing so, transparency is very important; each bouwteam participant assignment should be shared.
Success factor 21: Understanding each other's objectives (+3)
Understanding why the goal is set for a bouwteam is important because then you know why someone is acting in a certain way. The attitude of the client can influence the attitude of all bouwteam participants.
Common goals should be set to understand each other since every bouwteam participant has a different technical background.

Success factor 20: Long-term orientation of the contractor (-4)
The bouwteam process is a process to find the most optimal solution for the client. This factor suggests that you want to do another project with the same client. When focusing on a long-term orientation is focusing on separate organizations.

Participant 15

Success factor 31: Involving the right people at the right moment (+4)
A bouwteam will not work if the right people are not involved. The most important person in the project is the design leader. Managers should assign people from the contractor for the client. However, from the client, the people involved cannot be influenced, sometimes resulting in involving the wrong people.
By focusing on the people available, the right people can be involved. For important projects, the best people should be assigned. People are different and have different characteristics and skills that must comply with the project and the project organization. For each phase, the people responsible should be selected in the right combination. If people do not fulfil their role, the contractor can talk to the client about it. In the end, the capacity and availability of people decide which people can be involved during the project.

Success factor 27: Integrated project teams (+3)
, An integrated project team, is valued as essential because developing a good design and a good calculation is important for a bouwteam. Everybody does something that can result in information pollution. It is the responsibility of the project team leader to gather all information in one place, and he should be aware of what is going on in each discipline (he should always know what the other one is doing).

Success factor 6: Project team leader's leadership ability (+3)
The design leaders need to be in the leads and needs to have a good charisma to influence the client and be people's people. Organization and coordination are most important but on top of that communication with the team and with the client is essential as well. The project team leader has to determine the problems that occur and evaluate the project and the upfront determined strategy. Senior management should find the right team leader that has good communication, organization and coordination skills.
Project team leaders can be coached to become potential good leaders with the help of training courses and by instructing them to improve their communication skills.

Success factor 10: Specified payment arrangements (-4)
It is up to the tender manager to stay within the budget received from the client. For the design and engineering department, it is important to know how many hours they can spend on a project, but often more hours are necessary to find integrated and suitable solutions. However, this can be solved internally by a contractor.

Participant 16

Success factor 33: Mutual trust (+4)
Mutual trust has to do with being open to each other, honesty and no double agenda. It is one of the most important things when working together. If there is no trust, what would be the value of a bouwteam. However, the client should be on top of this, as a contractor, you are only a point of contact. In the bouwteam, the key players from client and contractor can create mutual trust.
Mutual trust can be built when there is an equitable relationship between client and contractor. However, the starting point of mutual trust is good communication. In the end, it is all about honesty and establishing mutual trust at the start of the bouwteam.

Success factor 35: Good communication (+3)
Good communication is communication in the form of efficient meetings, clear information exchange and suitable digital resources. It is important to know who is the point of contact for what. If there is no good communication, the other success factors cannot be carried out. Agreements should be made about how to communicate with each other and all organizations involved can influence this.
There is a preference for face-to-face meetings and talking in-person to each other, but not necessarily with the entire bouwteam because separate conversations per discipline can contribute as well. If persons do not have to be present at meetings, they should not be. Agreements should be made with all parties involved, but the starting point is that the client is always informed. Limited assignments and emailing can be obstacles for good communication, and therefore, the focus should lie on it during the design process, but in the other phases it must be maintained.

Success factor 30: Equitable relation and respect for all (+3)
Equitable relation and respect for all are related to mutual trust and good communication, it is interconnected and therefore, essential for collaboration. All parties present in the bouwteam can influence it, but that does not always happen at the moment. By showing respect to the bouwteam participants, this success factor can be implemented. If a relationship arises, respect can be lost through different circumstances and therefore it is essential to maintain respect at all times.

Success factor 7: Contractual incentives (positive and negative) (-4)
A incentive does nothing, regardless whether it is positive or negative. It does not make you work faster. It is less essential because it does not apply to the role of the design leader because you have to be involved with the design and consultants involved.

