

Supply chain Integration in Early Contractor Involvement – The principal contractor's role

Author: Ing. Sietse Mastenbroek

Master Thesis Construction Management & Engineering (CME)

Supervisors: Dr. H. Voordijk (University of Twente), Drs. Ing. J. Boes (University of Twente), Ir. R. ten Bras (BAM Infra), S. Wartena (BAM Infra)
Department of Construction Management and Engineering, Faculty of Engineering Technology (ET), University of Twente, Drienerlolaan 5. 7522 NB Enschede, The Netherlands.

07-12-2023

Word count: 15.722

This thesis explores the integration of supply chain partners within network governance cooperations during a project its design-phase, particularly focusing on Early Contractor Involvement (ECI) projects. The core aim was to assess the extent and efficacy of this integration and its impact on project dynamics. Employing a mixed-methods approach involving multiple case studies, the research analysed Collaborative Relationship Factors (CRF) of Suprpto (2006). While recognizing the principal contractor its integration efforts, the study pinpointed specific improvements within three out of four CRFs (Front-end definition, Relational attitudes and Teamworking quality) that warrant improvement. The study emphasizes the transformative potential of strengthening these collaborative factors, advocating a proactive approach from the principal contractor to enhance integration and enhance project success within the construction projects.

Keywords: Construction industry, Supply chain integration, Early Contractor Involvement, Network governance, Cooperation

1. Introduction

The construction industry is a diverse and complex sector which is characterised by a high degree of fragmentation (Dainty et al., 2007). This fragmentation is evident in the substantial number of firms operating in the industry, the wide range of activities undertaken and the geographical dispersion of construction activity (Dubois & Gadde, 2000). Lu et al. (2008) characterised the construction industry as a high degree of interdependence between firms. This is due to the fact that construction projects are typically large and complex, involving the coordination of a range of different activities and trades. This makes the construction industry a highly competitive marketplace (Flanagan et al., 2007). Where each construction company tries to get chosen for a project to deliver his service. This can be a contractor bidding for a project tender of a public client or a subcontractor executing his specialism or supplier delivering his materials for a principal contractor. Generally, the subcontractor and material supplier are called the supply chain partners of a principal contractor (Noordhuis & Vrijhoef, 2011). The competition between principal contractors and the supply chain can be fierce (Flanagan et al., 2007). Principal contractors often try to undercut the prices of their rivals to win work (Nyström & Mandell, 2019). Cox and Thompson (1997) concluded that most subcontractors compete on *price* to secure work from a principal contractor. Next to price, the *quality of workmanship* is also a key factor for principal contractors in the competition between the supply chain partners (Cox & Ireland, 2002).

Next to the principal contractor, public clients spent the last decades on bidding competition and quality of workmanship. Over the years, advancements have been made to allow clients procure not only on price but also on the quality of workmanship of the contractor and his reputation (PIANOo, n.d.). With these advancements clients tried to truly find (procure) the best contractor for their project. In this paper three types of advances of how clients search for experience from contractors in procurements are distinguished.

Award expertise of bidder: A couple of decennia ago clients had clear project expectations and procured contractors for projects mostly based on their pricing offers. Due to this, contractors had to search for competitive prices at their subcontractors and suppliers to gain some decent profit margins (Wong et al., 2001). Shen et al. (2004) studied that a low price does not suggest that the contractor

has the right expertise for the project. In 2013, clients introduced Most Economically Advantageous Tender (MEAT) to procure projects on value instead of price (EIB, 2013).

Ascertain expertise of bidder: Along with awarding the contractor based on his expertise, different procurement processes were introduced. Procurement methods like for example Best Value Procurement made it easier for clients to award the experience of the bidders. Additionally, it made the results of the procurement more transparent (Storteboom et al., 2017).

Asking for expertise of bidder: Akintoye (1994) studied that clients required the execution expertise of contractors for the design and/or engineering of the project because the construction projects became too complex for clients. With the introduction of the UAV-IC 2005 clients introduced more integrated contracts. In practice, this means more design freedom and more advisory opportunities for the contractor. Due to these integrated contracts, the responsibilities and liabilities of the design shifted towards the awarded contractor. It became evident that a complete shift of risks is not always desired for contractors since large construction projects became too risky for them (Top, 2022). It resulted in the introduction of a new project delivery method of requesting expertise: Early Contractor Involvement (ECI). In the design phase (bouwteam-phase) the contractor and client work collaborative on the design of the project, instead solely the client or the contractor. Depending on the requirements of the project, clients assign the construction responsibilities of an ECI to a contractor (UAV-IC 2005) or to themselves (UAV 2012 / DNR 2011). The differences between the traditional, integrated and ECI delivery methods are displayed in Figure 1.

In the construction phase, the principal contractor is responsible for the overall management of a construction project and wants to ensure that he delivers a quality product to his client. He is responsible for the coordination of all subcontractors, suppliers and materials. The principal contractor is also typically responsible for the financial management of the project. The subcontractor is responsible for a specific trade or element of work within a construction project and work under the direction of the principal contractor. Besides making profit, supply chain partners also want to deliver a high-quality product, as this will improve their chances of securing successive work from principal contractors (Noordhuis & Vrijhoef, 2011). The reputation of a principal contractor or subcontractor is a key factor in the

competition between contractors (Crane, 1999). A good reputation can help a subcontractor or supplier win work, as principal contractors are more likely to choose firms with a good reputation.

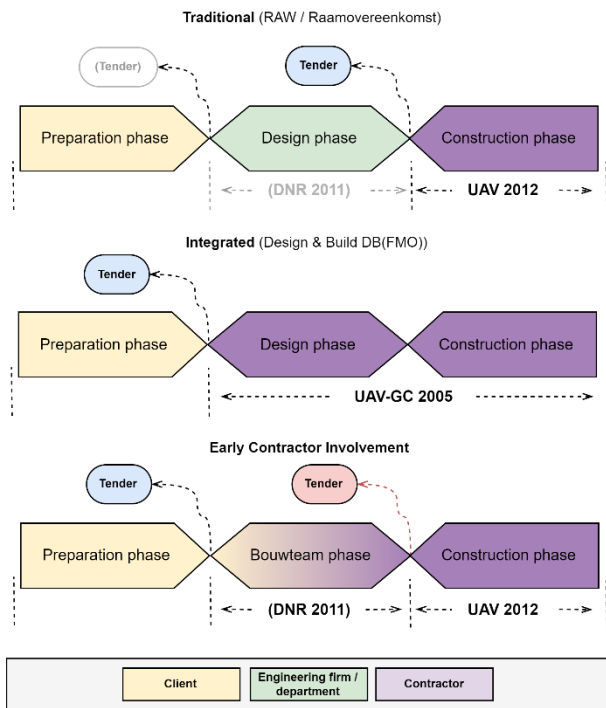


Figure 1.; Traditional, integrated and ECI delivery methods

As mentioned by Adriti et al. (2002), a firm determines whether he performs in the design phase solely or needs supply chain partners for the bundle of tasks. This is also the case for the bouwteam-phase of ECI where subcontractors or suppliers will be integrated into the project organisation of the bouwteam-phase. The way how supply chain partners collaborate with the principal contractor is decided by the chosen governance mode of the contractor (Briscoe et al., 2001). Flanagan et al. (2007) concluded that the competition between principal contractors and supply chain partners is intense. In ECI, the contractor and client work collaborative in the bouwteam-phase. From a transaction costs economics (TCE) perspective in such bouwteam-phase the transactions between parties are complex and customized with a high frequency and long duration. These are characteristics of a cooperation (Erikson, 2008). Whereas standardized transactions with low frequency and/or short duration coupled with low uncertainty should be governed in a relationship focused on competition (Collin, 1993; Macneil, 1974; Williamson, 1985).

It has been extensively studied how clients procure principal contractors depending on their areas of expertise (e.g., Eriksson, 2008; Akinitoye et al., 2000; Jelodar et al., 2016). On the contrary, it is hardly studied how principal contractors procure supply chain partners when they are needed for their expertise in the design phase. As a result, questions arise on how supply chain partners are integrated in a design phase by principal contractors when the relationships extend longer than just the construction phase and if both parties are still competitive towards each other or cooperate?

The paper of Erikson (2008) attempts to increase clients their awareness of how procurement affects competition or cooperation based on TCE but does not state the relationship between principal contractor and supply chain partners collaboration for a longer period in a project. For example, the type of work where the chosen project delivery method is ECI have a high asset specificity since the client needs specific knowledge from the principal contractor for a

specific project. Asset specificity is defined as the extent to which the investments of one firm are specific to a particular transaction and thus have little or no value in an alternative use (Al-Hakim et al., 2016).

By studying how a principal contractor and several supply chain partners collaborate with each other in project phases (where asset specificity is high) and by verifying these results at four projects where collaboration conflicts occurred, this research aims to study (1) if cooperation prerequisites for network governance can be examined in projects where supply chain partners are involved early in the design phase and (2) to increase principal contractors their awareness on how supply chain integration affects competition or cooperation. Therefore, this paper focusses on how a principal contractor aims to achieve integration of the supply chain partners their expertise for the bouwteam-phase and how they collaborate with them. Therefore, this study reviews "To what extent are supply chain partners integrated via network governance cooperations for their knowledge and expertise during the design phase of projects by principal contractors, and what are the factors that impact this level of integration?"

The structure of the study is as follows: Chapter 2 presents the theoretical background of ECI and cooperation. Then, Chapter 3 elaborates on the research methodology, after which Chapter 4 presents the results of the current state of network integration and its verification by the four case studies. Finally, the paper concludes with a discussion and conclusion in the final Chapters 5 & 6.

2. Theoretical background

2.1. Collaboration: competition or cooperation?

Flanagan et al. (2007) states that in the construction industry, competitiveness has become one of the hottest topics, and consequently, a large number of research works have been published. Competition can be seen in every industry. It exists across different nations, industries, and projects in addition to competition at various firms. At firm level, both supply chain partners and principal contractors desire a competitive edge over their rivals. Despite this, the forms of competitiveness that each type of firm seeks are different. Lu (2006) states that competitiveness is embraced as a management or economics concept that is preferable than conventional economic measures like profitability, productivity, or market share, which are viewed as being insufficient to enable continual performance improvement. In the construction industry, projects are often predefined by clients while contractors provide construction services. Competitiveness at the construction project level is then about a contractor his capacity to win a contract and to execute the project according to good workmanship.

The principal contractor (and its stakeholders) evaluates the competitiveness of potential supply chain partners. According to Lu (2006), the principal contractor evaluates the degree of competition among the subcontractors, ranks them according to level off competition, and pre-qualifies them for the bidding process. Pre-qualification on lowest-price win was the dominant mechanism in competitive bidding exercises. Wong et al. (2001) states that it has been considered effective, since traditionally the functions of projects were pre-designed, and the quality of projects was largely confined by regulations or contract documents (e.g., UAV 2012). In Palaneeswaran and Kumaraswamy (2000) their studie they find that the low bid approach should be recommended when the scope of a project is very tight, clearly defined and innovations or alternatives are not being sought. Nowadays, construction projects are highly complex and as stated in Chapter 1 and Figure 2 that requires a state of cooperation.

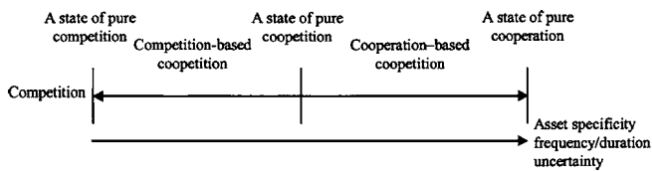


Figure 2.; The competition-cooperation continuum (Eriksson, 2008)

2.2. Governance modes

The fragmentation and interdependence of parties, knowledge and tasks in the construction industry has led to the development of one distinctive governance structure: market governance (Noordhuis & Vrijhoef, 2011). However, to understand what market governance is, the two other governance modes will additionally be explained: hierarchy-based and network-based governance.

Hierarchy is the most familiar and the traditional governance mode for firms. It is based on a hierarchical structure, with a clear chain of command and a centralized decision-making authority (van Kersbergen & van Waarden, 2004). Van Heffen and Klok (2000) state that this mode is often used in firms where there is a need for clear and concise communication, a high degree of coordination, and a high degree of control. Next, it is used often in situations that requires quick decision-making, such as in emergency situations. A disadvantage of this mode is that in response to changes it can be inflexible and slow. Hierarchy governance is a typical governance mode within a single organisation and therefore not the dominant governance mode in a project organisation like ECI.

Market governance is the predominant form of governance between different companies in the construction industry (Joosten, 1998). Joosten states that market governance is characterised by a highly competitive environment in which firms operate independently of one another and therefore is based on the principle of supply and demand. This often leads to a race to the bottom in terms of price, as firms compete (*competition*) to offer the lowest price for their services. Firms using this mode make decisions based on what will maximize their profits. This mode is often used in situations where there is a need for quick and efficient decision-making, and where there is a lot of competition (Cox & Ireland, 2002). The disadvantage of this mode is that it can be short-sighted and may not always consider the long-term effects of decisions. Therefore, the procurement of an ECI can be market-based, but in the bouwteam-phase the disadvantages of this governance mode are not desired.

Network-based governance is based on the principle of *cooperation*. Ebers and Jarillo (1998) defined that firms using this mode make decisions based on what will benefit the network. This mode is often used in situations where there is a need for a high degree of flexibility and adaptability (Keung & Shen, 2013), for example in the bouwteam-phase. It is a type of collaborative decision-making that allows network members to share resources, knowledge, and expertise to achieve common objectives (Pauget & Wald, 2012). A disadvantage of this mode is it that the decisions process can be slow and therefore be less efficient than other two modes (van Heffen & Klok, 2000). Network governance has emerged in forms like ECI as a response to the challenges of governing large and complex projects, such as large UAV-IC contracts being overbudget, that are characterized by decentralized control, distributed authority, and diverse stakeholders. A challenge of network governance is the diversity of interests among the various stakeholders. In a networked environment, there are a variety of actors with different interests, perspectives, and agendas (Cheng et al., 2001) which could emerge to competitive behaviour.

Therefore, interfirm network governance is characterised by a more collaborative approach in a market governed industry, in which firms work together to deliver construction projects. Network governance and interfirm network governance are similar in their purpose of achieving efficiency and effectiveness in the industry. However, there are differences in their approaches (Nooteboom, 1999). *Network governance* is a type of governance structure used to manage the activities of multiple firms. The most generic form of network governance in the construction industry is the “multi-partner” model. *Interfirm network governance* has a centralized process in which one firm, usually the most powerful, is responsible for making decisions and setting rules for other firms. Interfirm network governance is often used in the construction industry, where multiple firms engage in a project (Borgatti & Foster, 2003). The most common form of interfirm network governance in the construction industry is the “lead firm” model. Regarding ECI, the client and principal contractor collaborate in the bouwteam-phase but if a principal contractor needs the expertise from a supply chain partner, the principal contractor becomes the lead firm.

In the construction industry we can indicate that collaboration in market governance (competition) and interfirm network governance (cooperation) are the contrary of both modes. The shift from market governance to interfirm network governance is driven by the need for firms to increase their ability to respond to changing market conditions and customer needs. This shift can be seen in construction project organisation like ECI. By forming long-term relationships, principal contractors and supply chain partners can develop mutual understanding of each other and build trust and commitment. This allows a principal contractor and supply chain partners to better anticipate the principal contractor its needs and offer more tailored solutions (Provan et al., 2007). To successfully shift from a market-governed industry to an interfirm network-governed industry, construction firms must adopt a new mindset first to develop a shared understanding of the market and their respective competitive positions. This will enable the identification and addressing of potential opportunities and threats of both parties (Gulati, 2007). One of the primary strategies is relationship building (Chinowsky et al., 2008). This implies developing trust, communication, and commitment between buyers and suppliers. This development affects activities such as face-to-face meetings, joint planning, and joint problem-solving. Another strategy for shifting from market governance to interfirm governance, is the development of cooperative arrangements. This includes activities such as joint venture agreements, which involve the sharing of resources and the pooling of capabilities to achieve common goals (Lecoutre & Lièvre, 2010). Additionally, cooperative arrangements can demand the sharing of information, such as pricing information and product specifications. Finally, the shift from market governance to interfirm network governance involves the development of strategic alliances. These alliances entail the sharing of resources and capabilities to create competitive advantages (Ebers, M., 1997).

2.3. Studying relationships

To study what the extent is of how supply chain partners are integrated via network governance cooperations by principal contractors, a theoretical framework has been chosen in Chapter 3 to study these relationships. The most dominant models in the literature research have been examined. Based on Table 1, the most suitable model for the study is the RECAP tool by Suprpto (2016). Although, both the Maturity Model and RECAP tool got high scores, the RECAP tool fosters a more practical approach towards studying relationships with its interview form. Appendix A gives an overview of the description of the values of Table 1.

Table 1.; Comparison of the five relationships models.

	PTI-Model	COL-MM	SCOR-model	Maturity model	RECAP-model
Soft vs hard criteria of tool	37,5% SOFT (03/08 criteria)	100% SOFT (25/25 criteria)	80% SOFT (05/06 criteria)	100% SOFT (08/08 criteria)	100% SOFT (13/13 criteria)
Model verified in Construction industry	38/38 citations of construction docs	4/18 citations of construction docs	Many citations of construction docs	154 citations of construction docs	105 citations of construction docs
Applicable to buyer-supplier relationships	Yes	NO	YES	YES	YES
Applicable to preliminary stages of a project	No front-end definition criteria	No front-end definition criteria	Yes	YES	YES

Partnering Temperature Index (PTI) was developed to measure partner collaboration (Cheung et al., 2003). To manage projects, the tool uses performance indicators that can be expanded with new performance indicators. The PTI evaluates the partnership or collaboration its status using eight hard and soft metrics. The five hard criteria are: cost, time, quality, safety, and environmental impact. The three soft criteria are: claims and problem resolution, contract relationships, and communication.

Collaboration Maturity Model (Col-MM) is a model which assesses the maturity of a collaboration (Boughzala & De Vreede, 2015). The methodology, which is designed for assessments, assesses the effectiveness of collaboration both within and outside of organizational boundaries. The model focuses on four key areas: information & knowledge integration, collaboration management, collaboration process & collaboration characteristics.

The *Supply Chain Operations References (SCOR-model)* model focuses on the supply chain of construction projects by assessing the contractor its supply chain management (Wibowo & Sholeh, 2015). The model was made for mainly factory industries and therefore the defined processes and some of its KPI's are not a reflection of the construction industry.

A paradigm for evaluating supply chain relationships in the construction industry is the *Maturity Model for Supply Chain Relationships* (Meng et al., 2011). This model, which is based on a thorough literature study in which twenty relevant studies were examined, includes the key indicators of a collaboration. It was then separated into the following groups: key factors that are crucial to the success of partnerships, key factors that lead to a traditional relationship between adversaries and key factors that hinder partnership success.

A 2016 dissertation by Suprpto at TU Delft led to the creation of RECAP, also known as the *RELational CAPability assessment tool* (2016). This tool can be used to evaluate a collaboration between the entire supply chain. The usage of the RECAP tool enables the improvement of areas of cooperation throughout several project phases based on quantitative data. In order to foster better collaboration in the Dutch construction industry, Nader (2019) used this tool to study the distinctions between Early Contractor Involvement and D&C projects and was able to study the collaborations between clients and principal contractors.

2.4 RELational CAPability assessment (RECAP) tool

Formal forms of collaborative arrangements, known as relational contracting, partnering, and alliancing, became more prevalent in the 2000s. These agreements are intended to align the project objectives with common corporate goals to foster a more cooperative and effective working environment. (Rahman & Kumaraswamy, 2005; Xue et al., 2010). Despite to the reported success of it, Suprpto et al. (2015b) concluded numerous case studies (Alderman and Ivory, 2007; Bresnen and Marshall, 2002; Chan et al., 2012; Smyth and Edkins, 2007) indicated its practical issues including a lack of top management commitment, a lack of

cooperative mind-set, and insufficient initial effort to establish a shared culture. Suprpto et al. (2015a) observed the lack of managerial attention to the underlying factors and mechanisms that make people in project teams work together across the boundaries of the permanent organizations, notwithstanding this fact that collaborative working arrangements have been widely adopted.

Suprpto et al (2016) explored 21 empirical studies and analysed them on the various factors and mechanisms influencing the buyer-supplier cooperation. An integrated model was designed based on the input-mediator-output framework by Dietrich et al (2010). The model conceptualizes 'Teamworking' and 'Team trust' as mediators that connect the antecedents (Relational attitudes, Team integration, Joint working, Senior management commitment, Buyer-supplier capability, and contract) to the outcomes ('Project performance' and 'Expectation of a continuing relationship'). Based on this integrated model, Suprpto et al. (2016) defined six General Relationship Factors (GRFs) in their early stages of their research: *relational attitudes, teamworking, team integration, joint working procedures, owner-contractor capability and contract functions*.

In absence of formal mechanisms, 30 practitioners of nineteen different companies sorted out that GRFs 'Teamworking' and 'Relational attitudes' (reflected by affective trust, common vision and objectives, open and honest communication, no blame culture, constructive conflict, social interaction, and senior management commitment) are the most crucial components to supplier-buyer cooperation. Contrary to mentioned literature, contractual aspects are perceived to be relatively less important for governing the buyer-supplier cooperation. Projects are about people, their mind sets (Winch & Maytorena, 2011), and characterized by competing cultures and rationalities (Sanderson, 2012). The 30 practitioners their main takeaway, considering the limited roles that contracts have in relationships, is that having the right contracts is essential but insufficient to guarantee successful buyer-supplier cooperations. A sample of 113 capital projects were analysed by Suprpto et al. (2015c). They assessed their hypothesis about the contractual aspects using Partial Leas Square Structural Equation Modelling (PLS-SEM). The findings suggested that through better 'Relational attitudes' and 'Teamworking quality', projects with a partnering/alliance contract are more likely to perform well than those with lump-sum and reimbursable contracts. Additionally, due to improved relational attitudes and collaboration qualities, projects with incentive contracts are likely to perform better than those without incentives. Therefore, from the six general relationship factors Suprpto et al. (2016) derived that the five GRFs without contract functions are necessary to research the buyer-supplier cooperative relationships.

- A. Relational attitudes;
- B. Teamworking;
- C. Team integration;
- D. Joint working procedures;
- E. Owner-contractor capability;

Suprpto et al. (2015a) concentrated on inter-team collaboration processes, in accordance with Smyth and Pryke their (Pryke and Smyth, 2006; Smyth and Pryke, 2008) theory that proposed methods in which individuals work together in teams significantly impacts the success and efficiency of project execution. Suprpto et al. concluded that "Teamworking quality" is a collection of underlying mechanisms represent the task-related and social interactions between the buyer his team and the supplier his team when a project is being conducted. The teamwork mechanisms include five task-related interactions (coordination, aligned effort, communication, balanced contribution, and mutual support) as well as two social interactions, cohesion and affective trust.

The study on front-end development in collaborative arrangements was a key topic of focus for Suprpto et al. (2015a), besides the focus on quality of teamworking. The most contributing practices during front-end development on project performance are integration of the different disciplines and parties involved to facilitate close collaboration between buyer-supplier; early joint efforts and involvement to support development of trust and alertness within team.

Next to Suprpto et al. (2015a), other study streams had concentrated on finding critical success factors (CSFs) for project-based collaboration in an effort to understand the essence of what makes collaboration effective. A number of CSFs, including the following, have been proposed to have an impact on the effectiveness of supplier-buyer cooperation:

- F. Top management commitment (Black et al., 2000; Rahman & Kumaraswamy, 2008);
- G. Team integration (Baiden and Price, 2011; Bosch-Rekvelde et al.);
- H. Joint working (Black et al., 2000; Chan et al., 2004; Meng, 2012; Rahman & Kumaraswamy, 2008);
- I. Buyer's in-house capability (Miller & Lessard, 2000; Rahman & Kumaraswamy, 2008);
- J. Teamwork (Baiden and Price, 2011; Chan et al., 2004; Cheung et al., 2009; Rahman & Kumaraswamy, 2008).

As a result, Suprpto et al. (2016) reorganized the GRFs and CSFs into five general collaborative relationship factors. Suprpto et al. use these five factors to evaluate the relationship capability at the inter-firm and inter-team levels in buyer-supplier cooperation's.