Participant 17

Success factor 35: Good communication (+4)
Good communication is sharing information like starting documents. It is important to ensure that every bouwteam participant has the same starting point. In the entire bouwteam communication must be good and therefore, agreements have to be made. Good communication tools ensure that a project runs smoothly. In essence, the client is responsible for good communication but they are often not working on it because they do not focus on it.
To implement good communication one person needs to have control and keep an eye on it; the right information must reach the right bouwteam participants. It is recommended to use a platform to monitor whether all questions and issues have been asked and solved and to share all information. It is important to make brief and concise meeting minutes and phase documents to keep track of how you are doing. The danger of extensive recording is that people get their own essence out of it. The way of communicating can be contractually laid down since an inconsistent application of the agreements can be an obstacle. If one person starts to work in his own way, this will dissipate the process. It must be implemented during the start-up phase because the starting points hast to be clear and equal.

Success factor 27: Integrated project teams (+3)
An integrated project team is a bouwteam in which all disciplines are present. During the design phase, it is most important to have a fully integrated design in which all disciplines are attuned. To achieve this, an integrated project team is required. The contractor can indicate which parties should be involved at what moment. In doing so, it is important that this is important.
During the bouwteam, you cannot enter into a contract with subcontractors because you are not sure if the project is being awarded to the contractor. Sometimes, suppliers seem to be involved, but then it turns out that they are less cooperative than expected. The starting point is good, but then the process does not proceed as desired.

Success factor 13: Shared risks (+3)
An issues that is always reoccurring in bouwteam project is design responsibility and unfortunately, this is a grey area. You try to align as much as possible, but sometimes something is not right or not well designed. If no responsible party can be identified, it is preferred to share risks instead of assigning it to a party that can not carry the risk. Shared problems should be dealt with together and all parties have to agree on how to share the risks. All risks must be identified before they occur.
Implementing this factor starts with contractualising design responsibility, including interfaces, even when it is difficult. It should be determined who is responsible for what aspect of the design. If problems arise and no-one is assigned to the task-related, risk can be shared, and it becomes a joint problem. However, often people point towards each other when something happens what makes it complex to deal with risks. However, the advantage of

sharing risks is that profits and losses are shared as well.

Success factor 28: Separate meetings in small groups per discipline (-4)
A bouwteam is used in a wide range of disciplines. Separate conversations of one of the disciples is, therefore, less important. It does not matter how is discipline is working out; it will have an impact but is not essential for collaboration.

Participant 18

Success factor 33: Mutual trust (+4)
Mutual trust is trusting each other in the work to be done: everything starts with trust, especially for a bouwteam. Everybody in the bouwteam can contribute to trust, but it starts by the client. Mutual trust can be implemented with open communication and being transparent and not having a double-agenda and holding back. Obstacles for mutual trust can be the attitude of bouwteam participants during the first introductory meeting and prejudices. The more you show that you're open and transparent, the more you can dispel prejudices. If people are open towards each other as a team, there would be no obstacles. It is essential to ensure mutual trust as soon as possible and it can also be established by showing that you are capable.

Success factor 21: Understanding each other's objectives (+3)
If you do not trust each other, you can not understand each other. The goal is to have the best people together, the right resources and the right price. Every bouwteam participant has a different end goal and you need to understand each other's goals in order to achieve good cooperation. If one notices that people do not understand each other and tensions arise, the client should react first. As a contractor, you can talk to the client if it is noticed that people do not understand each other or you can talk to the other party you think does not understand the situation. During the start-up this success factor is most essential.

Success factor 23: Transparency (+3)
Transparency is sharing information and transparent communication tools. Communication tools are the resources necessary to fulfil your tasks, e.g. if you need information, you get the information from the client or another bouwteam participant. If openness and transparency are important, you should share everything but in practice you don not see this happen quickly. However, if is trust it will come in due course, especially when problems arise. There are no obstacles if people are willing to share information. Nonetheless, if other people are not transparent it is easy to become reluctant as well. During the start-up phase, initiating transparency is essential, but being transparent is important from the moment bouwteam participants start to share information

Success factor: Regular meetings (-4)
People often have meetings for the meetings. It is important to talk to each other and have meetings, but often it is about the same points and you also go through points that do not apply at that time. Meetings once a week should be sufficient, and depending on the phase in the project it can even be less. However, it is important to determine a meeting structure in advance. During the meeting, only the heads of a department should be present to guarantee efficiency.

Participant 19

Success factor 33: Mutual trust (+4)
Mutual trust expresses itself in fulfilment of agreements made and a good distribution of risks and is reflected in the enthusiasm of people. If so, mutual trust unwinds itself. Every relationship, including the relationship between client and contractor, starts with trust. For this reason, this is most essential factor for collaboration. All participants are important to initiate mutual trust, but the support of senior management is important to support the execution of the contract.
Trust has to be earned and cannot start on the first day. It has to develop from both client and contractor by communicating well, keeping appointments, talking to external stakeholders upfront and by dividing risks fairly. However, there is not a practical tool that can be used since it depends on people's behaviour. If it turns out that trust is decreasing, the project can be slowed down to take a time-out and take a step back. Obstacles for mutual trust are failure to keep agreements and differing assumptions. Ideally, everything starts with trust right after the start of the bouwteam, but then not everything is known.

Success factor 10: Specified payment arrangements (-4)

Specified payment arrangements are included in an extensive attachment and is about what has to be deducted to get paid in a project. If you want to define it upfront, while you still have to start a design process, you are working in the wrong order. If the approach is there, then you can only say something about payment arrangements.

Participant 20

Success factor 12: Defined scope of the bouwteam (+4)
A defined scope of the bouwteam is a defined end-goal of the client what is, in general, the defined business case including budget and demands. A changing scope often leads to frustrations and delays. If the scope is not determined upfront, you are working on the wrong end-goal. If you do not know when a project is feasible, then you cannot know what you are focusing on. At the beginning of the bouwteam, it should be clear what the business case of the client is. The client should be in the lead of defining the scope of the project, together with the involved designer.
To implement this success factor, the scope of the project should be checked during the bouwteam. If you are not on track anymore, changes can be made as early as possible. Furthermore, the openness of the client is important to know how he makes the project profitable. When the contractor has this information, he can adapt his approach accordingly. Finally, the clarity of the client on the division of roles is desirable to know what they contain. A client that keeps the business case secret has no transparency or openness can be an obstacle for defining the scope. During the design phase, a defined scope is best appreciated, and it translates in price negotiations.

Success factor 33: Mutual trust (+3)
There must be trust between the parties in the form of transparency and openness. The client brings parties together, but they should be able to work together. Trusting each other completely with the same goal in mind is important because if there is no trust, other success factors can not be established. It could be said that if there is no mutual trust, the bouwteam can stop.
The basis of trust lies within an organization's capabilities that determine whether a company is capable enough to develop the project. By indicating which other projects have been executed, trust grows. However, if you are too far apart in terms of budget, there is no point in continuing the bouwteam. Furthermore, no insight in the business cases results in a difficult starting point for the contractor because the bouwteam starts without the openness of data and transparency.

Success factor 21: Understanding each other's objectives (+3)
Understanding each other objectives knows what the other is going to do, what the end products are and what you can expect from someone in terms of knowledge and skills. With the help of a defined scope you know what should be made, then you should also know what you can expect from each other, but it is also important to indicate why you are participating in the process. Everyone has an interest in a project going ahead, but interests can be mutually exclusive, especially if there is limited trust.
All parties can work on understanding each other's objectives. Translating individual objectives to project objectives helps to create a win-win attitude. Furthermore, an elaborate kick-off in which participants take time to get to know each other (personally) is recommended, instead of directly starting to work without laying down the basics. Perhaps a social or informal team-building activity before the start of the bouwteam is helpful. Clashes between bouwteam participants are an obstacle for understanding each other, but it is good to know why different opinions are present.

Success factor 10: Specified payment arrangements (-4)
If the purpose and scope of the bouwteam are clear and you have confidence in each other, then payment arrangements do not need to be fully specified in a bouwteam. Parties do need to know that they will be paid but how, what and when matters less.