1. **Front-end definition;**
2. **Collaborative practices** which include team integration and joint working procedures;
3. **Relational attitudes** which include senior management commitment and relational norms;
4. **Teamworking quality** which consists of inter-team communication, coordination, balanced contribution, aligned effort, mutual support, cohesion, and affective trust;
5. **(Joint teams' capabilities** which consist of buyer his team capability and supplier his team capability.)

Suprpto (2016) conceptualised the empirical model of the five general collaborative relationship factors into Relational capability assessment tool (RECAP) for the project practitioners to measure the current state of their collaborative working. In the validation of the RECAP tool Suprpto et al. (2016) concluded that besides measuring the ongoing relationship's health during a project, the participants suggested RECAP can be applied in other areas. Utilizing RECAP in post-project evaluation assessment can be useful to extract lessons learned from both parties and teams. Next to this, RECAP was also considered useful as part of the supplier performance audit. With the help of RECAP, a project manager can initiate and develop relationships with suppliers. The purpose of RECAP is to measure relational capability in the supplier-buyer cooperative relationship and not on the 'individual capability' of each party, therefore Suprpto et al. (2016) excluded the need to investigate '5. teams' capabilities' in the assessment.

All four collaborative relationship factors are not assessed directly but broken down into sub-criteria (except for the front-end definition) which are then assessed through two to six indicators. Overall, RECAP consists of thirteen sub-criteria and 58 indicators. An overview of the four factors and sub-criteria is given in Table 2.

3. Research design

In the previous chapter, the theoretical foundation of cooperation, interfirm network governance and studying relationships have been analysed and as a result the RECAP-tool as a research methodology. This chapter addresses the research design, including the research approach that elaborates the tool, procedures and processes to collect and verify all data. The qualitative research design is divided into two distinct empirical phases: a *comparative* and an *explanatory* multiple case study, collectively forming a sequential mixed-methods approach. Multiple case studies are suitable since they provide a detailed empirical description of a particular setting (Stake, 1995).

Table 2.; Collaborative relationship factors and sub-criteria of the relational capability assessment tool (RECAP) (Suprpto, 2016)

Collaborative relationship factors	Sub-criteria	# of indicators	Definition
A. Front-end definition	1. Front-end definition	5	The ability to comprehend the project scope, basic design, execution plan, and roles and responsibilities.
B. Collaborative practices	2. Team integration	5	The extent to which the buyer and the supplier teams are structured and integrated as a single team with no apparent boundaries.
	3. Joint working processes	7	The extent to which the buyer and the supplier teams perform joint working processes.
C. Relational attitudes	4. Senior management commitment	5	How well the senior management of the buyer and the supplier commit to support the collaboration.
	5. Senior management trust	4	The extent of mutual trust between firms.
	6. Established relational norms	7	Norms of no blame culture, win-win, and communication openness.
D. Teamworking quality	7. Communication	4	The extent of to which the teams communicate with each other effectively.
	8. Coordination	3	The extent to which the teams achieve synergies in coordinating interdependent activities.
	9. Balanced contribution	3	The extent to which the teams contribute their specific knowledge and expertise.
	10. Aligned effort	3	The extent to which the teams align their effort.
	11. Mutual support	3	The extent to which the teams help each other in achieving project goals.
	12. Cohesion	4	The extent to which the teams behave as one team
	13. Affective trust	6	The extent to which the teams' members personally trust each other.

The comparative multiple case study allows the research to explore the perspectives and experiences of the principal contractor and supply chain partners regarding early cooperation in the design phase. Patel et al. (2012) argued that collaborative work is an inherently complex phenomenon. By employing this design, the aim is to uncover the subjective meanings, attitudes, and challenges associated with early cooperation in the design-phase from the participants their perspectives. The study attempts to answer: *RQ1 “What is the current state of the collaborative relationship factors on supply chain partners being integrated via network governance cooperations in the design-phase of projects by principal contractors?”*

Based on the findings of the comparative multiple case study, an explanatory multiple case study has been conducted to determine whether the comparative study its results served as the foundation for conflicts between the principal contractor and supply chain partners. The explanatory multiple case study answers the question of *RQ2 “To which extend does a negative result of one of the collaborative relationship factors result in poor supply chain partner network integration?”*

It became evident before executing both studies that the principal contractor their previous work on ECI projects (where they relied on supply chain partners for their expertise and knowledge during the bouwteam-phase) was insufficient to compare various viewpoints, which would have a negative impact and risk on the results its reliability. As can be seen in Figure 1, the principal contractor participates in the design phase of both integrated projects as in ECI (bouwteam phase). The biggest differences between the two delivery methods are that in ECI the principal contractor is executing the design together with the client. Although, this research main aim is to study the cooperation between the principal contractor and supply chain partners in the bouwteam phase. As a result, the context its scope expanded to encompass UAV-IC projects where supply chain partners were involved for their execution-related expertise, where they provided advice on design choices, and they were allowed to do the execution of the work.

3.1. Comparative Multiple Case Study

The comparative multiple case study aims to explore and compare the opinions and experiences of two key stakeholders, namely the principal contractor and supply chain partners group, regarding their early collaborative engagements in the design-phase within the construction projects. Via conducted interviews with both parties, the study focusses identifying patterns, commonalities, and differences using the RECAP-tool.

The participants for this study consisted of the principal contractor and supply chain partners who had been involved in design phases. Since the principal contractor did not execute that many ECI projects with supply chain partners, a non-random selection of participants via purposive sampling was chosen for this study. It was employed to select participants with relevant experience and knowledge in the field of construction projects, specifically those involving ECI or extensive design work in UAV-IC projects. It was deliberately chosen to interview both the principal contractor and supply chain partner who collaborated with each other since it was about creating meaning from a collaboration between the two. The sample included participants from diverse backgrounds, such as distinct roles within the construction industry, varying project types, and a range of project sizes. From the principal contractor, in particular project leaders were interviewed because of their extensive contact with supply chain partners, and in addition, one buyer and one environment manager were interviewed. Of the principal contractor, the buyer is often the first person who has influence on the relationship with the supply chain partner. The environment manager was known to have had an explicit role in working with a supply chain partner in

the design phase and is a knowledge holder of ECI projects of the principal contractor. For the supply chain partners, both subcontractors and suppliers were interviewed to determine if there is any difference in the collaboration of the two with the principal contractor. The suppliers were subdivided into suppliers of an intermediate product or end product to conclude any more accurate variations. In Table 3 the total of fourteen participants are given.

Semi-structured interviews served as the primary method for data collection. The interview questions were based on Suprpto his RECAP-tool (2016) allowing the participants to reflect their experiences and share their insights. The form (Appendix B) of the RECAP-tool were send to the participants before the interviews were conducted to give the interviewees time for preparation. The interviews were conducted in private setting (mostly via MS Teams), and each interview lasted approximately one hour. All interviews were audio-recorded with participants their consent, and detailed field notes were taken to capture non-verbal cues and contextual information.

Thematic analysis was employed to analyse the qualitative data obtained from the interviews. The analysis process involved several iterative steps. Firstly, the recorded interviews were transcribed verbatim. Then, the transcripts were read multiple times to develop a sense of familiarity with the data. Initial codes were generated, based on the 58 indicators, by identifying key concepts, themes, and patterns that emerged from the data. These codes were then organized into the thirteen sub-criteria and the five collaborative relationship factors. Through an iterative process the data of the codes and connections between the different interviewees were explored.

To enhance the validity and reliability of the study, member checking was employed, where participants were given the opportunity to immediately review the answers based on summarizing questions to ensure accuracy and authenticity. Informed consent was obtained from all participants, ensuring their voluntary participation and confidentiality of their information. Anonymity was maintained during the reporting of the findings to protect the identity of participants and organizations involved.

Table 3.; Participants of mixed method case studies.

Principal contractor	
Buyer	
Environmental manager	
Project leader A	
Project leader B	
Project leader C	
Project leader D	
Supply chain partners group	
Subcontractor A	Road joint transitions
Subcontractor B	Drainage
Subcontractor C	Green areas
Subcontractor D	Earthmoving
Subcontractor E	Foundation work
Supplier A	Intermediate product
Supplier B	End product
Supplier C	Intermediate product

3.2. Explanatory multiple case study

An additional explanatory multiple case study research design was employed to investigate the dynamics of cooperation within single projects. The objective was to gain an in-depth understanding of the dynamics, challenges, and conflict outcomes of cooperation in these projects between the principal contractor and supply chain partners. This approach allows for the exploration of causal relationships and the reasons behind observed conflicts based on the concepts of cooperation.

Four cases are the lower limit of the optimal range recommended by Eisenhardt (1989). A purposive sampling approach was used to select multiple cases that represented a range of ECI projects or UAV-IC projects with design input from the supply chain. The selection criterion was a project in which the principal contractor and supply chain partner had a conflict which resulted in a negative perspective on the collaboration. The input for the purposive sampling were the conducted interviews of the previous comparative multiple case study. The final selection included four cases that provided comprehensive insights into cooperation within the project context. The four cases are presented in Table 4 and Appendix C.

The data analysis process began with the organization of the interview data from the comparative multiple case study. Based on the results, additional calls were planned with the interviewees to gather extra data based on gaps about the conflict of the cases. The data were then coded and categorized to identify key themes and patterns within each case. Cross-case analysis was conducted to identify commonalities and differences across the selected cases, allowing for the identification of overarching themes and insights.

Table 4.; Metadata about the cases.

	Case A	Case B	Case C	Case D
Contract type	UAV-IC	ECI	ECI	UAV-IC
Principal contractor	Project leader B	Buyer	Project leader B	Buyer
Supply chain partner	Sub-contractor C	Supplier C	Sub-contractor B	Sub-contractor A
Type of project	- buildings - landscaping	- sewage - landscaping	- sewage - drainage - landscaping	- asphalt
Size [€]	16,28 mln	-	-	45 mln

4. Results

The results begin with the results of the comparative multiple case study on the collaborative relationship factors between the principal contractor and the supply chain partners. Second and finally, four projects were analysed via the explanatory multiple case study, and the results of the collaborative relationship factors on the conflicts are discussed.

4.1. Collaborative relationship factors

The results of the collaborative relationship factors include both quantitative results and qualitative results. The quantitative results are based on the interviewees' grading of the statements/indicator per sub-criterion. These were sent prior to the interview to get the sheer opinion of the interviewee. During the interview, the interviewee had the opportunity, based on the dialogue, to adjust their grade, if necessary, if their opinion had changed or they did not initially understand the indicator prior. The following paragraphs present the quantitative results for each collaborative relationship factors by sub-criteria and for the indicators for each sub-criterion. For an in-depth analysis, Appendix D overviews all quantitative outcomes at the indicator level per sub-criterion and per interviewee.

Furthermore, each section consists of qualitative results of the collaborative relationship factors. The **[indicator letter]** represents the outcomes of an indicator that affected the result of the sub-criterion and, as a consequence, the collaborative relationship factor. *The topic of the indicator is given in italic.* Each outcome of an indicator is presented in such way that the differences and similarities between the principal contractor and

the supply chain partners group are presented first, followed by the outcomes between the two types of supply chain partners. Based on the open dialogue about the indicators of the RECAP tool, the data analysis of the interviewees their opinions are presented in Appendix E. The input of Appendix E are the transcripts of all interviews displayed in Appendix F.

In Figure 3, an overview of the quantitative results of the sub-criteria per collaborative relationship factors are given. The results display the differences between the principal contractor and of the supply chain partners group and the difference between subcontractors and suppliers. The average of all the collaborative relationships factors together gives the following result:

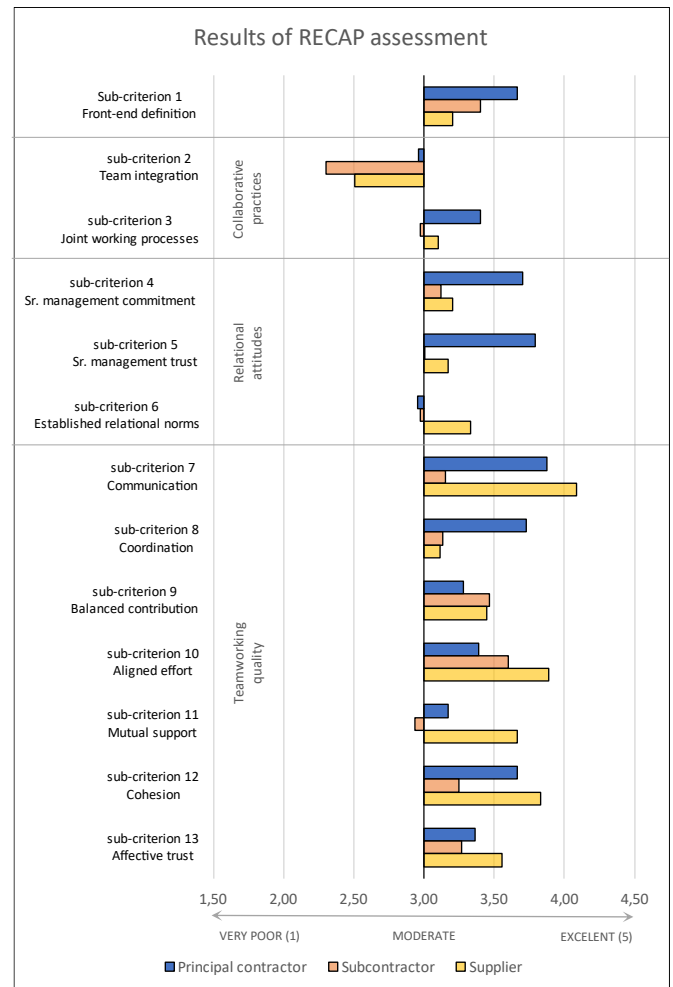


Figure 3.; Quantitative results of sub-criteria RECAP tool.

- **Principal Contractor:** 3.43
- **Supply chain partners:** 3.26
 - *Subcontractor:* 3.12
 - *Supplier:* 3.39

4.1.1 Front-end definition

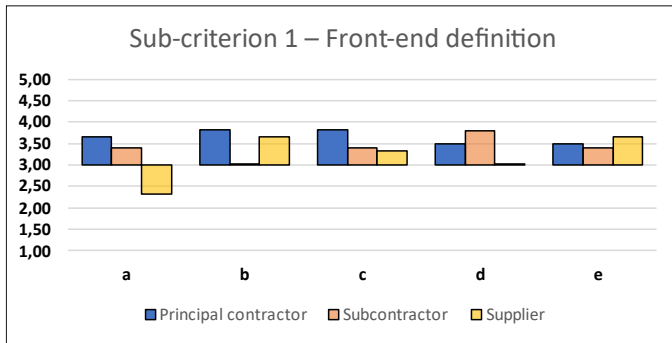


Figure 4.; Quantitative result of CRF & sub-criterion 'Front-end definition'.

Front-end definition averages:

- **Principal Contractor:** 3.67
- **Supply chain partners:** 3.30
 - Subcontractor: 3.40
 - Supplier: 3.20

[b] The front-end definition sub-criterion explored the experiences and perspectives of interviewees of both principal contractor and the supply chain partners group during the preliminary stages of project development. The process of selecting a supply chain partner revealed differences in how the principal contractor approach and communicate requirements to the supply chain partners group.

Both the principal contractor as the supply chain partners group emphasized the importance of 'considering the expertise of potential partners based on the project goals, objectives, and scope'. Although, both indicate that the way of engaging the supply chain partner is almost the same as they do in traditional contracts: requesting price estimates based on the project requirements through email communication. Notably, while cost price is not a primary consideration for selecting partners in ECI projects, it remained a common factor during the tender phase. The transactional costs economics (costs involved in making economic transactions) were less a crucial factor than the supply chain partner its cost price. Additionally, search and information, bargaining and switching costs were also less explored by the principal contractor. Two project leaders of the principal contractor stress that considering a supply chain partner based on its expertise is far more important than their price. However, when engaging with a supply chain partner, both project leaders typically start by requesting a price.

Next to this, the principal contractor recognizes the impact of clear communication of the project context to supply chain partners and to engage in joint exploration of how supply chain partners can contribute their expertise. Therefore, the principal contractor highlighted the significance of subsequent phone conversations to clarify specific aspects of the requirements when requesting a price. Looking at the supply chain partners group perspective, interviewees from the subcontractors indicated to have more trouble understanding the front-end definition than suppliers. The subcontractors indicate that they find it difficult to understand the project context based on the principal contractor its communication. Although, they experience more frequent contact about the request from the principal contractor when the front-end definition is broader compared to traditional contracts, but because the front-end definition is broader, they find it more difficult to price what exactly is being asked for and requirements from the principal contractor may be missed. Suppliers indicate that they find understanding the front-end definition easier than subcontractors because they only supply products.

[d+e] Both the principal contractor and the supply chain partners group provided insights into the expectations on 'clear responsibilities and roles' of supply chain partners in team-based projects, although both types of supply chain partners differ in opinion. While subcontractors acknowledged the perception that the design-phase may not generate immediate revenue for them, they recognized the changing nature of future collaborations and expressed enthusiasm for contributing innovative ideas and expertise. Suppliers indicated that they see ECI as an opportunity to promote their products to the client and principal contractor at the same time in a project.

Furthermore, interviewees of subcontractors emphasized that roles of supply chain partners often evolve and shift throughout the project, encompassing advisory, active partnership, and traditional pricing roles. Considering these findings, they state that the principal contractor should focus on effectively communicating the role of supply chain partners in the tender and/or design phase and establishing clear expectations from the outset of the collaboration. Suppliers indicated that they experienced this less since they offer a product.

[a] The interviewees of the principal contractor highlighted prerequisites when selecting supply chain partners for ECI projects. The principal contractor emphasized the importance of choosing partners with the relevant expertise and track record to fulfil the 'project goals, objectives and scope, and the partner its influence on it'. The supply chain partners group recognized the principal contractor its focus on finding the best solution rather than solely considering cost. But the supply chain partners group suggests that the principal contractor should also pay attention to the partners their flexibility in response to the front-end definition and not only their technical expertise. Furthermore, regarding the supply chain group, two out of three suppliers indicated that principal contractor should critically assess the client its given technical requirements more, based on freedom of products.

[c] Regarding clear responsibilities of supply chain partners in the front-end definition, both interviewees of the principal contractor and the supply chain group revealed varying perspectives. The principal contractor differed in their opinion about the clarity of the front-end definition for supply chain partners, while the supply chain partners group expressed the need for more support in understanding the broader front-end definition. Mainly the subcontractors emphasized their limited experience in ECI projects and the importance of receiving assistance from the principal contractor to fulfil their responsibilities effectively. To address this, interviewees of supply chain partners group desire that the principal contractor should create awareness within the organization about the potential need for additional assistance from partners on 'reviewing functional requirements together'.

4.1.2 Collaborative practices

Collaborative practices, which include sub-criteria team integration and joint working processes, play a crucial role in the early involvement during the design phase.

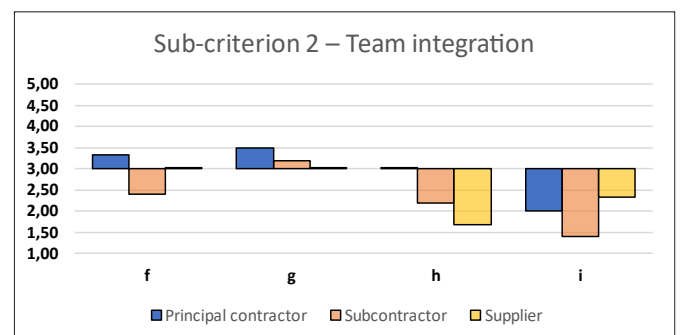


Figure 5.; Quantitative result of sub-criterion 'Team integration'.

Collaborative practices – Team integration averages:

- **Principal Contractor:** 2.96
- **Supply chain partners:** 2.38
 - Subcontractor: 2.30
 - Supplier: 2.51

[f] In terms of *'forming an integral project team'*, the principal contractor views the formation of a project team as the responsibility of the project leader. Where the degree of integration into an interfirm network project team varies, depending on the project leader his or her approach. Both types of supply chain partners believe that the organizational culture of the principal contractor is a significant factor for the degree of integration. While some interviewees of the supply chain partner group believe that true integration is achieved, creating a cohesive project team, others perceive it as coordinated work among separate organisations.

Regarding supply chain partners their own efforts on integration, subcontractors find it more challenging to integrate into the project team compared to suppliers. Subcontractors express the need for a clear understanding of the context and value of their role in the preliminary stages of the project, where important decisions are made. Next to this, subcontractors have the feeling that the cooperation shifts during the collaboration of the project lifecycle towards more traditional roles.

[g] ECI projects provide an opportunity for improved *'goal setting and alignment'*, enabling effective cooperation. However according to both the principal contractor and the supply chain partners group, it requires individuals who can transcend their organizational boundaries and comprehend each other's perspectives. Although, the interviewees of the principal contractor highlight the extensive discussions they held with supply chain partners in general to establish shared project goals and common ground. Therefore, the principal contractor should promote a shared vision among all team members in order to ensure that project goals are thoroughly discussed and understood.

[h] To foster project goal setting and an effective cooperation, *'team building workshops'* play a significant role. Typically, the principal contractor organizes Project StartUp (PSU) sessions aimed at facilitating introductions and discussing technical aspects of the project. However, regarding the supply chain partners group, subcontractors feel their involvement in these workshops is often limited. They express the need for greater participation in PSU-sessions to enhance mutual understanding and trust within the project team and to provide valuable insights into each other's capabilities and weaknesses, contributing to stronger relationship.

[i] *'Recognition and rewards'* play a significant role in motivating the relationship between team members and organisations. While ECI projects do not typically involve specific reward structures, the principal contractor is rewarded by the client to execute the project after the bouwteam-phase. The supply chain partners group indicate that the ultimate reward lies in securing the execution of the project or the opportunity to deliver products. However, one subcontractor highlighted the potential lack of recognition due to the perceived routine nature of business transactions governed by a framework agreement. Therefore, ongoing appreciation and acknowledgment of the efforts and contributions of supply chain partners is essential throughout the project, according to both the principal contractor and the supply chain partners group.

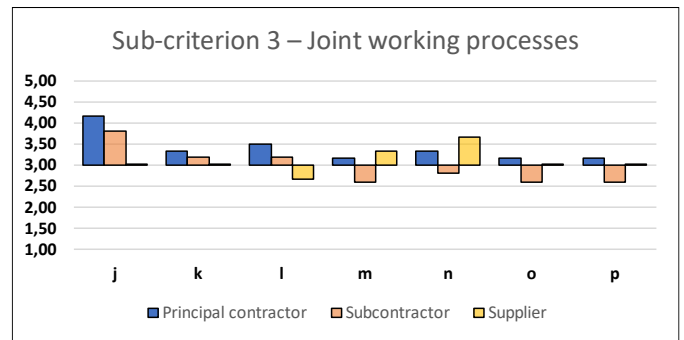


Figure 6.; Quantitative result of sub-criterion 'Joint working processes'.

Collaborative practices – Joint working processes:

- **Principal Contractor:** 3.40
- **Supply chain partners:** 3.04
 - Subcontractor: 2.97
 - Supplier: 3.10

[o+p] Addressing conflicts within the project team is crucial for joint working processes. Both the principal contractor and the supply chain partners group noted that ECI projects experience slightly fewer conflicts compared to other project organizational forms, thanks to the shared goals and the extended project lifecycle. However, challenges related to design-related issues and financial matters persist, and regarding supply chain partners, subcontractors argue that these issues were attempted to be resolved in the same style as in traditional projects. While conflicts are resolved more swiftly due to the shared purpose, the best possible resolution may not always be achieved. The principal contractor should foster understanding among all team members and provide support when conflicts arise, leveraging the shared goal and the established relationship.

In terms of *'procedures for resolving and escalating conflicts'*, the principal contractor employs various approaches, ranging from standard escalation models to case-by-case resolutions. Two project leaders of the principal contractor indicated that the principal contractor should communicate the escalation procedures clearly and discuss them with the supply chain partners in advance to ensure transparency and effective conflict resolution. Other interviewees of the principal contractor were more hesitant about communication of procedures based on possibly causing a negative atmosphere and stated that senior management usually gets involved in escalations more instantaneously. Supply chain partners (mainly subcontractors) are less aware of these escalation models but emphasize the potential financial implications of escalated conflicts, which may involve their business managers.

[j+k+l] In joint working processes like *'planning, issue management and monitoring/controlling/reporting'*, the principal contractor recognizes the benefits of frequent communication and shorter lines of communication within the project team. This allows for timely exchange of advice and insights among team members and facilitates effective communication with the client. While generally both types of supply chain partners appreciate the increased cooperation in ECI projects, two subcontractors express concerns about being engaged late in the process, limiting their potential contribution. They view that the principal contractor should proactively involve supply chain partners in decision-making and seek their input when it is valuable, enabling them to provide their expertise and insights.

[n] When it comes to *'allocating risks'*, both the principal contractor and the supply chain partners group believe that careful consideration is given to assigning risks to the party best equipped to manage them. However, the principal contractor, driven by contractual obligations, hesitates to allocate risks entirely to the

supply chain partners. Likewise, subcontractors of the supply chain partner group are unwilling to assume full responsibility for all risks. They find it challenging to discuss project-specific risks directly with the client, although the suppliers feel that in ECI projects project-wide risks are more open for discussion. Leveraging this understanding, suppliers feel better equipped to address issues like fluctuating material prices. Subcontractors, on the other hand, find it challenging to communicate unforeseen risks related to the execution phase to the client within the ECI framework.

4.1.3 Relational attitudes

Relational attitudes play a crucial role in the early involvement during the design phase because of the collaboration between various parties, encompassing senior management commitment, senior management trust, and established relational norms. The interview findings shed light on the perceptions and practices surrounding these sub-criteria.

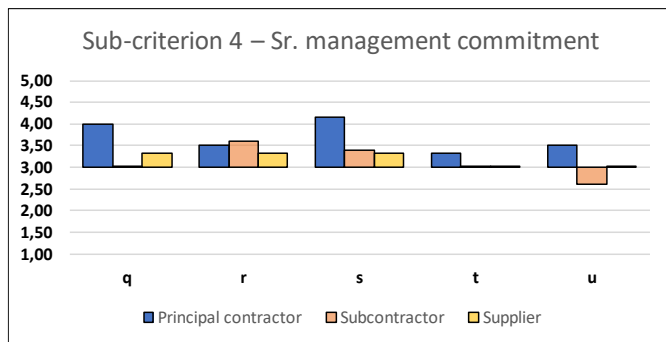


Figure 7.; Quantitative result of sub-criterion ‘Sr. management commitment’.

Relational attitudes – Sr. management commitment - averages:

- **Principal Contractor:** 3.70
- **Supply chain partners:** 3.15
 - Subcontractor: 3.12
 - Supplier: 3.20

[q+r+s+t] All interviewees perceived firm managers of the principal contractor and supply chain partner as the first layer of senior management of the cooperation between both parties. The *commitment and consistent leadership of the senior management, regarding supporting the project team*, is perceived differently by the principal contractor and the supply chain partners group. While the principal contractor believes that commitment is primarily driven by project risks and costs, with project management responsible for fostering cooperation, subcontractors from the supply chain partners group are less optimistic. They emphasize the importance of commitment from senior management and the need for a collaborative approach that goes beyond traditional roles.

[u] *Jointly resolving escalated conflicts* often requires the commitment of *senior managements from both sides*. Both principal contractor and supply chain partners acknowledge that conflicts escalated to senior management tend to have broader implications beyond the project itself, particularly in cases involving additional work or financial consequences. However, there are concerns by two subcontractors that in such situations, the traditional roles of competition may prevail over the cooperative spirit of the project team. Both interviewees find that addressing this challenge requires a shift in mindset, prioritizing the best interests of the project over individual agendas and ensuring that lessons learned are applied in future endeavours.

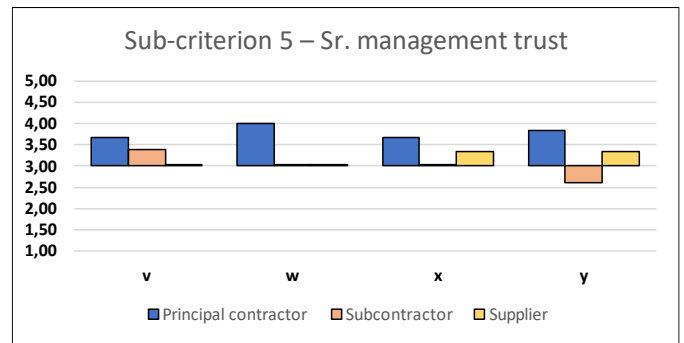


Figure 8.; Quantitative result of sub-criterion ‘Sr. management trust’.

Relational attitudes – Sr. management trust - averages:

- **Principal Contractor:** 3.79
- **Supply chain partners:** 3.07
 - Subcontractor: 3.01
 - Supplier: 3.17

[x+y] *Senior management trust* encompasses mutual organisational trust and maintaining trust within the project. It is observed by all interviewees that senior management primarily engages with each other during conflicts, often focusing on contractual obligations rather than fostering a strong relationship.

[v] The responsibility for maintaining *mutual trust between senior managements of both the principal contractor and supply chain partner* is perceived by both parties to lie with project management itself. Although, the principal contractor acknowledges occasional efforts by senior management to nurture relationships and the supply chain partners group express divided opinions on the frequency and responsibility for maintaining trust, citing regional fragmentation of the principal contractor and personal relationships as a factor.

[w] Trust in achieving project goals is primarily vested in the project team rather than senior management. Both the principal contractor and supply chain partners group agree that *senior management their influence lies in aligning project goals with the client its expectations*.

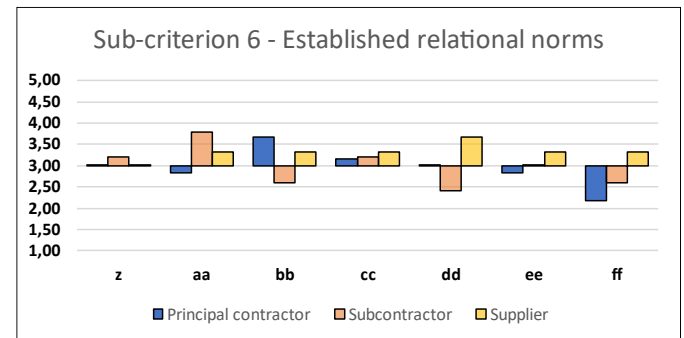


Figure 9.; Quantitative result of sub-criterion ‘Established relational norms’.

Relational attitudes – Established relational norms - averages:

- **Principal Contractor:** 2.96
- **Supply chain partners:** 3.11
 - Subcontractor: 2.97
 - Supplier: 3.33

[z+aa] Established relational norms encompass creating an open culture and commitment, unity in business outcomes and mutual commercial goals. The principal contractor and the supply chain partners group agree that openness and commitment are rooted in existing relationships but stress the need for active promotion from the project its inception. Furthermore, both supply chain partner types highlight the perception of increased openness and *‘no blame culture’ in ECI projects with the principal contractor*.

[bb+cc] Unity in business outcomes is regarded as essential, although opportunistic behaviours with *hidden agendas* may arise throughout the process. The principal contractor addressed this concern, but mainly see an opportunity to foster stronger relationships with supply chain partners. Regarding the supply chain partners, subcontractors express a preference for one-on-one collaboration rather than competitive scenarios, as it allows for greater commitment. This would result in less switching costs but could imply costs for policing and enforcement of opportunistic partners.

[dd+ee] Regarding *mutual commercial goals*, both the principal contractor and the supply chain partners group agree that verifying price offers by a third party is acceptable to ensure market conformity for the client and to limit opportunistic behaviour. However, both types of supply chain partners emphasize the importance of upfront clarity on this matter to maintain trust.

Both the principal contractor and the supply chain partners group acknowledge that communication about commercial goals barely happens, which results in making assumptions about each other. Two of the subcontractors highlighted the need for the principal contractor its understanding of their commercial position, as multiple contractors may seek to engage them in the tender phase. Therefore, transparent communication and acknowledging the constraints faced by supply chain partners are essential for maintaining trust and facilitating effective collaboration.

4.1.4 Teamworking quality

Effective teamwork is a critical aspect of the design phase and interfirm network governance, encompassing communication, coordination, balanced contribution, aligned effort, mutual support, cohesion, and effective trust. The results of the interviews provided insight into how these sub-criteria are perceived and applied.

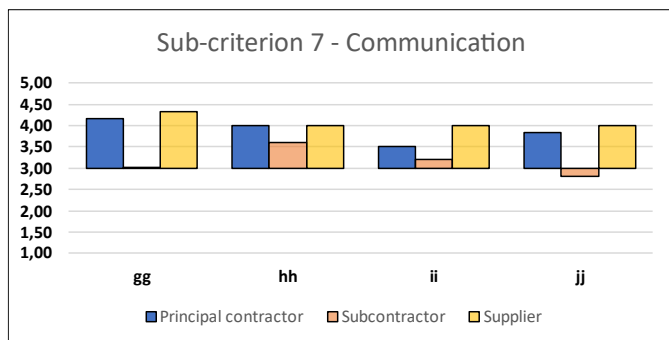


Figure 10.; Quantitative result of sub-criterion 'Communication'.

Teamworking quality – Communication - averages:

- **Principal Contractor:** 3.88
- **Supply chain partners:** 3.50
 - Subcontractor: 3.15
 - Supplier: 4.08

[hh+jj] Communication, regarding the openness of project-relevant information, evokes varying opinions within the principal contractor. While some believe that working in an ECI encourages better information sharing among all supply chain partners and facilitates discussions on negative aspects, others emphasize the importance of discussing and sharing only essential information beforehand. Regarding supply chain partners, subcontractors highlight the need for clear communication about which information is important to share and the timely sharing of it.

[gg+ii] The *direct communication* at various levels of the project team is deemed crucial by the principal contractor,

facilitating effective collaboration and trust-building across the entire project team. However, regarding subcontractors, one expresses challenges in collaborating with other parties at lower project team levels (calculator vs. calculator) due to their focus on traditional contracts. Additionally at the supply chain partners, subcontractors find it difficult, compared to suppliers, to communicate with the principal contractor his client when project-related information, such as allocated risk, is needed. Subcontractors believe that the principal contractor should facilitate communication between relevant persons from each party, enabling comprehensive communication within the project team and addressing these issues.

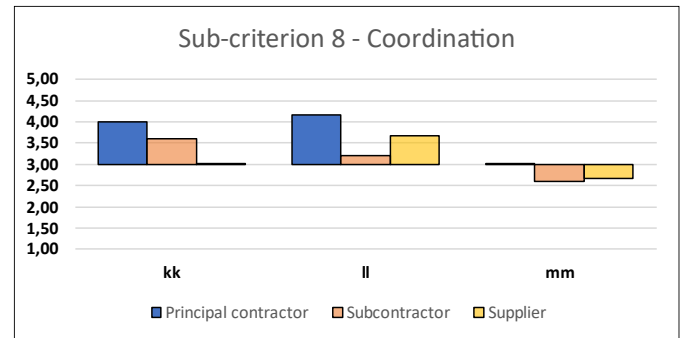


Figure 11.; Quantitative result of sub-criterion 'Coordination'.

Teamworking quality – Coordination - averages:

- **Principal Contractor:** 3.73
- **Supply chain partners:** 3.13
 - Subcontractor: 3.13
 - Supplier: 3.11

[kk] Following the interviewees, coordination mainly entails *demarcating common grounds* and managing shifting responsibilities due to organizational fragmentation. The interview findings indicate that the demarcation process is typically performed jointly by the principal contractor and supply chain partners, although some overlap still exists at projects. Although, both types of supply chain partners believe that the amount of overlap is less compared to traditional contracts.

[mm] To further *reduce overlap*, the supply chain partners group suggest early involvement and joint discussion of interfaces.

[ll] Additionally, two project leaders of the principal contractor find it important to consider *the linkage of which party will be responsible* for execution and involving them timely in the bouwteam-phase is crucial for effective coordination. This could improve the coordination between the shift of phases in ECI's.

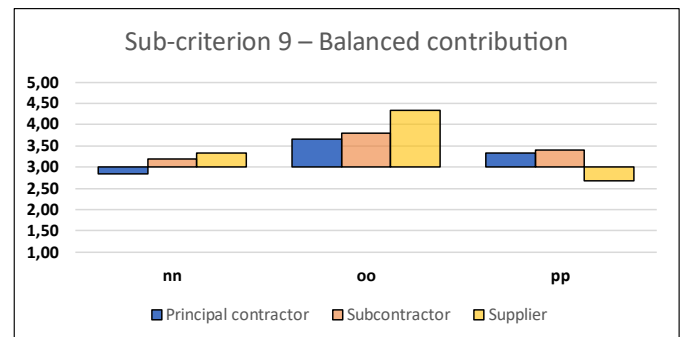


Figure 12.; Quantitative result of sub-criterion 'Balanced contribution'.

Teamworking quality – Balanced contribution - averages:

- **Principal Contractor:** 3.28
- **Supply chain partners:** 3.46
 - Subcontractor: 3.47
 - Supplier: 3.44

[nn+oo] Balanced contribution involves understanding the potential mutual contribution of team members and encouraging their active involvement. Both the principal contractor and supply chain partners group emphasize the importance of gaining *insight into each other's skills and expertise* early on. Currently, supply chain partners' understanding of the request often occurs too late, hindering the timely utilization of specialized knowledge. Although, both types of supply chain partners appreciate that their advice based on expertise and knowledge is valued by the principal contractor. To address this, the principal contractor should clearly express expectations regarding information sharing, especially during the preliminary stages of collaboration.

[pp] *(Balanced) contribution to innovations and ideas* could be an important key aspect, particularly in the bouwteam-phase. To promote effective collaboration, the supply chain partners group believe that the principal contractor should create an environment that encourages open communication about innovation-related knowledge and responsibilities. Although, the principal contractor acknowledged a difficulty faced by the supply chain partners group in sharing all information related to innovations.

Additionally, suppliers express a willingness to participate in ECI, as they believe that because the client participates in the bouwteam-phase it facilitates proposing and implementing innovations. However, they also highlight the need for a fair distribution of risks related to innovation implementation.

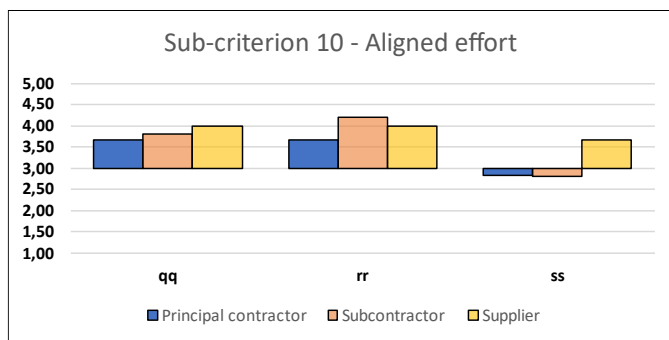


Figure 13.; Quantitative result of sub-criterion 'Aligned effort'.

Teamworking quality – Aligned effort - averages:

- **Principal Contractor:** 3.39
- **Supply chain partners:** 3.71
 - Subcontractor: 3.60
 - Supplier: 3.89

[qq+rr] In the pursuit of aligned effort, cooperation is essential, as it involves requesting *commitment from all parties involved* while simultaneously navigating potential opportunistic behaviour arising from organizational boundaries. Both the principal contractor and supply chain partners group acknowledge the importance of commitment and perceive ECI as a context that fosters increased commitment. However, both types of supply chain partners suggest that one-on-one collaboration during the tender phase further enhances commitment. Although, the principal contractor its interviewees are hesitated since it can create opportunistic behaviour based on commercial interests which could result in potential conflicts.

[ss] *Avoiding commercial interests of contractors during conflicts* requires the principal contractor and the subcontractors their active involvement and fostering a cooperative mindset.

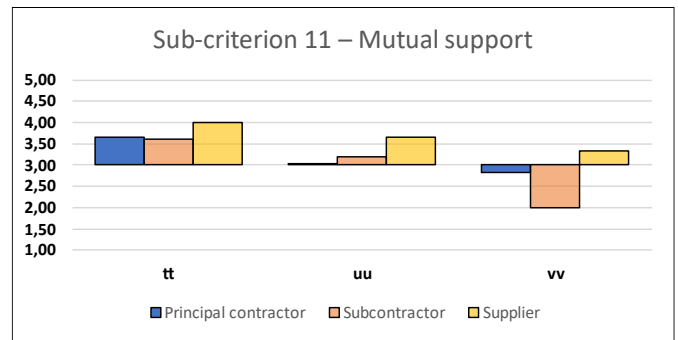


Figure 14.; Quantitative result of sub-criterion 'Mutual support'.

Teamworking quality – Mutual support - averages:

- **Principal Contractor:** 3.17
- **Supply chain partners:** 3.21
 - Subcontractor: 2.93
 - Supplier: 3.67

[tt] *Mutual support* involves decision-making during cooperation and the ownership of decision-making. The interview findings indicate that ECI encourage collaboration and joint decision-making based on what is best for the project. Although, the supply chain partners group believe that improved synergy can be achieved through more frequent communication within the project team and a better understanding of contractual documents. Ensuring effective cooperation across all levels of the project organization is vital for enhancing mutual support.

[uu+vv] Although, the principal contractor has a different opinion on the ownership of decision-making. Based on the contractual agreements of the client, the principal contractor still feels the responsibility of the ownership when a supply chain partner makes a decision. As a result, the subcontractors do not always experience that *decision-making is truly jointly* expressed to the client.

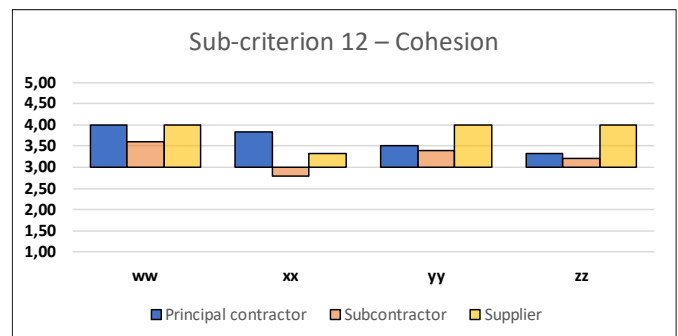


Figure 15.; Quantitative result of sub-criterion 'Cohesion'.

Teamworking quality – Cohesion - averages:

- **Principal Contractor:** 3.67
- **Supply chain partners:** 3.47
 - Subcontractor: 3.25
 - Supplier: 3.83

[ww->yy] Cohesion, a key aspect of successful cooperation, revolves around establishing a sense of *team unity and personal engagement*. Both the principal contractor and supply chain partners group perceive ECI as effective in fostering team cohesion and a sense of unity beyond hierarchical roles. However, subcontractors acknowledge that the principal contractor its role has evolved into a coordinating chairperson, which they also understand.

[zz] To enhance cohesion, the principal contractor should *foster the development of a team mindset* and promote a collaborative environment through each level of the project team.

Both the principal contractor and the supply chain partners group acknowledge that when a member of the project team refuses to be cooperative that assigning him/her to a different project is better for the cohesion of the project team.

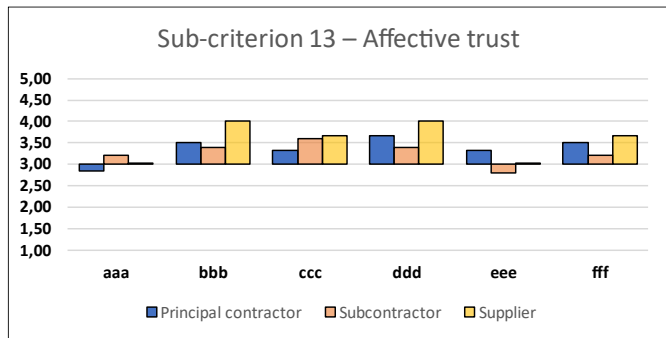


Figure 16.; Quantitative result of sub-criterion 'Affective trust'.

Teamworking quality – Affective trust - averages:

- **Principal Contractor:** 3.36
- **Supply chain partners:** 3.38
 - Subcontractor: 3.27
 - Supplier: 3.56

[aaa->fff] As previously explained in other sub-criteria, affective trust is a delicate balancing act between trust and commercial incentives and plays a pivotal role in cooperations. While trust between the principal contractor and supply chain partners is generally perceived good during the bouwteam-phase, it can quickly diminish when financial consequences occur, particularly during the tender phase. Nevertheless, trust is often built on existing relationships. Both the principal contractor and the supply chain partners group experience that in new relationships it requires time to establish trust. Both types of supply chain partners argue that the principal contractor should pay focus to the importance of trust to create an atmosphere of fairness and transparency throughout the project.

4.2. Conflicts in cooperations

The explanatory multiple case study assessed to which extend a negative collaborative relationship factor resulted in poor supply chain partner integration. The sub-criteria that affected the collaborative relationship factor its effect are listed in Table 5. The background of the sub-criteria in Table 5 can be found in Appendix G and the following assessments.

Case Study A examined the collaboration between Project Leader B (representing the principal contractor) and Subcontractor C in the context of joint processes, conflicts, escalation, and senior management. The project involved the redevelopment of a site in Veltzicht, encompassing both building construction work and civil engineering activities. Although not classified as an Early Contractor Involvement (ECI) project, the principal contractor followed a similar approach to enhance collaboration. During the

Table 5.; Sub-criteria of CRF's influencing the case's supply chain integration

	Front-end definition	Collaborative practices	Relational attitudes	Teamworking quality
Case A	Communication of Front-end definition & reviewing the basic design	Team integration & joint working processes	Sr. management commitment & trust.	Communication, coordination & mutual support
Case B	Clear roles and responsibilities	Joint working processes	Relational attitudes	Communication
Case C	Communication of Front-end definition & reviewing the basic design	Team integration	Relational attitudes	Communication, coordination & aligned effort
Case D	Communication of Front-end definition & reviewing the basic design	Joint working processes	Interviewees did not mention something notable about this CRF	Mutual support

tender phase, it became evident that Subcontractor C was not actively participating in the plan submission process and did not contribute to risk identification or establishing common ground. This lack of engagement led to a conflict between the parties, which persisted for several months and required numerous discussions. The conflict was eventually escalated by Subcontractor C to their senior management, triggering honest and open conversations to address the incident and its underlying causes.

The collaborative relationship factor of "front-end definition" resonates with the observation that Subcontractor C had difficulties comprehending the project context based on the principal contractor its communication. The broader front-end definition in the design phase led to more frequent contact between the parties, but it also introduced challenges in pricing and potential missed requirements.

In terms of "collaborative practices", the case demonstrates the importance of effective "team integration" and "joint working processes." Despite the initial conflict, both parties were able to see beyond their individual organizational boundaries and prioritize the project organization's interests. This exemplifies the willingness to work together and solve problems promptly, which is essential for successful collaboration.

Regarding "relational attitudes," the case highlights the significance of senior management commitment and trust. These were vital factors in addressing the conflicts and improving the supply chain partner network integration. The escalation of the conflicts to senior management resulted in honest conversations and the acknowledgment of errors. This proactive involvement of senior management facilitated the resolution process and strengthened the relationship between the principal contractor and the subcontractor. Additionally, the findings of the comparative multiple case study emphasize the need for commitment from senior management and a collaborative approach that goes beyond traditional roles.

This also reflect aspects of "teamworking quality." Effective "communication" played a vital role in addressing the conflict and fostering understanding between the principal contractor and subcontractor. The case underscores the importance of timely and clear communication, particularly in sharing project-relevant information and expectations.

In terms of "coordination," the case study reveals challenges in demarcating common ground and managing shifting responsibilities due to organizational fragmentation. It aligns with the need for early involvement and joint discussions of interfaces, as suggested by supply chain partners in the comparative multiple case study. This results in "mutual support" and the ownership of decision-making. The resolution of the conflict was facilitated by a collaborative mindset and a shared commitment to the project organization its interests.

Overall, Case Study A illustrates the importance of the results of the collaborative relationship factors. The successful resolution of conflicts, the establishment of trust, and the commitment to effective communication and coordination contribute to the positive outcomes of the collaboration between the principal contractor and subcontractor in this case.

Case Study B focuses on a climate adaptation project conducted through ECI. The project aimed to support the client their climate adaptation strategy. The principal contractor's buyer engaged Supplier C for a collaborative partnership to support the client its strategy. The principal contractor did not have a previous cooperative relationship with the supplier, so a new relationship had to be formed by both parties.