Participant 21

Success factor 11: Financial range is agreed upfront by client and contractor (+4)
If must be clear what the budget and range are of the client since a bouwteam focuses on finding optimizations and cost savings. It is important to know the bandwidth of the client to know it that the project is feasible. If not, it makes no sense to joint a bouwteam. Together, the client and contractor can determine the financial range.
The contractor should start a dialogue with the client and designer to indicate what is attractive in terms of cost savings. In doing so, sound research into whether something is feasible or not can be done to demonstrate and substantiate recommendations. Market prices, other quotations, and demonstrating your search can substantiate your beliefs. If not everything can be explained, be honest to the client.

Success factor 21: Understanding each other's objectives (+3)
Understanding each other's objectives is about project objectives (feasibility) that can be aligned. Project objectives are related to the final product of the bouwteam. If you do not understand or misinterpret them, you do not understand someone's attitude in a bouwteam project. If projects are aligned and understood, you can always fall back on them after new ideas or developments.
Writing down on paper what objectives are and what is expected of each other helps to understand each other. Furthermore, a number of milestones can be initiated and measured during predefined moments and sub-contractors can be included when talking about cost savings or detailed solutions. If you believe you have understood someone's objectives, look for confirmation and write it down. The contractor can have a coordinating role in this. However, a mismatch between client and contractor is an obstacle for a bouwteam project because objectives are not aligned, and both parties have differing goals.

Success factor 24: Win-win attitude (+3)
If there is no win-win attitude in a bouwteam project, it becomes one-sided and is not endorsed by both parties. If you understand each other's objectives and goals, you automatically create a win-win attitude while the other way around does not necessarily apply (a win-win attitude does not mean that objectives are understood).
It is important to have a good match with the client (the type of client), and it has to fit the company culture. However, people make the company behind the project and therefore finding a balance with the client is important. A win-win attitude is important during the entire process but especially during price negotiations since that is the finale chance at the end of the bouwteam to be awarded the building contract.

Success factor 10: Specified payment arrangements (-4)
Specified payment arrangements should not limit you in a bouwteam project since it is arranged contractually outside the bouwteam trajectory.

Participant 22

Success factor 12: Defined scope of the bouwteam (+4)
The scope of the bouwteam is the end-goal that should be defined. In many cases, it is not clear what the end-goal of the bouwteam is while a predefined scope results in fewer failure costs. Both client and consultants can influence the scope of the bouwteam because they make the drawings.
Involving the right people (constructor, bestek-writer etc) is important to make a good, technically correct design. However, finding the right people is difficult since they are not always present, and currently there are insufficient competent and capable people. However, by including too much people works counterproductive, the right people should be involved that have the expertise of a certain discipline. At the earliest moment, at the start of a bouwteam project, this should be initiated because otherwise, the bouwteam will suffer from it later on.

Success factor 30: Equitable relation and respect for all (+3)
This success factor means how you treat each other. If you respect each other, you get more done. Everyone in the team needs to respect each other, both personally and professionally. However, no person in the same and people have to deal with that. Respect should be there; it can not be implemented or initiated in a bouwteam. If you notice that respect is not there, people might consult with other people if they notice the same.

Success factor 33: Mutual trust (+3)
Mutual trust is that you can rely on someone. When you tell something to do something, you have to be faithful that it is done properly, and if that does not work, you expect it to be reported. Mutual trust lays the foundation for any relationship, especially in a bouwteam project. By talking to the whole bouwteam project about things that have not yet been agreed upon, mutual trust can be initiated. However, it also depends on age and status because some people speak up while others do not.

Success factor 32: Regular meetings (+4)
Meetings take time and often have limited results. It is better to say where you are and where your going during a coffee instead of discussing it at a fixed time.

Participant 23

Success factor 23: Transparency (+4)
Being transparent is having no double agenda and being open, and it is the basis to start every bouwteam.

Bouwteam participants should be open and clear about direct costs and everything produced. If you manage risks at the same time, the bouwteam will get along. The contractor has the most influence by being transparent. If the contractor immediately shares all information, confidence is shown by taking the first step. By sharing everything, documents, drawings and calculations are meant. Transparency is important, but it is a precondition that the bouwteam agreement has already been signed.
Sharing everything does not happen in practice because there is always a catch for one of the parties. Often, financial information is an obstacle because you do not want to share information or can not tell them. It is important to tell each other what you want to be able to collaborate in a bouwteam project. If everyone has a different opinion, it is difficult to convince all other people.