In terms of the "front-end definition," the case study reveals the principal contractor its intention to establish a long-term partnership rather than a project-specific supplier relationship. This strategic decision corresponds with the findings of emphasizing the importance of selecting partners with relevant expertise and considering long-term collaboration potential. Although, challenges emerged in terms of communication and understanding between the principal contractor and the supplier. These challenges resulted in poor supply chain partner network integration, hindering effective collaboration and shared understanding of project requirements.

The collaborative practices in the case study had a significant effect on "team integration" and "joint working processes." The principal contractor sought a supplier capable of cooperating in ECI projects and with substantial knowledge and expertise in climate adaptation. However, conflicts arose between the principal contractor and the supplier, stemming from differences in communication expectations and decision-making processes. One of the key issues was "relational attitudes". Both parties had a different opinion about the definition of openness in the project and its decision-making. This can also be seen in terms of "teamworking quality," since effective "communication" emerged as a critical factor in the case study. The principal contractor desired direct communication with the supplier its supplier, since the supply chain partner is also a trade organisation. However, the conflicting expectations and assumptions about decision-making and control negatively impacted the integration of the supply chain partner network. This lack of coordination and understanding compromised the effectiveness of collaboration and hindered the achievement of shared goals.

In conclusion, Case Study B demonstrates the impact of negative outcomes in the collaborative relationship factors on supply chain partner network integration if there is no trust between parties when a new relationship is being formed. Challenges in front-end definition, collaborative practices, relational attitudes, and teamworking quality resulted in poor integration and hindered effective collaboration between the principal contractor and the supplier.

In Case Study C, the collaboration between Project Leader B and Subcontractor B focused on relational norms, mutual trust, and business models within an Early Contractor Involvement (ECI) project. The project involved addressing issues with the village's sewer system, specifically related to high groundwater levels and preventing nuisance caused by construction work. The principal contractor recognized the need for expertise in drainage and sought the involvement of Subcontractor B, who had the required skills.

Concerning the "front-end definition", Case Study C highlighted the challenges faced by the principal contractor and the subcontractor in understanding and effectively communicating project requirements. The subcontractor found it difficult to grasp the broader front-end definition, leading to potential misunderstandings, missed requirements and impacted their ability to accurately price the work and meet the principal contractor's expectations. This lack of clarity hampered their ability to integrate into the project team and align their contributions, resulting in a weakened supply chain partner network integration.

Examining the "collaborative practices" employed, it was evident that subcontractors faced greater difficulty in integrating into the project team compared to suppliers. They struggled to understand their role and the project's context, impeding their ability to collaborate effectively. "Relational attitudes", including trust and commitment, played a crucial role in the collaboration between the principal contractor and the subcontractor. the lack of honesty and open communication during the tendering process eroded trust and hindered the development of a strong working relationship. This lack of trust and commitment had a detrimental impact on the integration of the supply chain partner network, as effective collaboration relies on mutual trust and a shared sense of commitment among all team members. In terms of "teamworking quality", the project underscored the importance of this effective communication, coordination, and aligned effort among team members. However, the absence of clear communication, transparency, and alignment of expectations during the tendering process resulted in subpar teamworking quality.

By analysing the project alongside the insights gained from the comparative multiple case study, it becomes evident that negative outcomes in the collaborative relationship factors had significantly impact the integration of the supply chain partner. Specifically the challenges in the front-end definition, limited integration of the subcontractor, lack of trust and commitment, and inadequate teamworking quality contributed to the poor integration.

The findings of Case Study D involving the Buyer (principal contractor) and Subcontractor A shed light on the collaborative relationship factors, specifically focusing on the front-end definition, coordination, joint working processes, and aligned effort. The case study examined their collaboration during an UAV-IC project in the context of major maintenance of national highways in the Netherlands.

Regarding the "front-end definition", it was observed that subcontractor A faced difficulties in thinking along with the project as a partner, as they were more accustomed to traditional forms of contracts where their role was primarily focused on calculations. The transition to integrated projects required them to actively engage with the principal contractor and the client to understand preferences and project requirements. This misalignment in interpreting the front-end definition highlighted the need for improved communication and clearer expectations between the principal contractor and subcontractor.

"Coordination" and "joint working processes" also played a significant role in supply chain partner network integration. The project revealed that subcontractor, being relatively new to the cooperation approach in integrated contracts, required additional support and guidance from the principal contractor to successfully navigate their role as a collaborative partner during a framework agreement. Principal contractor project managers emphasized that the contract type did not determine the nature of cooperation but acknowledged its influence on the distribution of responsibilities and how they were communicated to partners. However, the results indicated that the principal contractor's level of assistance fell short of the subcontractor needs, hindering their integration into the broader supply chain partner network and impacting the "mutual support". Resulting in hindered effective communication, decision-making, and synergy among team members.

Overall, the results of this case study highlight the importance of effective communication, knowledge sharing, and clear expectations in cooperations. The principal contractor should provide adequate support to partners like Subcontractor A to help them adapt to their new role as equal collaborators. Enhancing coordination, aligning efforts, and fostering a sense of partnership are crucial for successful collaboration in the front-end definition phase and throughout the project lifecycle.

5. Discussion

The results of this research are based on the mixed-methods approach of a comparative and an explanatory multiple case studies. For the comparative study the CRF's of Suprpto (2016) are used to compare how supply chain partners and a principal contractor view the current state of supply chain integration via network governance cooperations in the design-phase of projects. The CRF's, including Front-end definition, Collaborative practices, Relational attitudes, and Teamworking quality, played a significant role in this research for analysing the extend of the integration. Understanding how these factors operated in for example ECI projects and the nuances that distinguished them from traditional construction roles is essential for effective network integration. Suprpto his RECAP-tool and its CRF's as foundation, formed the basis for the semie-structured interviews with the principal contractor, five subcontractors and three suppliers. All interviewees indicated that the semie-structured interviews helped to think about the indicators before the interview itself. Although, several times interviewees indicated that some indicators are too similar or that answers on sub-criteria like coordination for example could also be given at the front-end definition regarding the project scope and its demarcation. The coding of the interviews was therefore important to identify the similarities and differences between all interviewees.

The explanatory research was performed on four cases which were identified in the interviews of the comparative study as projects where conflicts arose. The aim of the explanatory study was to identify if a negative CRF was the basis of the conflict. Based on its results, it is found that these conflicts can be described via lacking CRF's. The CRF's helped in identifying and structuring the conflict and indicating if the conflict was a result of poor supply chain partner network integration. Although the initial scope of this research was solely ECI projects, extending the scope to other integrated contracts (were supply chain partners had a significant role in the design-phase) resulted in that the negative results of the collaborative relationship factors in poor supply chain partner network integration could still be studied. For the validity of these results future research should investigate if there is a difference between ECI projects and other integrated contracts when studying a larger population of projects with conflicts.

Based on the results of the previous chapter's findings, the following current state of the supply chains partners integration via network governance cooperations in the design phase of a project is shaped.

In collaborative preparation projects, the front-end definition took a more expansive and cooperative dimension. It involved supply chain partners jointly defining project objectives, risks and opportunities early in the project lifecycle. Unlike traditional construction roles where the scope is often predefined and fixed, interviewees indicate that early involvement in the design phase encourage a more open and flexible approach. Based on cooperative collaboration, the front-end definition should allow for better risk identification, shared understanding, and alignment of project goals. Although, differences in interpreting the front-end definition emerged among parties. For instance, the principal contractor may have a broader vision of project objectives, including cost management and project efficiency. In contrast, subcontractors may focus on technical aspects and their own risk management. The level of expertise in the different roles in these contracts brings challenges some supply chain partners to fully understand the front-end definition and duties. Challenges faced in comprehending and effectively communicating the project requirements, as evidenced in case studies A, B, and C, align with the literature emphasizing the importance of a clear project scope at the project outset (Khan, 2006). It highlights the critical role of

front-end definition in reducing ambiguity, aligning expectations, and facilitating efficient collaboration (Kent & Becerik-Gerber, 2010)

Early supply chain partner involvement seems to promote cooperative practices that transcend traditional construction roles more. Unlike the hierarchical and segmented approaches in traditional projects, ECI encouraged parties more to work together as a cohesive team from the project's inception because of the need for their input. This includes the sharing of knowledge, expertise, and decision-making responsibilities among supply chain partners. Although, interviews indicate that a problem in this is that firms still have trouble in truly cooperating cross firm boundaries. Insights from case A and B underscore the vital role of effective team integration, joint working processes, in enhancing cooperation within construction projects. These case studies illuminate the importance of fostering a cohesive team dynamic and aligning expectations from the project's outset, promoting cooperative practices. Both the principal contractor and the supply chain partners exhibit variations in their willingness to embrace collaborative practices. Mostly, impacted by the commercial goals within a project. This could be the result of the market governance background of most firms and their competitive behaviour. The principal contractor takes a vital role in driving collaboration, leveraging their position to foster a cooperative atmosphere. Which corresponds more to the multi partner interfirm network governance as stated by Borgatti and Foster (2003). Supply chain partners, differ in their level of engagement, with some emphasizing cooperative behaviour while others adhere to traditional, competitive roles because they are used to that. Despite the fact that conflicts and misunderstandings can arise in projects, the willingness of parties to work together to resolve issues aligns with previous research highlighting the importance of shared objectives and mutual cooperation (Keung & Shen, 2013; Das & Teng, 2001). In this research it is found that the nature of the project can influence collaborative practices. For instance, in complex projects with interdisciplinary requirements, collaborative practices become imperative. On the other hand, relatively straightforward projects may experience less emphasis on collaborative practices. Therefore, it is essential to tailor cooperation approaches to the project's unique characteristics and requirements.

Studying the relational attitudes, encompassing trust, commitment, and senior management involvement, trust-building is essential to foster cooperation, and it often relies on existing relationships of the principal contractor. The study findings reinforce the idea that openness, trust, and commitment are fundamental for successful collaborations (Smyth & Edkins, 2007). In the conflicts of case A and B, the commitment from senior management is crucial for supporting the collaborative approach. In conflicts the involvement of senior management can facilitate resolution. Which is in line with literature on relational contracting (Rahman & Kumaraswamy, 2008). While the principal contractor often view commitment as primarily driven by project opportunities and risks and costs, supply chain partners emphasized the importance of commitment from senior management to foster a cooperative approach for good relations with their client, the principal contractor.

The last CRF is teamworking quality, which includes sub-criteria: effective communication, coordination, balanced contribution, and aligned effort. Unlike traditional roles where communication often follows a hierarchical structure, the study found that these projects emphasize open and direct communication among the project team members. Coordination involved demarcating common ground and managing shifting responsibilities due to organizational fragmentation. Although, demarcating common

ground in tasks in the preparation phase was found to be harder by both parties. Next, the two parties may encounter varying challenges in teamworking quality. The principal contractor typically plays a leading role in coordinating team efforts, while supply chain partners indicated facing difficulties in communicating with the client or other supply chain partners due to their specific role. These differences require proactive efforts from the principal contractor to ensure effective teamworking quality.

5.1. Research implications

While every effort has been made to design this research with rigor and comprehensiveness, certain limitations warrant consideration. These limitations may impact the extent to which the findings can be generalized to broader contexts.

The non-random selection of participants via purposive sampling might introduce sampling bias, as participants were selected based on their involvement in specific projects. This could potentially limit the generalizability of the findings to other ECI projects with different characteristics. Next, it is important to note a specific aspect of the sample. The principal contractor representation was from a single, although geographically dispersed, organisation. This may limit the generalisability of the findings, especially to other principal contractors. For instance, the examined principal contractor is one of the largest in the Netherlands, hence, conclusions may vary for smaller contractors or those in different countries. This limitation underscores the need for caution when applying the findings more broadly, emphasizing the importance of further research to validate and extend the conclusions.

It is essential to recognize researcher reflexivity since the role of the researcher in shaping the research process and outcomes addresses potential biases to maintain the integrity and objectivity of the research. In this study, the prior experience in the construction industry and familiarity with ECI projects might shape the way interviews were approached and data was analysed. During the interviews a few discussions about topics occurred with interviewees but in analysing the data only their perspective is used.

The study its reliance on semi-structured interviews might restrict the depth and breadth of insights obtained. Some aspects of cooperation dynamics in ECI projects may not be fully captured through this method alone. Next to this, the cooperative dynamics explored in this study are specific to the construction industry and may not be directly applicable to other sectors or industries.

Originally, the research scope included the client their viewpoint regarding the integration of supply chain partners through network governance mechanisms in ECI projects. However, due to the research its extensive nature, the focus was narrowed exclusively to the principal contractor and supply chain partners. Subsequent research could broaden the study to encompass the entire project organisation regarding supply chain integration through interfirm network governance. This broader exploration promises a deeper comprehension of the complex dynamics, relationships, collaborative practices, and challenges within construction projects.

6. Conclusion

Effective cooperation and seamless integration of supply chain partners are essential for principal contractors to obtaining successful project outcomes in the complex environment of the construction sector. This study focussed into the degree to which supply chain partners are integrated through interfirm network governance cooperations during the design-phase of construction projects, focusing primarily on the context of Early Contractor Involvement (ECI) projects. The principal contractor demonstrated proficient cooperation with supply chain partners via network integration, yet this study highlights opportunities for enhancement of the collaborative relationship factors.

The current state on the Collaborative Relationship Factors such as front-end definition, collaborative practices, relational attitudes, and teamworking quality revealed their central role in achieving network integration and emphasize the critical need for robust collaboration practices, clear communication, proactive coordination, and a cohesive team dynamic built on trust and commitment. For the design-phase, the emphasis on early involvement and a more open collaboration mindset differs from traditional construction roles, because supply chain partners are encouraged to participate in project decisions from the principal contractor as the client, and partners are expected to contribute to project objectives, risk identification, and problem-solving while this is not always directly asked from them in the front-end definition. These insights underscore the significance of effective communication and collaboration during the front-end definition phase of the cooperation. This fundamental difference sets early involvement in the design-phase (like ECI) apart from other project delivery methods and underscores the need for tailored strategies for supply chain integration in this context.

In cooperations via interfirm network governance, the sharing of both risks and rewards is a fundamental principle. This contrasts with traditional construction roles, where risk allocation tends to be more rigid. The literature on ECI highlights the need for equitable risk and reward sharing mechanisms between all parties but mainly the client and principal contractor. Since the principal contractor involves the supply chain partner in the design-phase it is open for discussion if the principal contractor should be responsible for the risks and rewards from the supply chain partner or if there should be an incentive to integrate supply chain partners fully into the project team.

Additionally, the study delved into the consequences of inadequate collaborative relationship factors at four case studies, aiming to discern how deficiencies in these factors negative impact the integration of supply chain partners within interfirm network governance cooperations. These case studies served as a practical testament to the importance of strategies around the collaborative relationship factors and provide valuable lessons for practitioners in the construction industry, encouraging a proactive approach to collaboration for improved project outcomes. The cases stressed the critical role of a cooperative front-end definition, the impact of early involvement of supply chain partners, and the significance of fostering trust and commitment. The study unequivocally demonstrated that deficiencies in these factors lead to suboptimal integration, underscoring their pivotal role in ensuring a unified and successful collaborative effort. Moreover, they underscored the intricate nature of teamworking quality, emphasizing the need for effective communication, coordinated efforts, and balanced contributions.

References

- Akintoye, A. (1994). Design and build: a survey of construction contractors' views. *Construction Management and Economics*(12), 155 - 163.
- Al-Hakim, L., Wu, X., Koronios, A., & Shou, Y. (2016). *Handbook of Research on Driving Competitive Advantage through Sustainable, Lean, and Disruptive Innovation*. IGI Global.
- Arditi, D., Elhassan, A., & Toklu, Y. C. (2002). Constructability Analysis in the Design Firm. *Journal of Management*(29), 991-1013.
- Borgatti, S., & Foster, P. (2003). The network paradigm in organizational research: a review and typology. *Journal of Management*(29), 991-1013.
- Boughzala, I., & De Vreede, G. J. (2015). Evaluating Team Collaboration Quality: The Development and Field Application of a Collaboration Maturity Model. *Journal of Management Information Systems*(32), 129-157. <https://doi.org/https://doi.org/10.1080/07421222.2015.1095042>
- Briscoe, G., Dainty, A. R., & Millett, S. (2001). Construction supply chain partnerships: skills, knowledge and attitudinal requirements. *European Journal of Purchasing & Supply Management*(7), 243-255.
- Cheng, W. L., Li, H., Love, E. D., & Irani, Z. (2001). "Network communication in the construction industry. *Corporate Communications: An International Journal*(6), 61-70.
- Cheung, S. O., Suen, H. C., & Cheung, K. K. (2003). An automated partnering monitoring system - Partnering temperature index. *Automation in Construction*(12), 331-345. [https://doi.org/https://doi.org/10.1016/S0926-5805\(02\)00108-5](https://doi.org/https://doi.org/10.1016/S0926-5805(02)00108-5)
- Chinowsky, P., Diekmann, J., & Galotti, V. (2008). Social network model of construction. *Journal of construction engineering and management*(134), 804-812.
- Collin, S.-O. (1993). The brotherhood of the Swedish sphere: A third institutional form for economic exchange. *International Studies of Management & Organization*, pp. 69-68.
- Cox, A., & Ireland, P. (2002). Managing construction supply chains: The common sense approach. *Engineering Construction & Architectural Management*(9), 409 - 418.
- Cox, A., & Thompson, I. (1997). 'Fit for purpose' contractual relations: determining a theoretical framework for construction projects. *European Journal of Purchasing and Supply Management*(3), 127-135.
- Crane, A. (1999). The movement for innovation (M4I) in construction in learning to succeed in construction. *Conference Proceedings(CITB)*, 2-8.
- Dainty, A., Green, S., & Bagilhole, B. (2007). People and culture in construction: contexts and challenges. .
- Das, T., & Teng, B.-S. (2001). Trust, Control, and Risk in Strategic Alliances: An Integrated Framework. *Organization Studies*(22(2)).
- Dietrich, P., Eskerod, P., Dalcher, D., & Sandhawalia, B. (2010). The dynamics of collaboration in multipartner projects. *Project Management Journal*(41), 59-78.
- Dubois, A., & Gadde, L. (2000). Supply strategy and network effects - purchasing behaviour in the construction industry. *European Journal of Purchasing and Supply Management*(6), 207-215.
- Ebers, M. (1997). Explaining inter-organizational network formation. *Oxford University Press*(3).
- Ebers, M., & Jarillo, J. (1998). The construction, forms, and consequences of industry networks. *International Studies of Management*(27), 3-21.
- EIB. (2013). *De feiten rond aanbesteden*. Economisch Instituut voor de Bouw.
- Eisenhardt, K. (1989). Building theory from case study research. *Academy of Management Review*(4), pp. 532-550.
- Erikson, P. (2008). Procurement Effects on Coopetition in Client-Contractor Relationships. *Journal of Construction Engineering and Management*.
- Flanagan, R., Lu, W., Shen, L., & Jewell, C. (2007). *Construction Management and Economics*, 25:9, 989-1000. <https://doi.org/10.1080/01446190701258039>
- Gulati, R. (2007). Managing network resources: alliances, affiliations and other relational assets. *Oxford University*.
- Joosten, G. (1998). The building industry. *Master Thesis, Tilburg University*.
- Kent, D., & Becerik-Gerber, B. (2010). Understanding Construction Industry Experience and Attitudes toward Integrated Project Delivery. *Journal of Construction Engineering & Management*(136(8)).
- Keung, C., & Shen, L. (2013). Measuring the networking performance for contractors in practicing construction management. *Journal of management in engineering*(29), 400-406.
- Khan, A. (2006). Project scope management. *Cost engineering*(48(6)).
- Lechner, C., & Dowling, M. (2003). Firm networks: external relationships as sources for the growth and competitiveness of entrepreneurial firms. *Entrepreneurship & regional development*(15), 1-26.
- Lecoutre, M., & Lièvre, P. (2010). Mobilizing social networks beyond project team frontiers: the case of polar expeditions. *Project Management Journal*(41), 57-68.
- Lu, W. (2006). A system for assessing and communicating contractors' competitiveness. Hong Kong: Hong Kong Polytechnic University.
- Lu, W., Shen, L., & Yam, M. (2008). Critical success factors for competitiveness of contractors: China study. *Journal of construction engineering and management*(134), 972-982.
- Macneil, I. (1974). The many futures of contracts. *South. Calif. Law Rev.*, pp. 691-816.
- Mankin, D., Cohen, S., & Fitzgerald, S. (2004). Developing complex collaboration: basic principles to guide design and implementation. In J. D. M., & S. Beyerlein, *Complex Collaboration: Building the Capabilities for Working Across Boundaries*. (pp. 1-26). Elsevier.
- Meng, X., Sun, M., & Jones, M. (2011). Maturity model for supply chain relationships in construction. *Journal of Management in Engineering*(27), 97-105. [https://doi.org/https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000035](https://doi.org/https://doi.org/10.1061/(ASCE)ME.1943-5479.0000035)
- Nader, A. (2019). *Success factors to the client-contractor collaboration in the dutch infrastructure sector*. TU Delft. .
- Noordhuis, M., & Vrijhoef, R. (2011). *Ketensamenwerking in de bouw: Een leidraad voor ondernemers die ketensamenwerking willen implementeren*. Stichting Research Rationalisatie Bouw.
- Nooteboom, B. (1999). *Inter-firm alliances: Analysis and design*. Routledge.
- Nyström, J., & Mandell, S. (2019). Skew to win, not to profit - unbalanced bidding among informed bidders. *Journal of Public Procurement*(19), 46-54.
- Oswald, D., & Dainty, A. (2020). Ethnographic Research in the Construction Industry: A Critical Review. *Journal of Construction Engineering and Management*(10).
- Palaneeswaran, E., & Kumaraswamy, M. (2000). Contractor selection for design/building projects. *Journal of Construction Engineering and Management*(126(5)), 325-406. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2000\)126:5\(331\)](https://doi.org/10.1061/(ASCE)0733-9364(2000)126:5(331))
- Patel, H., Pettitt, M., & Wilson, J. R. (2012). Factors of collaborative working: a framework for a collaboration model. *Applied Ergonomics*(1), pp. 1-26.
- Pauget, B., & Wald, A. (2012). Relational competence in complex temporary organizations: The case of a French hospital construction project network. *International Journal of Project Management*(31), 200-211.
- Provan, K., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network level: a review of the empirical literature on whole networks. . *Journal of management*(33), 479-516.
- Rahman, M., & Kumaraswamy, M. (2008). Relational contracting and teambuilding: Assessing potential contractual and noncontractual incentives. *Journal of Management in Engineering*.
- Reeves, S., Kuper, A., & Hodges, B. D. (2008). Qualitative research methodologies: ethnography. *BMJ (Clinical research ed.)*, p. 337.
- Sanderson, J. (2012). Risk, uncertainty and governance in megaprojects: A critical discussion of alternative explanations. *International Journal of Project Management*(30), 432-443.
- Shen, L., Li, Q., Drew, D., & Shen, Q. (2004). Awarding construction contracts on multicriteria basis in China. *Journal of construction engineering and management*(130), 385-393.
- Sloan, A., & Bowe, B. (2014). Phenomenology and hermeneutic phenomenology: the philosophy, the methodologies, and using hermeneutic phenomenology to investigate lecturers' experiences of curriculum design. *Quality & Quantity*(3), pp. 1291-1303.
- Smyth, H., & Edkins, A. (2007). Relationship management in the management of PFI/PPP projects in the UK. *International Journal of Project Management*.
- Stake, R. (1995). "Case studies". *Denzin, N.K. & Lincoln, Y.S.* Sage Publications NC.
- Storteboom, A., Wondimu, P., Lohne, J., & Lædre, O. (2017). Best value procurement - the practical approach in the Netherlands. *Procedia computer science*(121), 398-406.
- Suprpto, M. (2016). *Collaborative contracting in projects*. Delft University of Technology. <https://doi.org/10.4233/uuid:8081fd15-7e16-4a05-bd6a-152c8fee2f94>
- Suprpto, M., Bakker, H., & Mooi, H. (2015b). Relational factors in owner-contractor collaboration: The mediating role of teamworking. *International Journal of Project Management*(33), 1347-1363.
- Suprpto, M., Bakker, H., Mooi, H., & Hertogh, M. (2015c). How do contract types and incentives matter to project performance? *International Journal of Project Management*(34), 1071-1087.
- Suprpto, M., Bakker, H., Mooi, H., & Moree, W. (2015a). Sorting out the essence of owner-contractor collaboration in capital projects. *International Journal of Project Management*(33), 664-683.
- Top, N. (2022). *Evaluation of different projects regarding cost overrun*. Bachelor's thesis, University of Twente.
- van Heffen, O., & Klof, P. (2000). Institutionalism: state models and policy processes. In O. v. Heffen, J. Kickert, & J. Thomassen, *Governance in Modern Society: Effects, Change and Formation of Government Institutions* (pp. 153-177). Kluwer Academic Publishers.
- van Kersbergen, K., & van Waarden, F. (2004). 'Governance' as a bridge between disciplines: Cross-disciplinary inspiration regarding shifts in governance and problems of governability, accountability and legitimacy. *European Journal of Political Research*(43), 143-171.
- Wibowo, M. A., & Sholeh, M. N. (2015). The analysis of supply chain performance measurement at construction project. *Procedia Engineering*(125), 25-32. <https://doi.org/https://doi.org/10.1016/j.proeng.2015.11.005>
- Williamson, O. (1985). The economic institutions of capitalism. *The Free Press*.
- Winch, G., & Maytorena, E. (2011). Managing risk and uncertainty on projects: A cognitive approach. *The Oxford Handbook of Project Management*, 345-364.
- Wong, C., Holt, G., & Harris, P. (2001). Multi-criteria selection or lowest price? Investigation of UK construction clients' tender evaluation preferences. *Engineering, Construction and Architectural Management*(8), 257- 271.

Appendix A | Assessment of the most dominant supply chain management models

Soft vs hard criteria of tool: Hard success criteria refer to specific, measurable, and objective goals. Soft success criteria refer to more subjective or intangible goals that may not be as easily measured or quantified.

Model verified in Construction industry: Based on the amount of time the original paper of the model, is cited in papers about the construction industry. Using ScienceDirect as the citation source.

	PTI-Model	COL-MM	SCOR-model	Maturity model	RECAP-model
Soft vs hard criteria of tool	<ol style="list-style-type: none"> 1. <i>Time</i> 2. <i>Cost</i> 3. <i>Quality</i> 4. <i>Safety</i> 5. <i>Environment</i> 6. <i>Communication</i> 7. <i>Contract relations</i> 8. <i>Claims and issue resolution</i> <p>The method itself calls the first five criteria hard measures and the last three criteria soft measures.</p>	<ol style="list-style-type: none"> 1. Collaboration object 2. Collaboration depth 3. Working mode 4. Interaction intensity 5. Collaboration forms 6. Formalization of relationships 7. Commitment and availability of individuals 8. Collaboration boundaries 9. <i>Collaboration goal</i> 10. <i>Management style</i> 11. <i>Decision-making</i> 12. <i>Leadership endorsement</i> 13. <i>Rewarding</i> 14. <i>Collaboration progress</i> 15. <i>Collaboration framework</i> 16. <i>Resources sharing</i> 17. <i>Awareness</i> 18. <i>Conflicts management</i> 19. <i>Engineering (methods and technologies)</i> 20. <i>Information collection</i> 21. <i>Information structuring</i> 22. <i>Information access</i> 23. <i>Knowledge validation</i> 24. <i>Knowledge reusing</i> 25. <i>Knowledge creation</i> <p>Based on the description of these criteria, 100% is soft.</p>	<ol style="list-style-type: none"> 1. <i>Reliability</i> 2. <i>responsiveness</i> 3. <i>agility</i> 4. <i>costs</i> 5. <i>asset management efficiency</i> <p>There are over 250 SCOR metrics in the framework, categorised against five performance attributes. The performance attribute costs are a hard criterion. Therefore, 80% is soft.</p>	<ol style="list-style-type: none"> 1. <i>Procurement</i> 2. <i>Objectives</i> 3. <i>Trust</i> 4. <i>Collaboration</i> 5. <i>Communication</i> 6. <i>Problem solving</i> 7. <i>Risk allocation</i> 8. <i>Continuous improvement.</i> <p>Based on the description of these criteria, 100% is soft.</p>	<ol style="list-style-type: none"> 1. <i>Front-end definition</i> 2. <i>Team integration</i> 3. <i>Joint working processes</i> 4. <i>Senior management commitment</i> 5. <i>Senior management trust</i> 6. <i>Established relational norms</i> 7. <i>Communication</i> 8. <i>Coordination</i> 9. <i>Balanced contribution</i> 10. <i>Aligned effort</i> 11. <i>Mutual support</i> 12. <i>Cohesion</i> 13. <i>Affective trust</i> <p>Based on the CRF's and its sub-criteria, 100% is soft.</p>

	PTI-Model	COL-MM	SCOR-model	Maturity model	RECAP-model
Model verified in Construction industry	38 out of the 38 citations on the model are coming from papers regarding the construction industry.	4 out of the 18 citations on the model are coming from papers regarding the construction industry.	There are many sources of the SCOR-model and combining these sources a lot of citations coming from papers regarding the construction industry.	154 citations and almost all of them are coming from papers regarding the construction industry.	105 citations and almost all of them are coming from papers regarding the construction industry.
Applicable to buyer-supplier relationships	Yes	<i>This model aims to holistically assess the collaboration maturity of a (virtual) team that uses several collaboration technologies. There is no specific aim on an inter-organisational project team.</i>	YES	YES	YES
Applicable to preliminary stages of a project	<i>No front-end definition criteria</i>	<i>No front-end definition criteria</i>	Yes	YES	YES

Appendix B | Relational capability assessment tool (RECAP) form

Purpose

The goal of the interview is to learn how the principal contractor his supply chain partners—subcontractors and suppliers—are currently cooperating with him, when the client its desire calls for a more equal relationship.

Context

In this interview we will use the project organisation of Early Contractor Involvement as an outline for cooperation. In general, the applications of Early Contractor Involvement offer the opportunity to involve the supply chain more equal because it necessitates significant expertise of the market in the bouwteam-phase.

Method

The **RELational CAPability** (RECAP) assessment is used throughout this interview. The framework enables evaluation of two parties' collaboration in a hierarchical relationship. The thirteen indicators in RECAP are associated to relational cooperation. There are a number of statements listed under each indicator. Each statement can be given a score between 1 and 5. These scores show if a statement about chain partner and contractor collaboration is typically very poor or excellent.

1 = very poor;	4 = good;
2 = poor;	5 = Excellent.
3 = moderate;	/ = not applicable

The statements that correspond to each indicator are subsequently presented after the indicator has been explained. There is a section to pre-write comments at the bottom of each indicator.

You are kindly requested to complete the ranking of the scores in advance so that we can address the statements in a semi-structured manner during the interview.

Please proceed to the following page->

Indicator 1 – Front-end definition

Front-end definition refers to the context of the Early Contractor Involvement relationship between the principal contractor and the supply chain partner, including topics like the goal, the scope, the roles involved, the collaboration agreement, and responsibilities.

1 – Front-end definition	1	2	3	4	5	/
a. The principal contractor understands the project goals, objectives, and scope set by the supply chain partner.						
b. The supply chain partner understands the project goals, objectives, and scope set by the principal contractor.						
c. Relevant functional / high level technical requirements (<i>basic design</i>) are reviewed together by both parties.						
d. There are clear <i>roles and responsibilities</i> created by both parties.						
e. There are clear <i>roles and responsibilities</i> assigned to both parties.						

Indicator 2 – Team integration

Team integration discusses how the team is formed and the roles that each party takes in this process.

2 – Team integration	1	2	3	4	5	/
f. The parties form <i>an integrated project team</i> where the principal contractor and the supply chain partner are structured and integrated as a single team with no apparent boundaries.						
g. The parties perform <i>goal setting and alignment meetings</i> collaborative.						
h. The parties exercise <i>inter-team building</i> workshops to encourage collaboration via fun and excitement.						
i. The parties have <i>recognition and rewards programs</i> to stimulate individual and parties' levels collaborative behaviour.						

Indicator 3 – Joint working processes

This indicator focuses on processes that need to be coordinated with one another since two different parties will be working together in a single party to execute project tasks.

3 – Joint working processes	1	2	3	4	5	/
j. The parties jointly conduct <i>planning</i> for relevant tasks.						
k. The parties jointly perform <i>monitoring, controlling, and reporting</i> .						
l. The parties jointly conduct <i>issue management</i> .						
m. The parties jointly <i>define</i> and <i>monitor</i> the achievement of key <i>performance areas</i> .						
n. The parties jointly <i>identify and monitor risks</i> and formulate a necessary <i>mitigation plan</i> .						
o. The parties have robust <i>mechanisms to resolve conflicts/disputes</i> .						
p. The parties have formal <i>procedures for joint decision making</i> .						

- - -

Indicator 4 – Senior management commitment

It is crucial that senior managements from the principal contractor and supply chain partner support the project team and preview the collaboration because Early Contractor Involvement comprises cooperation.

4 – Senior management	1	2	3	4	5	/
q. Senior management of the principal contractor commits to provide necessary resources and support the project team.						
r. Senior management of the supply chain partner commits to provide necessary resources and support the project team.						
s. Senior management of the principal contractor shows consistent and passionate leadership.						
t. Senior management of the supply chain partner shows consistent and passionate leadership.						
u. Senior management of both parties actively work together to resolve potential conflicts when needed.						

Indicator 5 – Senior management trust

'Senior management trust' involves the mutual trust, transparency and enthusiasm that exists between the two parties their management to achieve the goals of the project.

5 – Senior management trust		1	2	3	4	5	/
v.	There is an atmosphere of mutual trust between senior management of both parties.						
w.	There is a mutual enthusiasm from senior management of both parties in achieving the project goals.						
x.	Senior management of both parties has confidence in each other to do what is right.						
y.	Senior management of both parties keep their promises truthfully.						

Indicator 6 – Established relational norms

Associated aspects are comparable to norms seen in interpersonal or familial relationships.

6 – Established relational norms		1	2	3	4	5	/
z.	The principal contractor intentionally adopts 'no blame culture' when problems arise.						
aa.	The supply chain partner intentionally adopts 'no blame culture' when problems arise.						
bb.	The principal contractor is intentionally open and honest in any interactions with no hidden agendas.						
cc.	The supply chain partner is intentionally open and honest in any interactions with no hidden agendas.						
dd.	The principal contractor strives for business outcomes whereby both parties either win or both parties lose.						
ee.	The supply chain partner strives for business outcomes whereby both parties either win or both parties lose.						
ff.	Both parties agree to have an equal say in any critical decision that matter to both parties.						

Indicator 7 – Communication

Despite the fact that the indicator ‘communication’ is extremely important in each collaboration, the Early Contractor Involvement environment sets a special emphasis on it. Lines of communication are kept short by direct communication.

7 – Communication	1	2	3	4	5	/
gg. Both parties communicate directly with each other.						
hh. Project-relevant information is shared openly by both parties.						
ii. Whenever a problem is detected, it is immediately and honestly communicated to the other party.						
jj. Both parties are satisfied with the usefulness of the information shared by other party.						

Indicator 8 – Coordination

Task coordination amongst team members, rather than by either party between the contractor and chain partner parties, is a crucial feature. Can everyone put their own interests aside for the benefit of the overall outcome?

8 – Coordination	1	2	3	4	5	/
kk. The work done in the team is closely synchronized between the parties.						
ll. There is a clear linkage between the parties for their interdependent tasks.						
mm. There is no redundancy regarding the work done between both parties.						

Indicator 9 – Balanced contribution

The objective of an Early Contractor Involvement is characterized by a balanced contribution where strengths are integrated and both sides give their specific knowledge. Knowing each other's strengths and weaknesses is crucial in this situation.

9 – Balanced contribution		1	2	3	4	5	/
nn.	Both parties recognize the specific strengths and weaknesses of each party its competences.						
oo.	Both parties are contributing their knowledge/ expertise in accordance with their full potential.						
pp.	There is a balanced contribution of ideas between the parties.						

Indicator 10 – Mutual support

This is about "helping each other as best as possible" and "solving problems constructively". The ratio of effort by both parties does not necessarily have to be around 50/50. A ratio of 70/30 could also be relevant to an Early Contractor Involvement cooperation.

10 – Mutual support		1	2	3	4	5	/
qq.	Both parties help each other as well as they could.						
rr.	Whenever problems occurred, they are resolved constructively.						
ss.	Every critical decision is made together by both parties.						

Indicator 11 – Aligned effort

The priority set in Early Contractor Involvement to jointly achieve the goals.

11 – Aligned effort	1	2	3	4	5	/
tt. Both parties give each project the priority it needs.						
uu. Both parties put their best effort into each project.						
vv. There are no conflicts regarding the effort that each party put into each project.						

Indicator 12 – Cohesion

Actually behaving as one project team is what this indicator focuses on.

12 – Cohesion	1	2	3	4	5	/
ww. Members of both parties are personally engaged to each project.						
xx. Members of both parties are integrated as one team.						
yy. Members of both parties feel proud to be part of the project team.						
zz. Members of both parties feel responsible for maintaining the relationships within the project team.						

Indicator 13 – Affective trust

In addition to the "senior management trust" (already defined), mutual party trust is essential for successful cooperation. Important fundamental components of trust in this include playing open cards, willing to run harder, and not taking advantage of each other's weaknesses. Throughout the organization's many levels, trust must exist.

13 – Affective trust	1	2	3	4	5	/
aaa. Both parties are comfortable being dependent on each other.						
bbb. Both parties keep their promises.						
ccc. Both parties work with high levels of integrity.						
ddd. Both parties are fair to each other.						
eee. Both parties look out for the interests of both companies.						
fff. Both parties can rely on each other for not taking advantage of the other parties their weaknesses.						

Appendix C | Description of the four cases.

Case study A

Project leader B – Subcontractor C | Joint processes, conflict, escalation & Sr. Management.

For a client, a site in Veltzicht needed to be redeveloped. The activities were both building construction work and civil engineering in nature. Both components of the project were divided organizationally, with the principal contractor in charge of both. For the redevelopment of the site, a design and plan had to be submitted in which the principal contractor needed expertise from a subcontractor. The subcontractor and the principal contractor had jointly agreed on an equal partnership. The contract itself was a UAV-IC contract, with all the requirements encompassing the specials that the subcontractor has expertise on were for them. The project therefore did not involve Early Contractor Involvement, although the principal contractor nevertheless followed the same approach. The principal contractor noticed during the tender phase that the subcontractor was not actively participating to the plan to be submitted and identifying any risks or common ground.

Based on comments in the interviews, the subcontractor had been notified of this experience at the time, which led to a brief dispute that lasted for several months and involved numerous discussions. The conflict was escalated by the subcontractor to his senior management. Together, conversations about the incident and its causes were honest and open. The errors in the tender were therefore acknowledged, and the subcontractor mentioned the matter internally as a result.

Due to their shared areas of expertise, both parties were able to easily comprehend each other's technicalities. During the meetings, both parties were able to see beyond their individual organizational limits, and the project organization came first, establishing the intention to work together to solve the problem straightaway. The mutual organizational relationship between both parties was good and there was confidence that the subcontractor would be a good partner in terms of knowledge and skills as well as the kind of business that would suit the principal contractor.

Both parties acknowledged that the conflict might have lasted longer if it had not been escalated, but because the project organization its interests came first, it was soon settled. As a result, they jointly enter into a letter of intent for similar projects where they cooperate extensively or for early contractor involvement projects. With the principal contractor taking the initiative and the partner contributing its experience, there is a clear separation between the requirements and the encompassing responsibilities, and they appreciate each other's competence and offered ideas.

Case study B

Buyer – Supplier C | Cooperation agreement, transparency, communication & cohesion.

For an Early Contractor Involvement project on the topic of climate adaptation to achieve the client its own climate adaptation strategy, a municipality held a tender in 2022. Since the principal contractor had the opportunity to create their own approach with the client to carrying out a plan for the climate adaptation, they had identified which suppliers they may turn to for expertise in the tender. Additionally, the principal contractor chose to search for a long-term partner rather than a supplier solely for this project because the topic of climate adaption will come up more frequently in multiple tenders in the future.

The principal contractor believed they had found a viable supplier for the tender who was capable of cooperating in Early Contractor Involvement projects and had substantial knowledge and expertise about the topic. Both parties desired to reach to an agreement of cooperation under the terms they had established. Although, the supplier is also a trade organization in addition to a supplier of its own products. The principal contractor had the desire to communicate, getting advice and send invoices directly with the supplier and not via the supplier its suppliers. The principal contractor considered this to be a crucial concern for openness in the cooperation and clear communication.

The supplier stated that they want to know why the principal contractor makes certain decisions, such as having the opportunity to look at calculations, and that they assume that if they are producing a new product, the principal contractor will keep it inside the firm or project organization. According to the supplier, both parties should be expected to act in good faith and refrain from speaking out. The principal contractor wanted this to be formalized in a contract, but the supplier had no need for that. The supplier believes that rather than the project or company, the amount of control the principal contractor wants is largely due to the individual being cooperated with.

The agreement was unable to be implemented as a result, and the principal contractor later learned that another cooperation agreement was being prepared with another division of the principal contractor.

Case study C

Project leader B – Subcontractor B | Relational norms, mutual trust & business models.

In a village of around 1.3 thousand residents, there is a problem with the current sewer system. During heavy rainfall, even dirty water leaks into the street. The client opted for an integrated approach in the form of an Early Contractor Involvement project organisation. During construction, the principal contractor would face some challenges, such as the high groundwater level and preventing nuisance caused by the work to the surrounding area. For these two challenges, the principal contractor had requested the expertise and skills of a drainage specialist. That specialist would also be involved as a partner if the principal contractor was awarded the contract was made known to the client, who responded enthusiastically.

During the tender phase, the principal contractor had asked the subcontractor if they could provide input to the plan regarding groundwater levels and preventing nuisance pumping. At the same time, the subcontractor had received a similar request from another principal contractor for the same project. This was also made known to the principal contractor during the tender phase. In fact, the subcontractor insisted that they could internally separate both requests and do so without hidden agendas.

In the interviews, the subcontractor clearly expressed that they experience a solid difference in terms of being able to show commitment when they are in the Bouwteam phase or in a tender phase where they have to work in competition. He indicated that in principle every bidder for a client has the same motivation to approach them, which is for their expertise. As a subcontractor, their organization is set up to work commercially with multiple parties and they cannot afford to work purely for one organization by default. When they receive two applications simultaneously, they can handle them separately and give both parties equal treatment. This is also due the fact that, the strategy of the subcontractor is determined by the construction methodology of the principal contractor.

Meanwhile, the principal contractor had requested a competitive price comparison from another party to verify what the subcontractor was offering them was also viable. This was because the principal contractor felt that the subcontractor its input to the plan might not be the best input possible for the principal contractor. This is because they felt that the subcontractor could still divide their best ideas between the two different plans and thus strategically achieve the best result for them to get the work awarded by one of the two bidders.

Ultimately, the project was not awarded by the client to one of the two principal contractors but to a different party. Both the principal contractor and subcontractor acknowledged that if they were to acquire the project, their cooperation in the Bouwteam phase might have encountered difficulties because they had not been honest with one another throughout the tendering process.

Case study D

Buyer – Subcontractor A | Front-end definition, coordination, joint processes, aligned effort.

The national government awarded the contract for major maintenance of national highways of a part of the Netherlands to the principal contractor. The project includes the maintenance of various national highways, divided over two lots. In the preliminary phase, much attention was dedicated to making agreements with all stakeholders and partners to, among other things, ensure safety during the work. The principal contractor required a subcontractor their expertise for the national roadways' joints. The principal contractor made the decision to enter into a covering agreement with the subcontractor and include them as a partner on projects involving road joint transitions, because the project entailed a maintenance program. Through this covering agreement, they are therefore explicitly included in projects in which their expertise occurs.

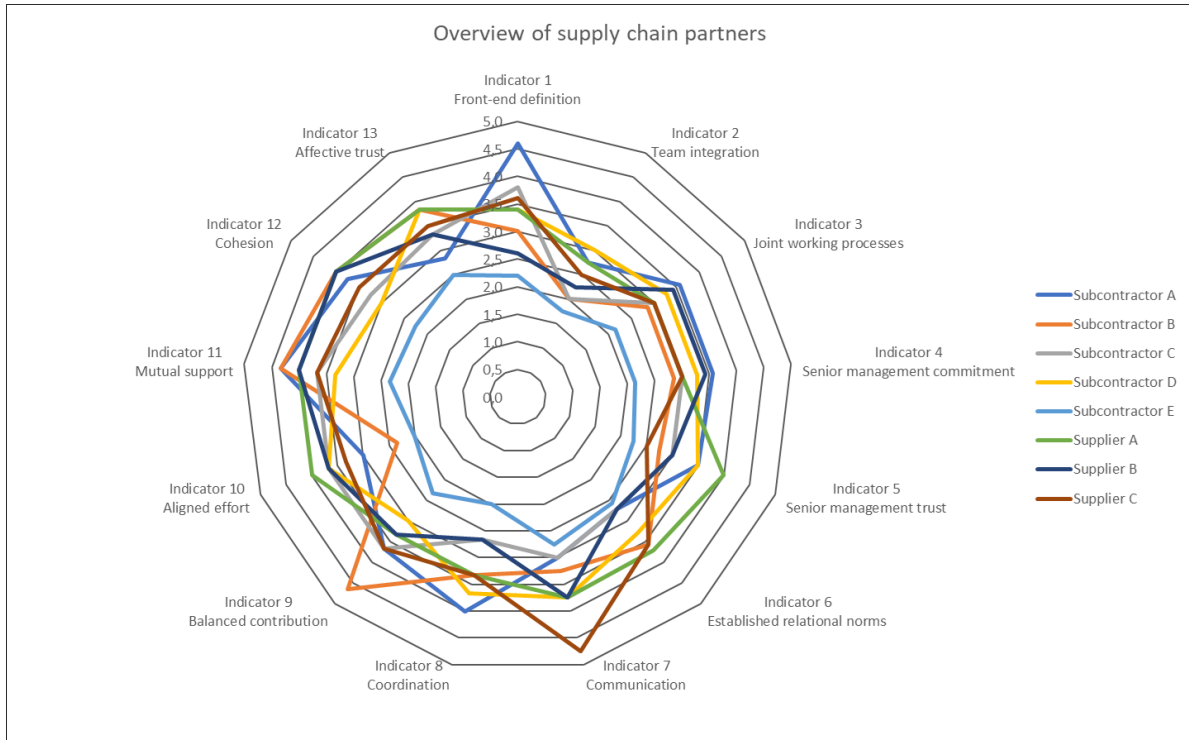
The partner mainly did integral maintenance contracts in the form of UAV-IC with the principal contractor. However, because they work intensively within these projects with the principal contractor, they notice the same experiences during Early Contractor Involvement projects they do with the principal contractor. In these types of cooperations, they have to examine the client their preferences along with the principal contractor because they are actively involved in the covering agreement. However, from their position where the majority of employees are used to calculating what is asked for in traditional forms of contracts, the partner is not yet used to thinking along with the project as principal contractors are used to nowadays. As a result, some requirements were forgotten in one of the UAV-IC projects because it was thought that they did not fall within the partner its responsibilities.

The partner has indicated in interviews that they found it difficult to think along in this new role of cooperation and would therefore like to be helped to gain experience in this. However, in Early Contractor Involvement projects, the partner also felt that they were not being helped enough in this process. The partner has the feeling that lessons learned are not shared enough internally by the principal contractor and that, because of this, they are still too much seen as a subcontractor compared to other regional offices of the principal contractor, instead of as a partner with whom equality should be striven for.