Success factor 17: Joint problem solving (+3)
The problems related to in this success factor are problems in the design, planning, costs and knowledge. If someone has a problem, he should be able to talk about it during bouwteam meetings. Since there are many people involved with different expertise, there is bound to be someone with a solution. If you want to do it yourself, the problem gets bigger and stay. Constructors, consultants and contractors can take care of this together.
Problems should be made negotiable and be discussed during bouwteam meetings. It is important to include at least the top 3 of the largest cost carriers that have an impact on the project since they can eliminate risks as early as possible. However, bouwteam participants should fit together and simultaneously look at each other from a different perspective. During the design phase, joint problem solving is most essential.

Success factor 35: Good communication
Communication is both verbal and non-verbal communication because you do not always have to talk to communicate with each other. In a bouwteam, everybody should have the opportunity to say something. If there is no good communication, problems remain and an email or whatsapp does not solve it. Talking to each otfher face-to-face is essential because the receives must be able to see how you feel. Calling is also a possibility because you can hear the voice of the other person. However, if there is a large problem, it is recommended to talk to each other face-to-face.
Everyone in a bouwteam should do what they are good at and indicate that, people should not try to pick up something they do not have the right capabilities for. Managers of all parties can influence good communication and are the people that should. This success factor is closely related to involving the right people at the right moment.

Success factor 7: Contractual incentives (+3)
Contractual incentives mean that you get a bonus if the project is finished in the team and a fine if it is delivered too late. You have to recognize the importance of delivery date, but financial measures are not required in a bouwteam. In a bouwteam, it is expected that every party involved makes an effort to meet the deadline. It is not possible that one person fails if so it is the responsibility of the entire bouwteam.

Participant 24

Success factor 31: Involving the right people at the right moment (+4)
Quality of people determines the success of a project. A large group can be paralysing and therefore it is recommended to look at people's competences. By involving the right people at the right time, the bouwteam remains dynamic. Client and contractor can influence this, supported by the designer involved. However, before the start of the bouwteam, it should be assessed whether the client fits the contractor.
The contractor itself should take an active role in the design by making own drawings, introducing building methods and by early involvement of a project leader for execution. A trade-off must be made on which people to involve continuously and which only when their expertise is required. But the availability of people can be an obstacle for involving the right people at the right moment. By making joint planning you can respond to this by making extensive preparation schedules to shows the importance of which people are needed.

Success factor 21: Understanding each other's objectives (+3)
Knowing what is important to each other helps in a bouwteam project. For a contractor, hard start dates are essential, and the project must start on time because managing capacity and scheduling employees is important. Therefore, a contractor should continuously steer towards understanding each other.
It is good to know from each other what you want to get out of the project and which things are important to each other. Objectives influence the contractor's thinking, and sometimes a consensus is necessary. Avoiding obstacles for this success factor is equal to postponing problems because they will occur eventually. At the start of the project,

understanding each other is most essential, but it is good to do a recap regularly from phase to phase.

Success factor 23: Transparency (+3)
Transparency is important because it is important to know what underlying interests are. You have to be transparent and clear with each other about what you want and need and to communicate clearly what risks and opportunities are. A contractor should not run away from responsibilities, but the client should know what is important to other bouwteam participants. Being able to recognise each other's opportunities and risks and help each other with that is part of a bouwteam.
There is a limit to transparency because you cannot always discuss everything, but it starts with doing it yourself. If you get into it yourself, the team might also dare to be honest about it. Sometimes, it is noticed that the client is not transparent or other bouwteam participants are not. If so, it must be indicated that they are not going to tell since transparent communication does not mean communicating everything: limits should be indicated. Furthermore, it is important to know each other's objectives because by knowing them the added value of the bouwteam can be delivered. Together you come up with the best solutions, and there are many examples of this. Sharing budgets and drawings with each other contributes to transparency, and for critical parts, sub-contractors can be included as well.

Success factor 10: Specified payment arrangements (+3)
If you get everything right, it will work itself out. Contractors want a bouwteam and want to get paid for it, but eventually it is done to being awarded the building contractor. Payment arrangements do not result in problems.