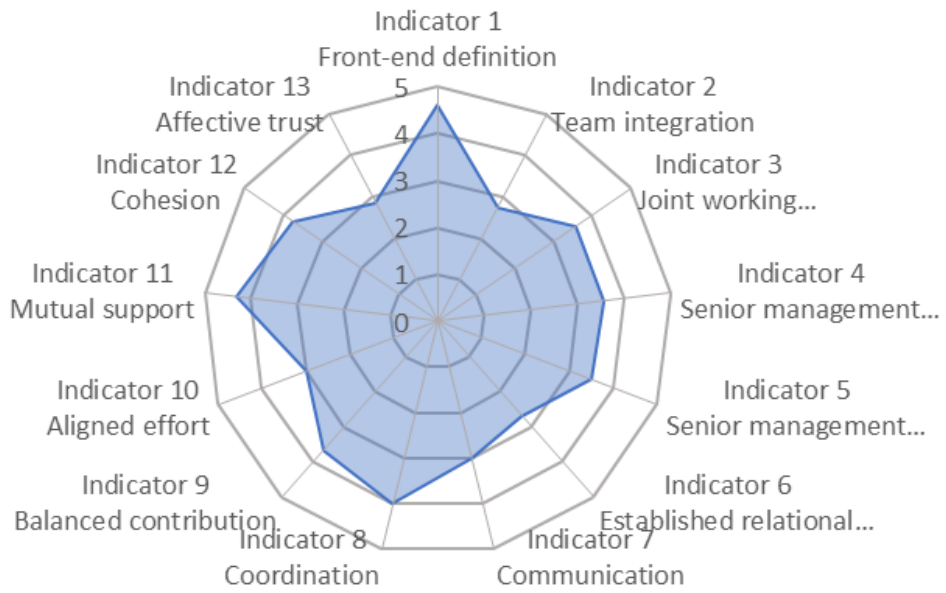
Several principal contractor project managers indicated that the way of cooperation is not determined by the contract type, but that it does influence the degree of responsibilities of the principal contractor and how these are translated to partners. They indicate that they often request offers from subcontractors and suppliers first and only afterwards thoroughly contact them. However, when partners find it difficult to think along with the project, it may happen that the front-end definition is understood differently by partners than the request by the principal contractor to partners.

Appendix D | Quantitative results of RECAP tool

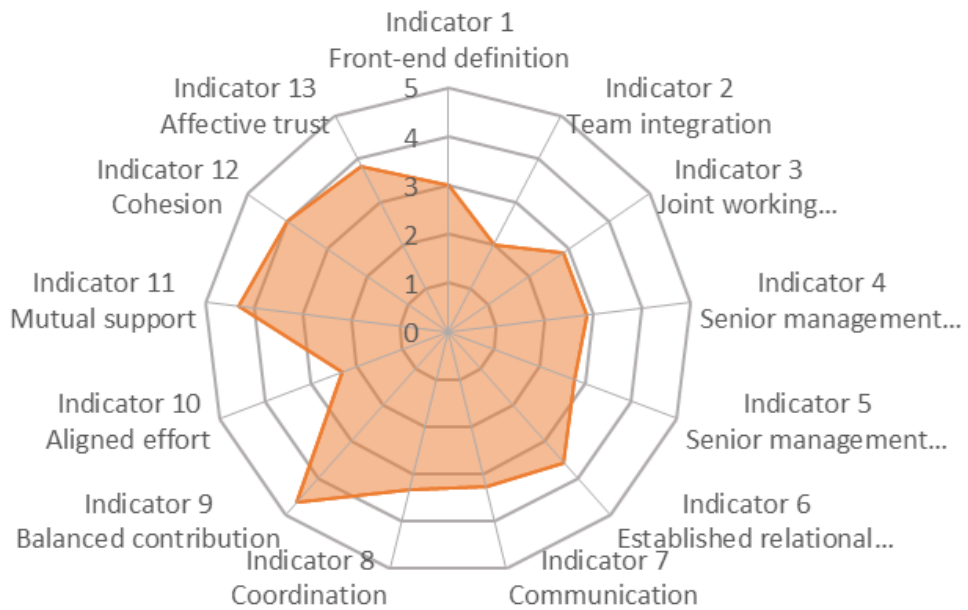
Results per supply chain partner



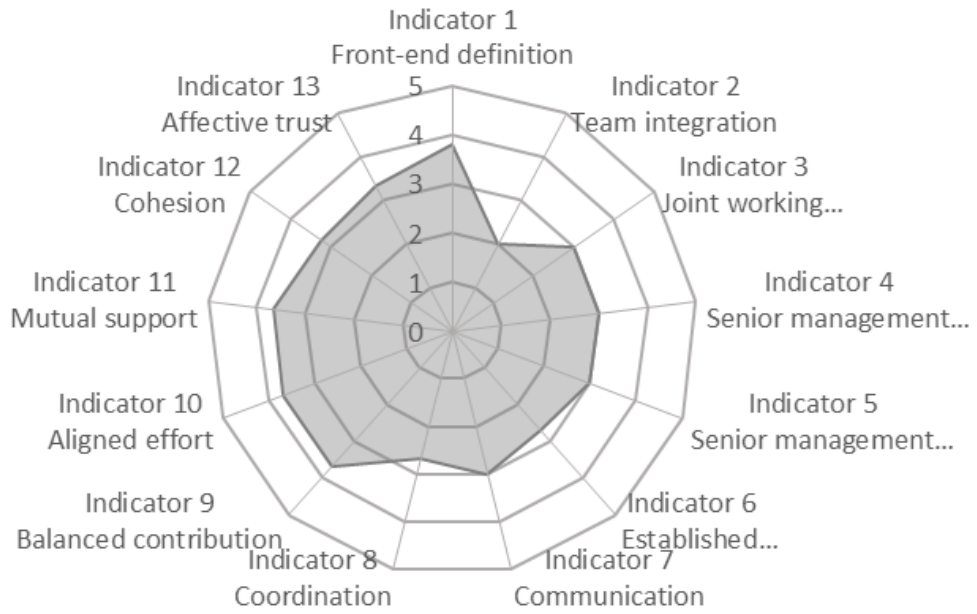
Subcontractor A



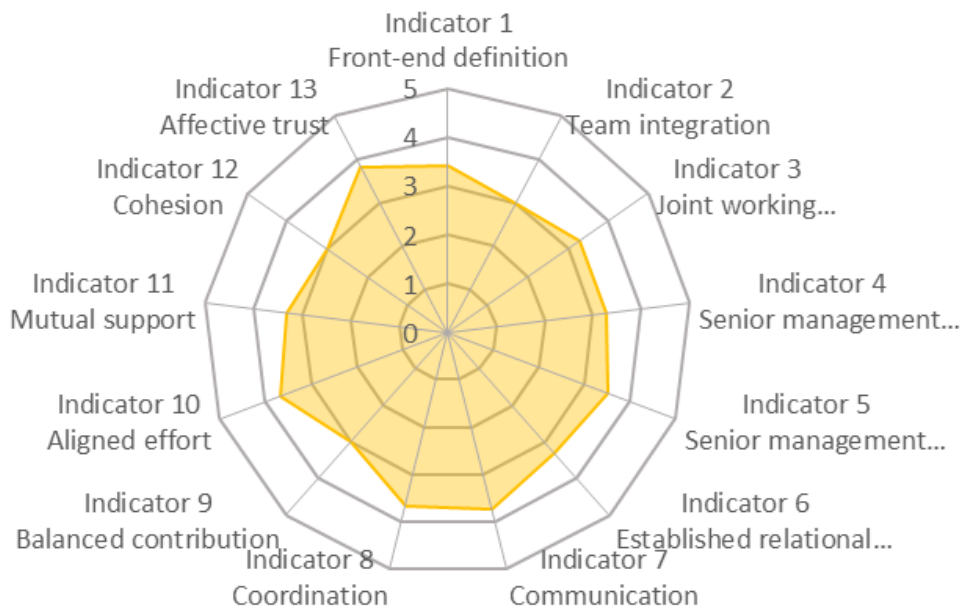
Subcontractor B



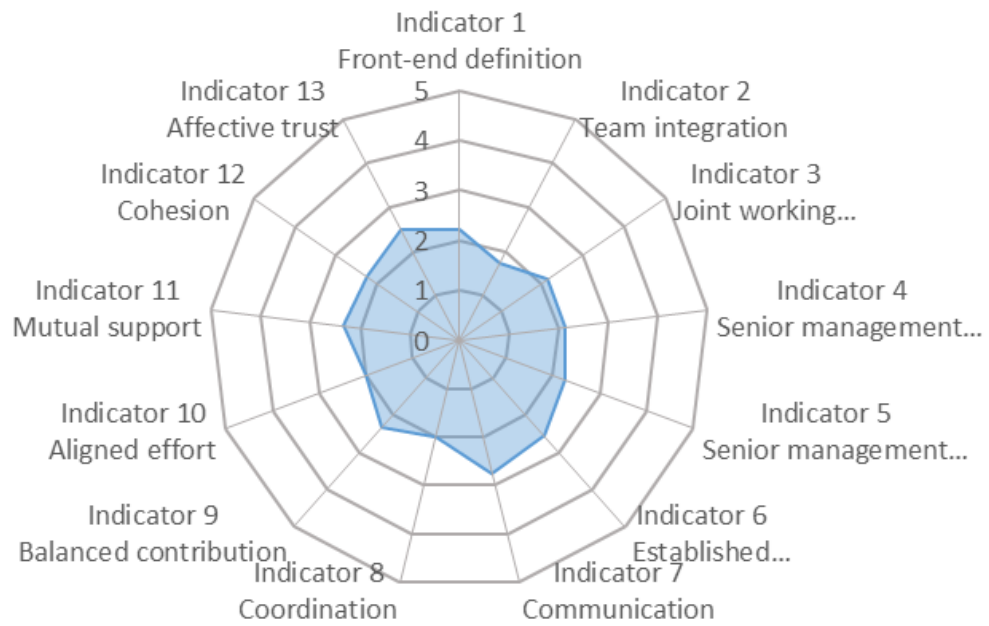
Subcontractor C



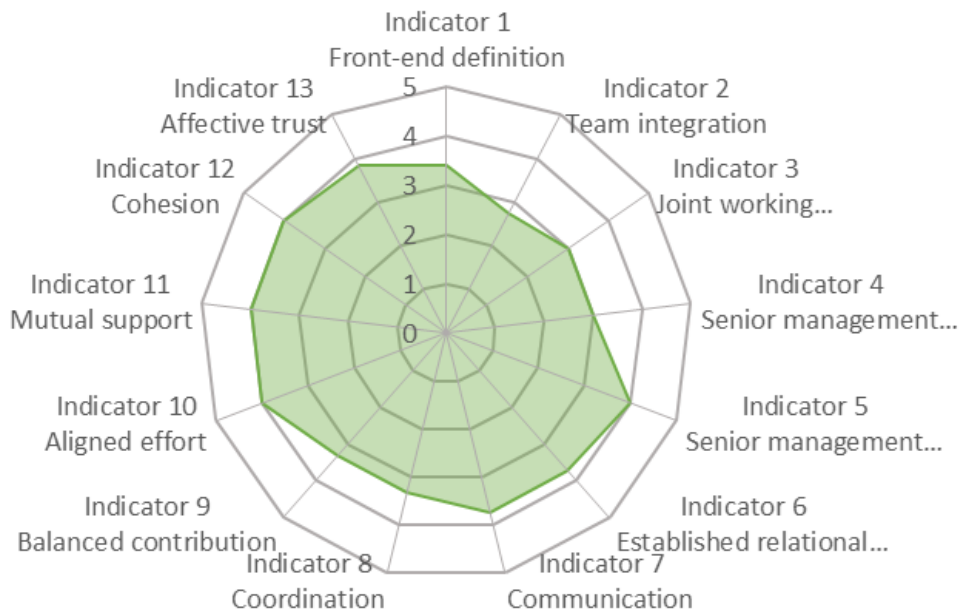
Subcontractor D



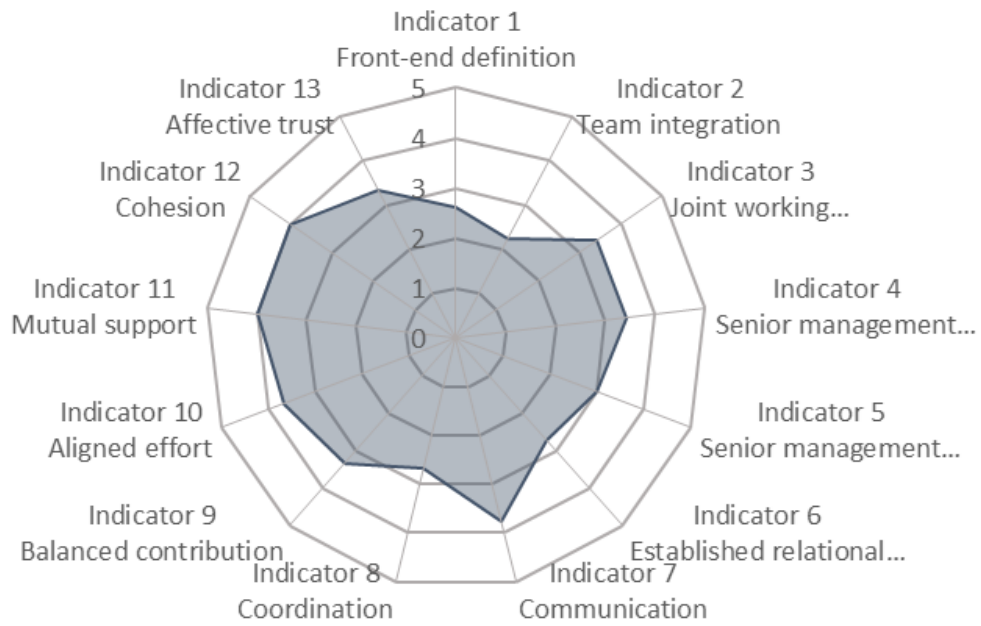
Subcontractor E



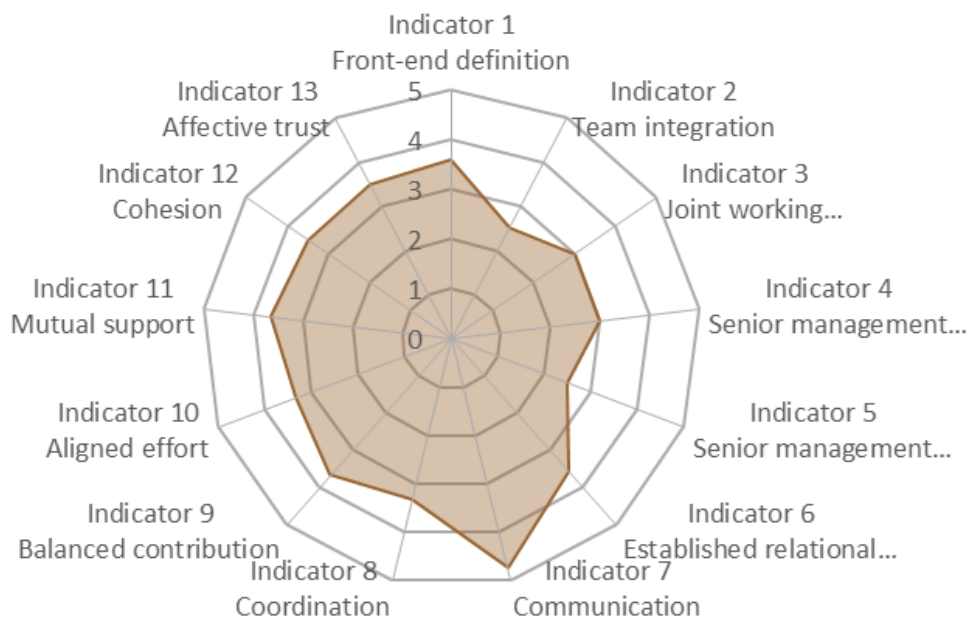
Supplier A



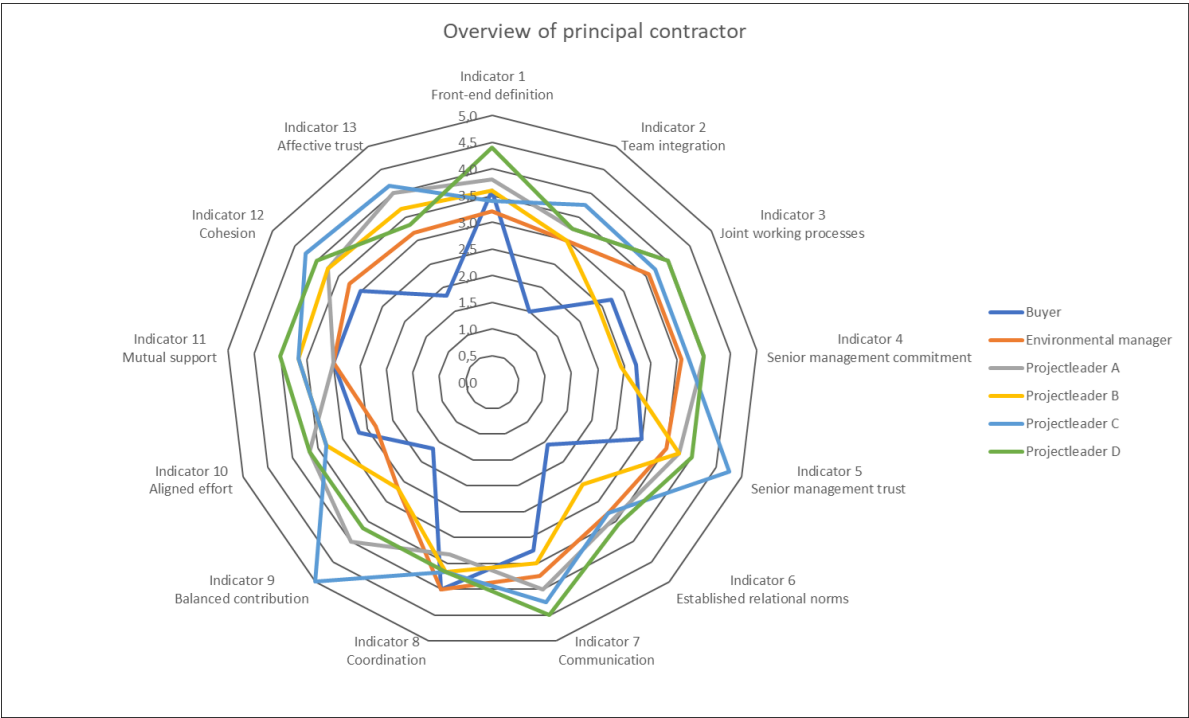
Supplier B



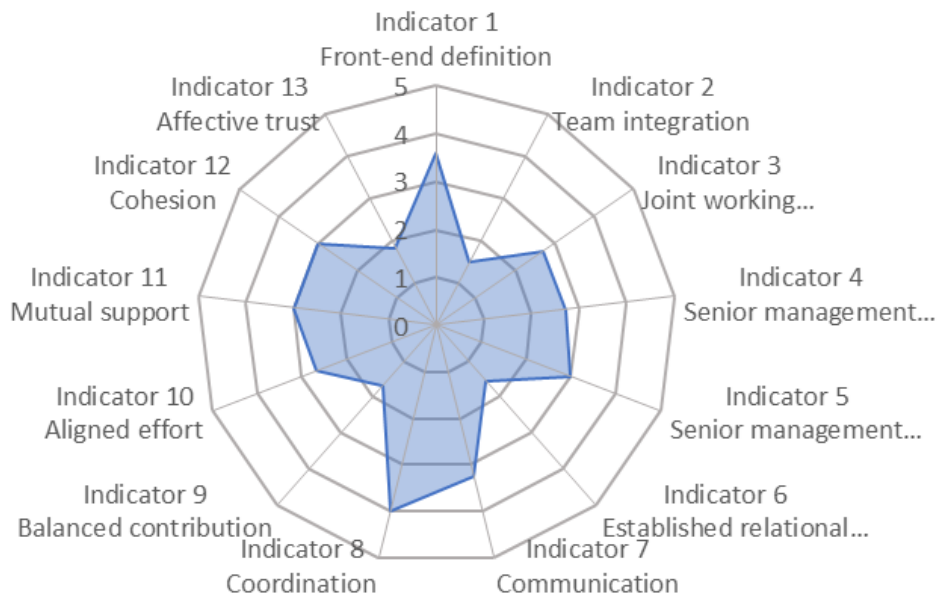
Supplier C



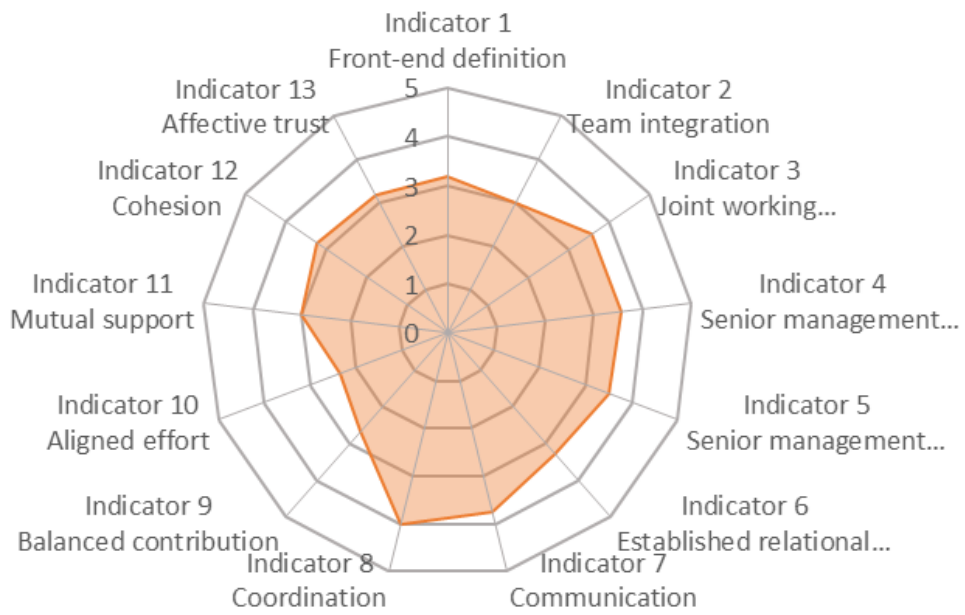
Results of principal contractor



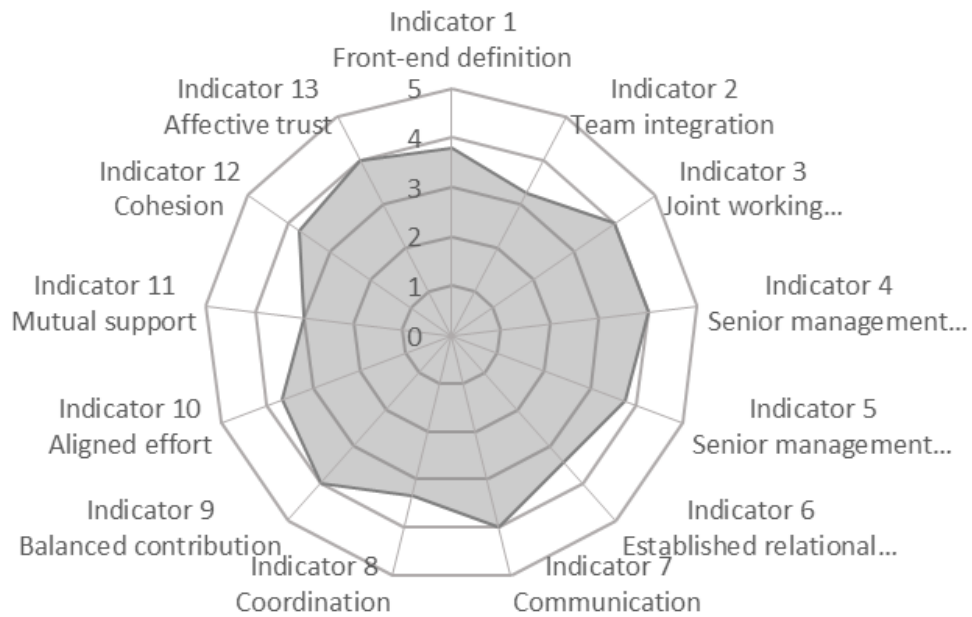
Buyer



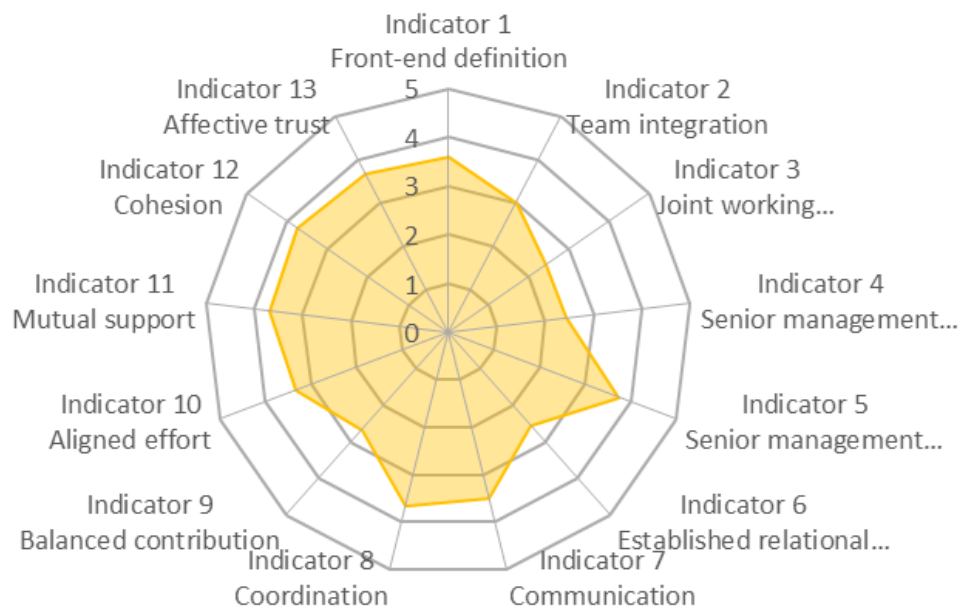
Environmental manager



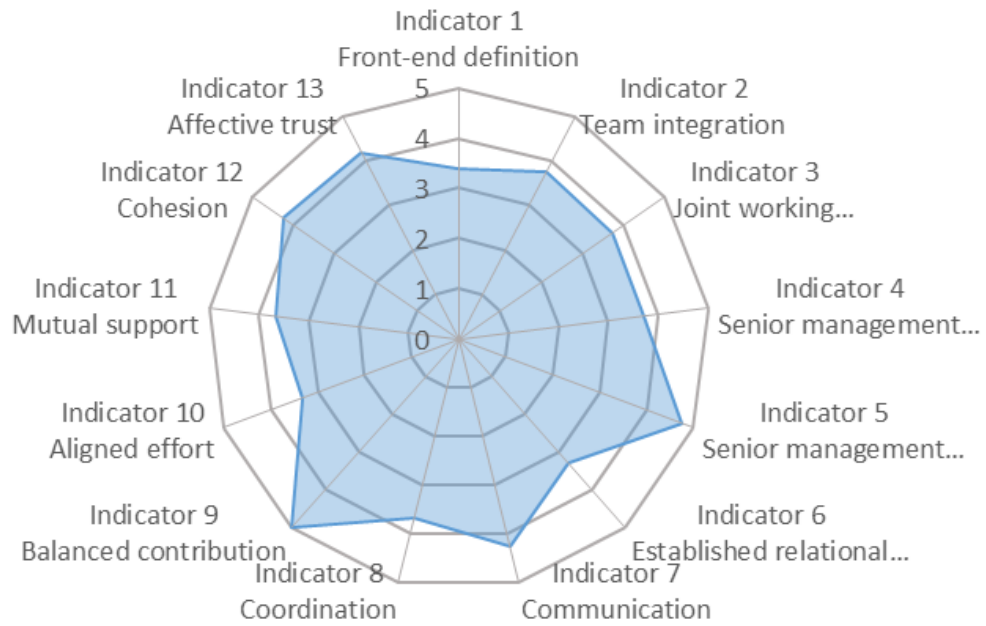
Project leader A



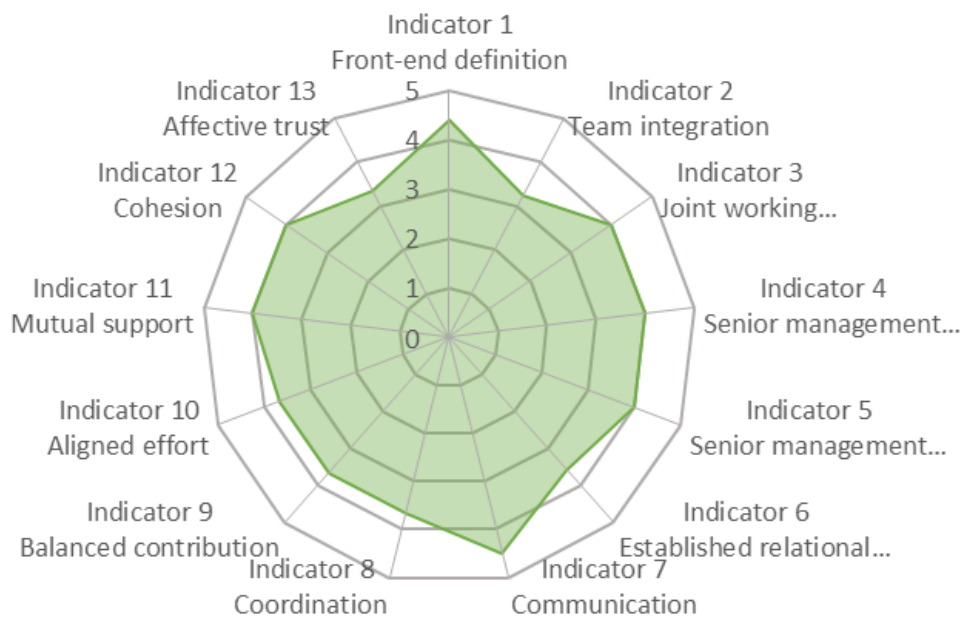
Project leader B



Project leader C



Project leader D



Appendix E | Qualitative results of RECAP tool

	Supply chain partners							
	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E	Supplier A	Supplier. B	Supplier C
Indicator 1 – Front-end definition	<p>01. Requests are often emailed and viewed separately from each other, followed often by telephone contact. As a result, subcontractor has experienced that sometimes key details are missed by looking at the request for tender separately.</p> <p>04. Subcontractor is used to pricing what is directly asked and need to be helped with understanding the clients' requests.</p> <p>04. Subcontractor would like to be helped more with understanding the documents, because now they often only discount what is actually on paper.</p> <p>02. Subcontractor would like their role to be more clearly expressed to the client.</p>	<p>01. Subcontractor feels that the principal contractor anticipates the subcontractor their advice and already bases plans on this and only seeks advice from the subcontractor later.</p> <p>01. Subcontractor is often approached too late, as a result of which its expertise can often be used too late, and changes are often no longer possible. As a result, the subcontractor feels that too much consideration is still given to who the cheapest/best partner may be.</p> <p>04. Subcontractor sometimes has the feeling that responsibilities can be placed much better with the subcontractor.</p>	<p>01. Subcontractor has the feeling that the request for tender is less quickly forwarded by mail.</p> <p>02. The role of the subcontractor often changes during the bouwteamfase. In the beginning, they are often asked for just advice and at the end they often only really become construction team members in operational matters. This is fine, but often this is not really clear.</p> <p>03. Subcontractor feels that the contractor is actually looking for the best solution instead of the cheapest.</p>	<p>01. Request is often unclear to subcontractor as it is often forwarded by contractor via email quickly without clear context.</p> <p>04. The principal contractor should coordinate more with the subcontractor beforehand in order to understand the request for tender. Now they are often involved too late in the process to be able to think along with solutions.</p>	<p>01. Request is often unclear for subcontractor because it is often only mail contact, which means that subcontractor often still has to make telephone contact.</p> <p>02. The subcontractor believes that when they give advice, it is actually listened to by the principal contractor.</p> <p>03. Subcontractor feels that the principal contractor should be more critical on the contract made by the client in terms of freedom of movement.</p> <p>04. Principal contractor demands specialist knowledge from subcontractor which means they often do not know exactly what they are asking for in the request for tender.</p>	<p>01. Supplier often understands the request for tender well however sometimes it is already determined what the solution should be, so their role is really only as a supplier.</p> <p>02. Supplier feels that their role in an Early Contractor Involvement only has value if there is still freedom of choice for them and not choices already determined for them by the principal contractor or client.</p> <p>03. Due to the broadness of the request for tender, the supplier feels that their expertise can be used well as advice, especially in the start-up phase of the project.</p>	<p>01. Supplier has specialist knowledge in-house so to be able to give good advice, they would like to be helped more to understand the total request.</p> <p>02. Discussions about the supplier's role in the process should take place more at the front end, so that everybody's strengths are also mapped out. Supplier is often involved too late for this, with consequences for the design. The supplier often lacks this knowledge.</p>	<p>01. Supplier often understands the request for tender because they also have contact with clients.</p> <p>02. Supplier can often look better at what the ideal solution is as price is a less critical component and the request for tender is often still broad.</p> <p>04. The supplier wants to be helped by the principal contractor to understand the documents because of the time available and to get commitment.</p>
Indicator 2 – Team integration	<p>05. Subcontractor notices that the level of integration depends on the people of the regions of the principal contractor. He has previously worked in a particular region and thus has satisfactory level of integration with them.</p> <p>08. Subcontractor has a covering agreement with the principal contractor, but occasionally misses the appreciation of the principal contractor because they see tasks performed as ordinary.</p>	<p>05. The earlier a subcontractor is involved, the more he or she also feels part of the team and this motivation continues into the execution phase as well.</p> <p>06. Subcontractor notices that joint goals are coordinated faster in an Early Contractor Involvement.</p>	<p>05. Subcontractor notices that they are increasingly taken along as real partners and can also have contact with the clients.</p> <p>05. Subcontractor finds it most important that they are chosen on the basis that they can be trusted, because otherwise everything during the process is being questioned.</p> <p>06. Subcontractor thinks that an Early Contractor Involvement should consist of people who can think beyond the company.</p> <p>07. Subcontractor would like to see more frequent a PSU between all parties that are contracted. These hardly ever occur.</p>	<p>05. Subcontractor his experience is that cooperation starts very enthusiastically at the beginning and then often dilutes the intention.</p> <p>05. Subcontractor always tries to connect the right people who fit the principal contractor.</p> <p>07. Subcontractor sees value in a PSU with the principal contractor for relationships within the team. Often, they get involved too late with the client their PSU or it is only between client and contractor.</p>	<p>05. Subcontractor his experience is that the principal contractor is doing an excellent job of looking at who fits best in the team.</p> <p>05. Subcontractor finds that sometimes the enthusiasm in the tender phase limits the process of who is really responsible for what part.</p>	<p>05. Supplier finds that there is a lot of difference in the way they are involved in Early Contractor Involvement but feels that this is often due to the culture of the principal contractor.</p> <p>06. Supplier feels that the project team should be more set up to respond to the regional clients in order to also provide better answers with interview by topics.</p> <p>07. Supplier believes that the first step for a relationship of trust should be taken by the principal contractor.</p> <p>08. Supplier feels the biggest reward is that they get to participate again. Have a long-standing relationship with BAM which makes it keen to work with them.</p>	<p>05. Supplier feels it is increasingly able to come to the same table as the client to share its knowledge.</p> <p>06. Supplier notices that sometimes goals do not match what is asked of them, so they already set aside extra budget themselves. They know that a lot of time goes into engineering. This could be better communicated.</p>	<p>05. Supplier had felt that earlier the principal contractor found it awkward when a supplier came to the table. Feels this is slowly changing.</p> <p>05. Supplier feels that finding each other within the project team is easier, but that they like to work out the request for tender further internally.</p> <p>07. Supplier sees added value of a PSU to get to know each other's skills, but this should come after the request for tender is clear.</p> <p>08. Supplier feels the reward of an Early Contractor Involvement is to be allowed to do the next work together again.</p>

	Supply chain partner							
	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E	Supplier A	Supplier. B	Supplier C
Indicator 3 – Joint working processes	<p>- 09. Process conflicts occur most often due to the inexperience of new project organisations, according to subcontractor.</p> <p>- 10. Conflicts are generally resolved on the project, but subcontractor notes that it often leaves an aftereffect for subsequent projects.</p> <p>- 11. Subcontractor is used to doing mainly RAW contracts and indicates difficulty in the new role to do joint processes.</p> <p>- 11. Subcontractor has weekly meetings with joint planning, and this helps.</p> <p>- 12. Subcontractor feels that too often there are still hierarchical relationships, including when communicating about risks where these are not allowed to be discussed jointly with the client.</p> <p>- 12. Subcontractor takes on risks through covering agreement and finds that this does provide clarity.</p>	<p>- 09. Subcontractor believes it is important to write down everything that matters.</p> <p>- 09. Subcontractor notices that there are fewer conflicts with Early Contractor Involvement.</p> <p>- 11. Subcontractor indicates that with Early Contractor Involvement, planning is better looked at jointly because of its importance.</p> <p>- 12. The subcontractor notices that synergy is mainly achieved with opportunities, but not so much with risks.</p> <p>- 12. The subcontractor indicates that it helps to think about what is best for the project but will not quickly take on the entire risk.</p> <p>- 12. The subcontractor indicates that known risks are always discussed well in advance, but unforeseen risks are often not discussed.</p>	<p>- 09. Most conflicts are in the technical area (which is no different with Early Contractor Involvement), but subcontractor does notice that these are more easily resolved.</p> <p>- 11. Subcontractor does not feel that Early Contractor Involvement produces more collaborative thinking, as they felt they were already doing this.</p> <p>- 12. Subcontractor feels that project-transcending risks are more discussable with Early Contractor Involvement.</p>	<p>- 09. Subcontractor notices that conflicts are fewer in Early Contractor Involvement, because of the length of cooperation.</p> <p>- 11. Subcontractor notices that during discussions in an Early Contractor Involvement, everyone is helped better because this is important in terms of costs.</p> <p>- 12. Subcontractor feels that parties sometimes omit risks because of their uncertainties.</p>	<p>- 09. Conflicts concerning collaborative design are well resolved. However, when these conflicts arise because the client has given little space, the conflicts are often more difficult.</p> <p>- 11. Subcontractor finds that they sometimes see too little of the planning when they are only asked for advice.</p> <p>- 12. Subcontractor feels that the responsibility of unforeseen risks in the execution phase should be better discussed in the bouwteamfase.</p> <p>- 12. Discussing risks is done transparently according to subcontractor.</p> <p>- 12. In an Early Contractor Involvement, the subcontractor thinks it is even more important that the right risks lie with the right party; this happens too little.</p>	<p>- 09. Supplier finds that through a long-term relationship, conflicts are resolved faster.</p> <p>- 11. Supplier notes the ability to be distinctive in the opportunities dossier and tries to help contractor with this. However, his opinion is that the formulation of this lies with the contractor. This is because they often have contact with clients as well.</p> <p>- 11. Supplier finds that they are approached in time to think along and therefore to anticipate.</p> <p>- 12. Supplier finds that with Early Contractor Involvement, project-transcending risks such as delivery times can be more easily communicated to the client.</p>	<p>- 10. Supplier finds that conflicts are often resolved on intuition rather than in a structured manner. As a result, there is a need for control measures.</p> <p>- 11. Supplier has noticed that, due to deadlines in Early Contractor Involvement, it is more convenient to coordinate matters jointly than to do so hierarchically separately.</p> <p>- 11. Supplier has many common grounds with other partners but is often approached too late, leading to discussions.</p>	<p>- 09. Supplier occasionally prefers to accept the opinion of the principal contractor for keeping a good relationship during a conflict, especially in an Early Contractor Involvement.</p> <p>- 11. Supplier is fine with deadlines being imposed by the contractor, especially if it is approached at a later stage. Supplier still sees the principal contractor as their client.</p> <p>- 11. Supplier notices that they are often allowed to think together due to distinctiveness in opportunities dossier.</p>
Indicator 4 – Senior management commitment	<p>- 14. Subcontractor finds that Sr. Management is only utilised when conflicts arise. Then they are often escalated to them.</p> <p>- 14. Subcontractor feels that conflicts are resolved by Sr. Management for just the project and are not approached cross-project.</p>	<p>- 14. Subcontractor does not feel Sr. Management is more quickly engaged in Early Contractor Involvement.</p>	<p>- 13. Subcontractor has the feeling that business leaders spontaneously ask about projects and that responsibility is given to project leaders.</p> <p>- 14. Subcontractor notices that conflicts that are escalated often have to do with finances or financial consequences.</p>	<p>- 13. Subcontractor does not feel that Sr. Management is extra involved in Early Contractor Involvement.</p> <p>- 14. Subcontractor does not feel that the type of project should cause Sr. Management to get extra involved or not.</p>	<p>- 14. Subcontractor notices that Sr. Management only talk to each other when it comes to finance and then, in his feeling, they often fall into their traditional role instead of an Early Contractor Involvement mindset.</p>	<p>- 13. Supplier finds that opportunities are often discussed with Sr. Management in the preliminary stage, but afterwards communication is only between lower levels such as calculators.</p>	<p>- 13. According to supplier, Sr. Management only looks at large projects due to the underlying financial risk.</p> <p>- 13. Supplier feels that with new relationships, Sr. Management does look at the project more often.</p>	<p>- 14. Supplier indicates that at project level Sr. Management only joins the discussion if there is a conflict, otherwise everything just belongs to the project management</p>
Indicator 5 – Senior management trust	<p>- 15. Subcontractor indicates that Sr. Management only sees each other during conflicts which is not beneficial to the relationship.</p>	<p>- 17. Subcontractor feels Sr. Management of the project (client) should visit more often projects to get to know the companies.</p> <p>- 16. Subcontractor feels Sr. Management should visit each other more often cross-project for trust, but that they often do not have time for this.</p>	<p>- 16. Subcontractor finds that due to the fragmentation of organisations, there is no point in doing this at Sr. Management level to improve the trust relationship, but that this is done on the project within the project team.</p>	<p>- 16. Subcontractor feels Sr. Management should meet more often to build trust before conflicts arise.</p>	<p>- 15. Subcontractor feels Sr. Management should see each other more often, outside of conflicts.</p>	<p>- 17. Supplier indicates due to long-standing relationship Sr. Management already has confidence in each other.</p> <p>- 16. Sr. Management often does not have time to speak to each other.</p> <p>- 16. Supplier notes that relationship is much more between project management than Sr. Management due to the fragmentation nationwide of principal contractors.</p>	<p>- 17. Supplier believes that trust is only created in the project team or when there is a partnership.</p> <p>- 17. Supplier indicates that Sr. Management is always ultimately decisive for cooperation.</p>	<p>- 17. Supplier feels it is not necessary for Sr. Management to get relationship with each other, as the relationship should be most important in the project team.</p>

	Supply chain partner							
	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E	Supplier A	Supplier. B	Supplier C
Indicator 6 – Established relational norms	<ul style="list-style-type: none"> - 18. Subcontractor feels that more can be done for each other by more interaction on vital information. - 19. Subcontractor thinks there should be a difference in treatment when parties are risk-bearing. 	<ul style="list-style-type: none"> - 18. Subcontractor notices that parties are more open to each other in an Early Contractor Involvement. - 19. Subcontractor finds it more difficult to be open to each other in a new relationship, while this should be the goal. 	<ul style="list-style-type: none"> - 18. Subcontractor finds commitment by working one-to-one important for trust. - 20. Subcontractor indicates that the more trust there is, the less there are discussions about finances each time. 	<ul style="list-style-type: none"> - 18. According to subcontractor, openness is linked to trust. This is developed quicker with existing relationships as a result. - 19. Subcontractor notices that in Early Contractor Involvement, parties are more open towards each other because interests are divided. 	<ul style="list-style-type: none"> - 18. Subcontractor often finds it clear when several parties tender. - 19. Subcontractor likes to work one-on-one if there are clear agreements. - 20. Subcontractor is fine if things are checked (such as the offer), but this should be communicated first. 	<ul style="list-style-type: none"> - 18. Supplier believes that parties are honest in their promises. - 19. Supplier has generic products and therefore automatically has transparency. - 20. Supplier often cannot compete one-to-one because of their generic products; however, they want to do so with specials. 	<ul style="list-style-type: none"> - 19. Supplier tries to keep multiple requests separate internally but has no standard way of doing this. - 20. Supplier indicates that for their feeling they communicate when multiple interested parties are interested, but if the interest is there, they also want to work one-to-one, but often this needs to be clarified in advance for investment. 	<ul style="list-style-type: none"> - 19. Supplier feels that openness is created by looking with each other within processes and finances. However, the supplier feels that too often the principal contractor also wants to legally record this. - 20. Supplier feels that openness is a personal quality and not illustrative to the company itself.
Indicator 7 – Communication	<ul style="list-style-type: none"> - 21. Subcontractor believes there should be a clearer plan for communication in advance and not just an assumption of something. - 22. Subcontractor notes that calculators find communication during cooperation difficult. 	<ul style="list-style-type: none"> - 22. Subcontractor notices that matter relevant to the client are difficult to communicate with the client because of how the client has legally arranged the project governance. 	<ul style="list-style-type: none"> - 22. Subcontractor notices that the right levels can communicate with each other. - 22. Subcontractor feels that the contractor, despite being the focal point, too often wants to be involved in communication flows. 	<ul style="list-style-type: none"> - 21. Communication between parties themselves is good, but there needs to be a more focus on what information is or is not important. - 21. Subcontractor needs to get used the role of being proactive. - 22. Principal contractor is often intermediary in communication towards the client. According to the subcontractor, this is because of the client. 	<ul style="list-style-type: none"> - 21. Subcontractor thinks communication with the principal contractor is good. - 22. Subcontractor thinks communication with other parties or client is good enough. 	<ul style="list-style-type: none"> - 21. Communication with contractor goes well because of the long relationship according to supplier. - 21. Supplier finds it most important that agreements are clearly communicated. - 22. Supplier notices that it is important to connect the right people within project team in a new relationship as soon as possible. 	<ul style="list-style-type: none"> - 21. Supplier is satisfied with communication with principal contractor; however, this could sometimes be faster so that they can change direction faster. - 22. Supplier finds it important that only people talk to each other at the right level, as the biggest task is to get everyone involved in discussions. 	<ul style="list-style-type: none"> - 22. The supplier finds it most important that the right people can talk to each other.
Indicator 8 – Coordination	<ul style="list-style-type: none"> - 23. Specific package of tasks is often prepared separately, resulting in missed work or overlap, according to the subcontractor. - 23. Subcontractor notices that coordinating tasks still needs to grow, despite the Early Contractor Involvement philosophy. 	<ul style="list-style-type: none"> - 23. Subcontractor notices that there is still sometimes overlap in tasks, this could be due to demarcation. 	<ul style="list-style-type: none"> - 23. Subcontractor finds that there is a close relationship between more intensive cooperation and less overlap in tasks. 	<ul style="list-style-type: none"> - 23. Subcontractor feels that demarcation should take place much earlier as there is occasional overlap. - 24. Subcontractor feels that more and timely consideration should be given to who is going to do the execution of the project as well. 	<ul style="list-style-type: none"> - 23. Subcontractor thinks demarcation in Early Contractor Involvement is important but could be done earlier to avoid conflicts. 	<ul style="list-style-type: none"> - 23. Supplier indicates that because of its role, demarcation is easy. 	<ul style="list-style-type: none"> - 23. Supplier finds that demarcation drafting collectively goes well. - 23. Supplier wants to be involved earlier, so that changes in common ground are processed more quickly. - 24. Supplier believes that better consideration should be given in advance to who will be doing the work later and that these people should also be involved timelier in the bouwteamfase. 	<ul style="list-style-type: none"> - 23. Supplier indicates that demarcation is going well. - 23. Supplier indicates that when demarcating, price is less important due to working efficiently.
Indicator 9 – Balanced contribution	<ul style="list-style-type: none"> - 25. Subcontractor feels that knowledge is actually adopted. - 25. Subcontractor has a small tender team and is therefore bound by the competences and characters of these people. 	<ul style="list-style-type: none"> - 25. Subcontractor does not always feel that there is room to share knowledge with each other, but if there is, it is always listened to properly. 	<ul style="list-style-type: none"> - 25. Subcontractor clearly feels that the advice they give is adopted. - 25. The subcontractor feels that knowledge is shared during the bouwteamfase. 	<ul style="list-style-type: none"> - 25. Subcontractor feels its knowledge is used too late and should be looked at more upfront. - 25. Subcontractor feels that everyone's expertise is deployed in the right way. 	<ul style="list-style-type: none"> - 25. Subcontractor feels that the principal contractor approaches them to late because the specialised knowledge is not seen direct. - 25. The subcontractor is open to sharing expertise on condition of obtaining compensation. 	<ul style="list-style-type: none"> - 26. Supplier finds it easier to do larger innovations in Early Contractor Involvement as client is involved for legal aspects. Is however of the view that the risk should be taken jointly with the principal contractor. 	<ul style="list-style-type: none"> - 25. Supplier believes that due to their specialist knowledge that they are often well involved, as this knowledge cannot be found anywhere else. 	<ul style="list-style-type: none"> - 25. Supplier often goes along with the opinion of the principal contractor, because of their coordinating role. - 26. Supplier considers Early Contractor Involvement ideal for their innovations and tries to contribute innovative ideas for this very reason.
Indicator 10 – Aligned effort	<ul style="list-style-type: none"> - 27. Subcontractor lacks back-up if something goes wrong and feels that the contract is looked at too quickly instead of how it can be solved as a team. This is often due to the original risk allocation. 	<ul style="list-style-type: none"> - 27. In the execution phase, the subcontractor indicates that everyone is more committed, but that this is also because they are often involved later in the bouwteamfase. 	<ul style="list-style-type: none"> - 27. Subcontractor indicates that when working one-to-one, they want to do more for the project than when half-agreements are made. 	<ul style="list-style-type: none"> - 27. Subcontractor indicates that because of the relationship, they always go all the way for the project. 	<ul style="list-style-type: none"> - 27. Subcontractor indicates it is willing to cooperate intensively if they are a partner and not a subcontractor. - 28. Subcontractor indicates that they should be more honest if they have no time for a project. 	<ul style="list-style-type: none"> - 27. Supplier indicates that they can move projects aside if the principal contractor indicates that it is important. 	<ul style="list-style-type: none"> - 27. Supplier indicates that in one-on-one work they are willing to spend more time. - 27. Supplier feels that the contractor sometimes takes on too much of the chairman role and does not pay enough attention to each party. 	<ul style="list-style-type: none"> - 28. Supplier thinks there should be more willingness to really do novelties together, as it can be a risk.