Participant 25

Success factor 8: Clear definition of roles before the bouwteam starts working (+4)
In a bouwteam, people should know who does what, why and when. If everyone knows their role, it is clear to the people and benefits of the bouwteam can be achieved. This is good because you understand what you have to do and what your role is. It must be clear that your are working towards a common goal. But, the client should initiate this, but in practice, this usually does not happen because the contractor has more need for clear roles.
The contractor should indicate how a bouwteam is seen by first aligning it with the client and together, common goals can be defined. If they are specified but still unclear, then client and tender manager or project manager should consult internally.

Success factor 33: Mutual trust (+3)
Trust means having the same goal in a bouwteam. You must pursue the same goal in everything you propose or discuss. Not having the idea that there are doubles agendas contributes to mutual trust. The client has the most influences as the person ultimately responsible, and that person should ensure that mutual trust is expressed.
This success factor can be initiated by being clear in what you want to know about time, money, products to be delivered. In doing so, the bouwteam project can be steered accordingly. Furthermore, lessons learned from other projects can be used to improve a current bouwteam and informing the client with the result of decisions to be made to trust as well. Often, mutual trust is not expressed in practice because there currently is a high level of distrust in the construction industry. Mutual trust is important during each phase of the bouwteam project, but you have to set it up during the start-up phase. It can be held on by letting financial processes run parallel to the design process instead of waiting until the end to share negative and financial related messages.

Success factor 12: Defined scope of the bouwteam (+3)
A defined scope is a clear description of the project and the question asked by the client to the contractor. A formulated end-goal can be part of the scope. A defined scope is essential for choices to be made by bouwteam participants. It must be clear on what the focus lies, depending on the project and business case. From the position of a contractor, the scope cannot be influenced but it should be clear what the scope is.
As a contractor, preliminary planning can be made to cross off time as a limiting aspect. However, if a scope is not followed up, a contractor can go along with it, but it must come forward during meetings. Therefore, it is important to define as many scope-related aspects as possible at the beginning of the project.

Success factor 10: Specified payment arrangements (-4)
It does not matter when you get paid, as long as you get paid.

D

Expert consultation

In this appendix, the set up of the expert meeting is given consisting of three parts. In the first part, the defined client types are tested and in the second part the identified contractor's perspectives are tested. Finally, in the third part the designed strategies are explained per client type and the expert are asked

D.1 Set up of the expert consultation

In this research, three members from senior management of Ballast Nedam who have experience with working in bouwteams were consulted. In doing on, individual expert consultations are conducted due to limited availability of the experts. Since the contractor's perspectives are shared by employees from Ballast Nedam, senior management is used to discuss whether the results of this research can be related to practice. The experts are involved during the start-up of a bouwteam by getting to know the client and negotiating bouwteam contracts. Thereafter, they are involved in managing the bouwteam process and are in close contact with the client during price negotiations. In the meeting, the focus was on three parts: the identified contractor's perspectives, client types and the designed strategies (see appendix D. Based on the experts knowledge and experience the findings are discussed. The goal of the expert consultations is to strengthen the results, with a focus on the designed strategies. Based on this, conclusions en recommendations are refined and it will be determined whether the strategies can assist the contractor in bouwteams.

D.2 Format of the expert consultation

Goal

The aim of this study is to identify which contractor's perspective for collaboration in bouwteam exist. After analysis of different perspectives, strategies are designed that can be used by the contractor to influence client-contractor collaboration to deliver a a project successfully. The interview will be used to confirm designed client-specific strategies. Because the perspectives are defined and shared by employees within Ballast Nedam Building Projects and the defined implementation of the strategies, the results are examined by senior management level. With the results of this expert consultation, the conclusions and recommendations will be sharpened and verified and it will be determined whether the strategic framework can help the contractor in bouwteam.

Structure of the interview

The expert interview consists of three parts. The first part focuses on the shared perspectives on collaboration in bouwteams. The second part focuses on the identified client types and the third part on the designed strategies and their implementation within Ballast Nedam.

D.2.1 Part 1: Contractor's perspectives

I would like to go through the identified contractor's perspectives that have emerged during my research. Per perspective I have a number of questions.

Perspective 1: Relationship first

The first perspective focuses on the relationship between 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 orientation is subordinate to the other factors because the bouwteam has to focus on their current tasks.

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- How do you think this perspective fits Ballast Nedam (why or why not)?
- Optional: Where/when do you see this perspective emerge?

Perspective 2: Early involvement of the right people

The second perspective is about involving the right competent people early in the project of which senior management and the project team leader can be part. The people involved need 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. 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.

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- How do you think this perspective fits Ballast Nedam (why or why not)?
- Optional: Where/when do you see this perspective emerge?

Perspective 3: Structure first

The third perspective focuses on identifying and determining the variables of the bouwteam. The scope and roles are ideally defined early to give structure to provide clarity for the bouwteam. Efficient communication can contribute to this, as long as only necessary information is shared. Once the project has been formulated, the focus can shift to the relationship between client and contractor. This group of people is willing to share occurring risks to deliver the project successfully.

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- How do you think this perspective fits Ballast Nedam (why or why not)?
- Optional: Where/when do you see this perspective emerge?

Closing question

Is the set of perspectives complete in the context of collaboration in construction teams?

D.2.2 Part 2: Client types

During my research I identified three types of clients from the literature that can occur in bouwteam projects. In order to make sure that the right assumptions have been made in relation to the established strategies, I would like to go through these types with you. By doing so, I want to determine whether the customers that occur in practice correspond with the customers from the literature.

Client 1: The involved client

The involved client is both owner and end-user of the project, and the project is not his primary source of income; the identified driver is self-use. The goal is to develop a suitable building that fulfills the desires of the client. It is assumed that the leader of the bouwteam is a specialized delegation of the organization of the client. Technical expertise related to the project is not part of the client's expertise resulting in a partly experienced client. Because the client will use the building himself, he will be committed and highly involved during the bouwteam process.

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- Does this client type have specific characteristics that always emerge but are not yet mentioned?
- Do you have examples of the client type?

Client 2: The project developer

The project developer is the owner of the project and develops a project as an investment, but is not the end-user after project delivery. The main driver of the developer is to make profit because the reason to deliver a project is a primary source of income which can either be through, e.g. sales, lease or investment. Therefore, the goal is to develop a profitable business case. Often, the developer has experience due to recent and relevant expertise but there is no technical expertise resulting in a partially informed client. The project developer is the leader of the bouwteam and understands the construction industry

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- Does this client type have specific characteristics that always emerge but are not yet mentioned?
- Do you have examples of the client type?

Client 3: The representative of the client

The representative of the client represents the owner of the project and is therefore neither owner nor end-user. The project is a primary source of income by managing the project for the client, resulting in direct profit. The goal is to keep the assignment and deliver work as agreed upon according to the client's objectives. During the bouwteam, the objective is completion and optimization of the project. Since they are experienced with construction projects and possess financial or legal and technical expertise, they are well informed (specialized) clients. The representative is aware of his contribution to the project and knows how to prioritize his objectives. Furthermore, he is the leader of the bouwteam and it is expected that he can act as a partner to the contractor because their interests are aligned. However, in the meantime, the representative reports to the original client.

- Do you recognise this perspective within Ballast Nedam Building Projects? (Why or why not)
- Does this client type have specific characteristics that always emerge but are not yet mentioned?
- Do you have examples of the client type?

Closing question

Is the set of client types complete in the context of private clients in the utility and building sector who are present in bouwteams.

D.2.3 Part 3: Strategic framework

For each client identified, a strategy has been designed using the different contractor's perspectives and the success factors that are valued as most essential per perspective. The strategies are recommendations for the contractor to influence collaboration in bouwteams to achieve successful project delivery.
For each client-specific strategic, the following questions are asked:

- In the strategy, the clients are matched with contractor's perspectives. Do you agree with the matches made (The goal is to determine whether the connection between client type and contractor's perspective logical and correct).
- Are there barriers/obstacles for the implementation of this strategy?
- What can you facilitate, from senior management, to implement this strategy? (What is needed to implement this strategy / how can it be organized)

Closing question

Is this strategic framework a tool that you would use to influence client-contractor collaboration in bouwteams to achieve successful project delivery?