	Supply chain partner							
	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E	Supplier A	Supplier. B	Supplier C
Indicator 11 – Mutual support	- 29. Subcontractor could gain even more synergy if they understood the client's contract better. - 30. Subcontractor feels they could be even more involved in, for example, traffic management measures if there is room for it.	- 29. Subcontractor feels that project team should meet more often to achieve synergy.	- 29. Subcontractor notes that through Early Contractor Involvement, everyone wants to do more for each other.	- 29. Subcontractor notices that there is not proper cooperation in all levels, despite this the case at project management level.	- 30. Subcontractor has noticed that decisions made in the tender also have to be implemented by the same people.	- 29. Supplier believes that an Early Contractor Involvement should include people who want to create something together and not follow rules separately.	- 29. Supplier has the experience that people in Early Contractor Involvement cooperate more and therefore prefer to help each other.	- 29. Supplier recognises that Early Contractor Involvement requires various kinds of people to work together (relationship thinkers), so that people are more likely to understand each other's role.
Indicator 12 – Cohesion	- 31. Subcontractor feels that cohesion with the contractor is good but had expected more because of the covering agreement. - 32. To prevent or resolve conflicts, it is sometimes useful to change people, but due to the size of the company, this is not always possible, says the subcontractor. - 32. Subcontractor indicates that bottlenecks are discovered at management level but are often not recognised at the lower levels.	- 31. Subcontractor notes that efforts are made to match the right people in terms of company and skill level. - 31. Subcontractor feels that the principal contractor has become much more of a chairman. - 31. Subcontractor indicates that there is room to talk to partners, but this depends on the risks of the principal contractor.	- Subcontractor says it has no specific comments on this.	- 31. Subcontractor feels that an Early Contractor Involvement should consist of people who can think beyond their own company. - 31. Subcontractor feels that space is given for partners to talk among themselves, but that in important discussions, the principal contractor often has to be at the table for common ground.	- 32. The subcontractor feels that the Early Contractor Involvement idea is abandoned when conflicts arise in the execution phase.	- 32. The supplier sat at the table with a competitor once, which did not help the relationship.	- 31. Supplier says it understands the role of principal contractor well as they were previously given this role by the client. This helps in cohesion.	- 31. Supplier says it is important to be able to look across each other's corporate boundaries and learn from each other's internal processes. This creates trust for the future. - 31. Supplier indicates that the choice to work together is based more on opportunities than relationships. - 31. In Early Contractor Involvement, the supplier feels there is room to approach other parties.
Indicator 13 – Affective trust	- The subcontractor does not have any specific comments on this.	- 33. Subcontractor believes that each party does keep promises due to business culture.	- 33. Subcontractor feels that the principal contractor always sticks to its agreements.	- Subcontractor says it has no specific comments on this.	- 33. The subcontractor indicates that it often does not want to start working until mutual expectations are clear.	- 33. Supplier indicates that the commitment exists because of the relationship they have with each other.	- 33. Supplier indicates that commitment is built on the relationship that is there and when that is not (yet) there, they really explore it first.	- 33. Supplier indicates that they feel it is most important that if they have also been allowed to do the bouwteamfase, that they are also allowed to do the execution phase.
Miscellaneous	- The subcontractor did not mention any points that do not belong in any of the thirteen indicators.	- Subcontractor believes that Early Contractor Involvement openness is not feasible in RAW or UAV-IC due to the individual interests there. - Subcontractor believes subcontractors should be more critical to work together if this has not gone well before. Since this is even more of an emphasis in Early Contractor Involvement.	- The contractor did not mention any points that do not belong in any of the thirteen indicators.	- The contractor did not mention any points that do not belong in any of the thirteen indicators.	- The subcontractor believes that the greatest gains can be made in cooperation if they are approached even earlier and more intensively.	- Supplier notices that with Early Contractor Involvement, phase transitions are smoother. - In the supplier's experience, innovations are always missed in UAV-IC. However, these can be discussed in Early Contractor Involvement. - The supplier feels that when they have a share in the project performance, they should also be named more often to the public.	- Supplier indicates they have little experience of actually working together as one team to create something like this instead of a hierarchical division of roles.	- Supplier feels it is important to emphasise that Early Contractor Involvement is important for them to develop a relationship or innovation and not to generate extra profit.

	Contractor					
	Buyer	Environmental manager	Project leader A	Project leader B	Project leader C	Project leader D
Indicator 1 – Front-end definition	<p>- 01. Employee says that the procedure is often to first see which party is suitable for the work, then ask for a price and then have a discussion with the partner.</p> <p>- 01. Employee says that with innovative contracts, price is not the most important thing and that too often this is only looked at from management perspective.</p> <p>- 02. Employee says that if someone really becomes a partner, the principal contractor always wants to submit a binding offer.</p> <p>- 03. Employee indicated that as purchasing they often only get involved internally when it comes to pricing and that is often at a later stage, however as they have a lot of contact with partners at that later stage, they could also give valuable input when looking for suitable partners on newer projects.</p>	<p>- 01. Employee notes that there is slow movement to see who understands the scope best and can thus be the best partner.</p> <p>- 04. Employee indicates that getting expectations clear in the tender phase is difficult for partners due to uncertainties.</p> <p>- 04. Employee notices that partners are more often asked to take over part of the objective instead of solving a particular problem, but this still happens too rarely.</p> <p>- 03. Based on the goals, employee indicated that they often think about which partner would be useful during the Bouwteamfase and look at what type of partner (operational/creative) is needed.</p>	<p>- 01. Employee indicates timely involvement of partners who are essential in the project is crucial and then giving them a prominent position.</p> <p>- 04. Employee feels that partners understand the purpose of the project well and can also apply their expertise and value well.</p>	<p>- 01. Employee says he always thinks clearly beforehand about what the importance of each partner is for the project and, based on that, considers how much a partner should be involved.</p> <p>- 02. Employee says he can imagine that parties do not feel equal because they do not explicitly talk to the client, but he always tries to create this feeling.</p> <p>- 03. Employee says that partners should be selected based on technical skills and not soft skills. These are particularly important but ultimately there has to be a product.</p>	<p>- 01. Employee says he always asks for a cost estimate first and based on the estimate, has a discussion on site.</p> <p>- 04. Employee says he always checks with the partner to see who is responsible for what, but in his opinion, BAM is always ultimately responsible.</p> <p>- 02. Employee mainly talks about how he thinks parties find it difficult not to have turnover during the bouwteamfase and that it therefore requires special kind of people who want to think along.</p> <p>- 03. The employee clearly indicates that he only asks for partners when BAM does not have the knowledge.</p>	<p>- 04. Employee indicates that by starting discussions, he makes the intended project result clear to the partner.</p> <p>- 04. Employee indicates that he does not discuss the project result in extreme detail with the partners, but rather with the client.</p> <p>- 02. Employee indicates that to his feeling partners are not waiting to participate in the bouwteamfase, as they are executing parties.</p> <p>- 02. Employee indicates that, in his opinion, partners find it difficult to participate in the construction team phase because they are often performers, and therefore he can often only contact medium-sized companies.</p> <p>- 03. Employee says that partners are selected when BAM lacks expertise and that this selection is mainly based on the product and quality.</p>
Indicator 2 – Team integration	<p>- 05. Employee indicates the someone should only be chosen as a partner if results can also be achieved in short term horizon, as otherwise the relationship loses its power.</p> <p>- 05. Employee indicates that he is not actively involved in team integration as a buyer himself. In addition, despite occasionally being involved with new parties or agreements, he indicates that he is not involved in forming the team internally or for the project.</p> <p>- 06. Employee indicates that he often only has an advisory role when a partner is chosen. Sometimes he knows from experience which partner is best to choose when considering who will do the work internally.</p>	<p>- 05. Employee indicates that, in an Early Contractor Involvement, he only wants to choose partners he feels are reliable.</p> <p>- 05. Employee has not yet experienced that in an Early Contractor Involvement, people working together across companies are really on the same page, as is the case on some projects as combinations.</p> <p>- 05. Employee notices that too few partners are selected based on the best partner for cooperation, but rather based on quality and reliability.</p> <p>- 05. Employee indicates that project leader determines the degree of cooperation with the partner.</p> <p>- 07. Employee indicates that he occasionally involved the partner in the PSU and that this generated commitment from the partner.</p>	<p>- 05. Employee experiences project team as small islands where goals are coordinated separately.</p> <p>- 05. Employee says that by physically seeing each other and making people responsible, the team feeling is created.</p> <p>- 06. Employee says he feels that common ground is well discussed in advance.</p> <p>- 07. Employee says it helps to take a team day to see how to work together.</p> <p>- 08. Employee indicates that he does not use a reward structure for the bouwteamfase and that the fines often only concern the execution phase.</p>	<p>- 06. Employee indicates that goals are always well discussed and repeated throughout the process for reference.</p> <p>- 07. Employee indicates that PSU is mainly with client and possibly a designing party, and that the PSU does provide a powerful tool to get to know each other.</p>	<p>- 05. Employee indicates that when a partner participates in the project, they become a full member of the project team.</p> <p>- 05. Employee indicates that he likes to be in contact with the lower levels of the project team because they provide the content and that they must also be real thinkers.</p> <p>- 06. Employee indicates that he goes through the client's requirements with the partner in order to understand the wishes.</p> <p>- 07. Employee indicates that he always looks at everyone's skills with the partner who is really in the project team (often in a PSU) to give the cooperation strength but that afterwards it is often about technology again.</p> <p>- 08. Employee does not notice a difference in Early Contractor Involvement whether people are rewarded but does notice in general that it is less common.</p>	<p>- 05. Employee indicates that the degree of integration depends on the type of request. With a broad question, the partner is often much more integrated than if only a product solution is requested.</p> <p>- 06. Employee experiences that specialised partners sometimes find it difficult to help think of a solution in context. Employee himself needs to encourage the partner for this.</p> <p>- 07. Employee clearly indicates that there is only a PSU with the client and that team building with partners often comes naturally and is often person dependent.</p> <p>- 08. Employee believes that effort should be rewarded, despite uncertainty as to whether the product will be applied.</p>

	Contractor					
	Buyer	Environmental manager	Project leader A	Project leader B	Project leader C	Project leader D
Indicator 3 – Joint working processes	<p>- 09. Employee indicates that when conflicts arise, he does not have standard ways of resolving it as he wants to look more at how the process went and based on that how the conflict can be resolved.</p> <p>- 09. Employee indicates that when conflicts arise, he often notices if someone can see beyond their own organisational boundaries or is in collaboration mode. In addition, communication and openness is often the problem if it cannot be resolved.</p> <p>- 10. Employee indicates that whether he or Sr. Management is asked when a conflict arises if it is escalated.</p>	<p>- 11. Employee notices by speaking to each other frequently in an Early Contractor Involvement, processes also go jointly intended or unintended.</p> <p>- 12. Employee experiences that through Early Contractor Involvement, thinking is less risk-averse but more solution-oriented.</p> <p>- 12. Employee indicates never wanting to give risks 100% to partner because of contractual responsibility.</p> <p>- 09. Employee indicates that design conflicts in an Early Contractor Involvement are still as many as traditional contracts.</p> <p>- 10. Employee indicates that partner is never really in the real steering group.</p>	<p>- 11. Employee indicates that the Early Contractor Involvement makes it easier to consult with the client and discuss comments from partners.</p> <p>- 11. Employee indicates that partners often want to think along in processes, but that in planning it is often the contractor who obtains information from partners.</p> <p>- 09. Employee indicates that the way of resolving a conflict should not be different in Early Contractor Involvement compared to other project organisations.</p> <p>- 10. Employee indicates that through lines of communication, escalation is possible but not often formal.</p>	<p>- 11. Employee indicates that they often make the first estimate for planning purposes and then consult with partners about their assessment.</p> <p>- 12. Employee says he prefers to put risks with the partners, but that he has recently been looking at how risk indexations can be made and that partners are open to this and that this saves discussion.</p> <p>- 10. Employee says he does not have robust ways of dealing with conflicts except to stay in conversation because every project is different.</p>	<p>- 12. Employee feels that risks are always discussed along the way and thus who is best responsible for them.</p> <p>- 09. Employee experiences fewer conflicts with Early Contractor Involvement than with other types of contracts due to common interests, and if there are conflicts it is about money.</p> <p>- 10. Employee has learned through experience that sharing an escalation model is particularly useful.</p>	<p>- 12. Employee feels that he always clearly points out the risks to the partners.</p> <p>- 09. Employee sees advantages and disadvantages of partners being allowed to participate in the design at an early stage, but mainly indicates that you should always go to the root cause when a problem arises.</p> <p>- 10. Employee indicates that he is in favour of setting up an escalation model in advance and also discussing it.</p> <p>- 10. Employee indicates that if escalation is needed, it is often about money and that this is during the realisation phase due to associated costs. These costs are less common in the bouwteamfase.</p>
Indicator 4 – Senior management commitment	<p>- 13. Employee indicates that Sr. Management often chooses the partner for the "strategy-to-win" and purchasing often gives sideways advice.</p> <p>- 13. Employee indicates that the person of the partner in contact is often Sr Management and therefore comes into the picture more often than Sr Management of the principal contractor.</p>	<p>- 13. Employee notices for long-term partnership that Sr. Management keeps an eye on the relationships, but not on individual projects.</p> <p>- 14. Employee indicates that Sr. Management only gets involved for financial reasons or additional work.</p> <p>- 14. Employee indicates that a previous conflict has caused bad experiences between Sr. Management of both companies and therefore the partner is less often selected.</p>	<p>- 13. Employee indicates that Sr. Management is not jointly looking at the project, whether both companies can help each other. This is often the responsibility of project management.</p> <p>- 14. Employee indicates that Sr. Management does not actively get involved in projects and is mainly used in conflicts.</p>	<p>- 13. Employee indicates that Sr. Management does not actively look at the relationship, but because they often speak to each other, they are often aware of it.</p> <p>- 14. Employee indicates that when problems arise that are beyond the project, Sr. Management often does keep an eye on it, but that this is often not looking purely at the project.</p>	<p>- 13. Employee does not feel that Sr. Management explicitly looks in on Early Contractor Involvement, but if this requested it does happen.</p> <p>- 13. Employee indicates that he is constantly talking to his Sr. Management and therefore extra effort is also not needed.</p>	<p>- 13. Employee indicates that responsibility always lies with project management, and they ought to maintain the relationship.</p> <p>- 13. Employee indicates that the most important thing is to get the mandate from Sr. Management.</p>
Indicator 5 – Senior management trust	<p>- 15. Employee indicates that, in his opinion, Sr. Management still focuses too much on price, which often determines how open and honest communication with the partner is. But he notices that this is slowly changing.</p> <p>- 15. Employee indicates that both parties in terms of Sr. Management still mainly look at price because it is also a low-margin sector, and they are responsible for profits.</p>	<p>- 15. Employee indicates that more trust should be created between Sr. Management of parties in order to be more willing to help each other.</p> <p>- 16. Regional management should be the people to maintain relationships, according to Employee.</p>	<p>- 16. Employee indicates that Sr. Management occasionally goes for coffee to improve the relationship with a partner.</p> <p>- 17. Employee thinks the added value of Sr. Management is mainly in maintaining the relationship with client.</p>	<p>- 16. Employee indicates that at project management level, maintaining the relationship is often the same as at Sr. Management level.</p> <p>- 17. Employee indicates that the first step of maintaining the relationship is more often taken by the partners, because they are curious whether new work may arrive. In turn, BAM often does this towards its clients.</p>	<p>- 15. Employee indicates that Sr. Management meets only when there are conflicts. But when his Sr. Management says to collaborate with Party A that he is always open to this, but then often assesses the relationship first.</p>	<p>- 15. Employee thinks there should be 100% commitment if you really want to involve someone as a partner and that people should also be rewarded for this.</p> <p>- 15. According to Employee, openness should be created by dividing responsibilities without looking too much at the contract.</p> <p>- 16. Employee clearly indicates that to his feeling Sr. Management does not explicitly interfere in the relationship.</p>

	Contractor					
	Buyer	Environmental manager	Project leader A	Project leader B	Project leader C	Project leader D
Indicator 6 – Established relational norms	- 18. Employee indicates that the degree of openness has a lot to do with to which extent there is trust in each other and the better you know the other party or have worked together more often the better trust is often expressed towards each other.	- 18. Employee indicates having the feeling that trust is expressed well in the beginning, but during the process it is often diluted and not discussed. - 19. Employee feels that when the end of the project comes in sight, everyone goes for their own benefit.	- 18. Employee indicates that he always tries to make it clear that when agreements are made to work together that they must actually be fulfilled. - 19. Employee indicates that, in his opinion, Early Contractor Involvement has ensured that there is no competition from other principal contractors during the bouwteamfase. - 20. Employee indicates that they ask subcontractors not to be too focused on the price, as it has to be in line with the market for the client.	- 19. Employee indicates that he has gained a certain experience with creating openness which he always tries to replicate, but also notices that if it is not stimulated, openness will not come because of competition. - 20. Employee indicates that partners in an Early Contractor Involvement are more open towards the principal contractor because they also have more interest in the project than in traditional contracts.	- 18. Employee always asks (claims) 100% commitment when people become part of the Early Contractor Involvement. He also says he makes this clear right at the start. - 20. Employee experiences much more trust in an Early Contractor Involvement because the interests are much more jointly aligned.	- 18. Employee says he has not experienced parties having a secret agenda before, as he only collaborates with parties he really trusts.
Indicator 7 – Communication	- 21. Employee says that because of his position, he mainly has communications that are on the strategic plane of management and can therefore talk honestly with parties because it is often not yet about risks, planning and time and so on, right away.	- 21. Employee feels that valuable information is still kept too much inside. - 22. Employee feels there is an increasing focus on lines of communication.	- 21. Employee experiences with specialised parties that they are open and honest and also want to share all their information, also because they have commercial interest in getting the work. - 22. Employee finds that the relationship develops between all layers of the project organisation.	- 22. Employee indicates that it is important to connect the right people so that they can build a mutual relationship and it no longer goes across different tranches.	- 21. Employee experiences that through Early Contractor Involvement, negative discussions can also be better discussed because the division of roles is quite different compared to a RAW contract.	- 22. Employee indicates that he feels the short lines of communication in the bouwteamfase are always there, but that energy needs to be put into transferring them to the execution phase as well.
Indicator 8 – Coordination	- 23. Employee indicates that a meeting always takes place during which various common ground is examined, after which a demarcation list is often compiled.	- 23. Employee notes that for large projects, an interface manager is often determined; this is often not done so specifically for smaller projects. This role also often shifts.	- 23. Employee briefly indicates that a demarcation is made jointly and then the appropriate layers further coordinate with each other if there is still some overlap.	- 23. Employee indicates that a demarcation list is always properly made and often monitored in the collaboration.	- 24. Employee indicates that it is important that there is no duplication between phases in terms of what needs to be done, which is why it is important to involve people working solely in the execution phase in a timely matter.	- 24. Employee indicates that he often really places the responsibility with the partner and that this requires good coordination.
Indicator 9 – Balanced contribution	- 25. Employee indicates that at partnerships they really need to look more into which party also has the skills to cooperate in these types of contracts and that this is slowly becoming more common.	- 25. Employee experiences a correlation between discussing knowledge and competences versus trust in the process.	- 25. Employee indicates that it is important that everybody's contribution is made clear in advance, because this makes it possible to see how to work together and whether people want this.	- 26. Employee indicates that the relationship is especially important for the amount of knowledge that is shared, so that this should be looked at carefully with innovative products, but this does not happen often enough.	- 26. Employee indicates that sharing knowledge is often more difficult with innovations, but always tries to make it clear that this is only for the benefit of the project.	- 26. Employee indicates that it is only in the case of truly innovative products that partners find it difficult to share everything.
Indicator 10 – Aligned effort	- 27. Employee indicates that his position gives him little insight into how this works on projects, but he does feel that partners show more commitment compared to other parties at projects.	- 27. Employee indicates that attention is given to choosing partners who can show commitment during the project but feels that this discussion takes place too rarely among themselves.	- 28. Employee clearly indicates that he notices that once in the bouwteamfase everyone goes for each other, but that in the tender phase commercial interests often come into play.	- 28. Employee indicates that once in the bouwteamfase, parties always give 100%, but that there can be a risk if you always collaborate with the same partners that they sometimes lack capacity for a project.	- 27. Employee experiences that in an Early Contractor Involvement a partner wants to do his best more than in a traditional contract because he is much more involved.	- 28. Employee indicates that there should be incentives to work together competitively by, for example, asking for market-based prices.

	Contractor					
	Buyer	Environmental manager	Project leader A	Project leader B	Project leader C	Project leader D
Indicator 11 – Mutual support	- 29. Employee indicates that Early Contractor Involvement does make people want to go for the relationship quicker compared to traditional contracts.	- 29. Employee indicates that they are always open to ideas from partners. - 30. Employee indicates that there should be more agreements regarding consulting partners in crucial decisions.	- 30. Employee indicates that important decisions are always made jointly as they are contractual responsible for them. And can also better justify it to the client this way.	- Employee could not say whether this went better with Early Contractor Involvement.	- 29. Employee always likes it when a partner can think along with the project, but warns that opportunism must always be guarded against, otherwise the partner's interest is too big.	- 30. Employee clearly indicates that he wants to be in control and that a partner does not has to think along with the principal contractor its responsibilities.
Indicator 12 – Cohesion	- Employee has no overview of this.	- 31. Employee experiences that there is less hierarchy in Early Contractor Involvement with partners. - 31. Employee indicates that partners often really feel part of the team, but at the same time often have other projects running.	- 32. Employee gives an example where one employee did not want to collaborate with the partner and that this affected the relationship, once this person got positioned elsewhere the cooperation went better, but there was already damage done to the relationship.	- 31. Employee indicates that it is important for parties to be open whether they have other projects going on as well. If there is honesty, then it will always be one proper project team faster.	- 31. Employee indicates that at all times in an Early Contractor Involvement he makes sure that the project team is one team and that people fully go for it. So far, he has not had any negative experience of people not liking working in an Early Contractor Involvement.	- 31. Employee indicates that the cooperation should actually be monitored more during the project and that this requires agreements at the beginning. - 32. Employee indicates that if someone does not want to cooperate, this should be discussed much more and earlier.
Indicator 13 – Affective trust	- 33. Employee finds that once parties are working together, they are honest towards each other, but that in the tender phase or when forming cooperation agreements, parties often still have commercial interests and are not always honest towards each other.	- 33. Employee has not yet experienced integrity becoming a problem between them and partners. However, interests can shift as soon as there are financial consequences.	- 33. Employee thinks it is fine if partners talk to each other, but when it comes to Money / Quality / Organisation, they want to know about it or be there themselves.	- 05. Employee finds that if the cooperation is well thought out in the beginning, together with the partner, the entire project is a joint team rather than separate islands.	- 33. Employee indicates that in an Early Contractor Involvement it is important to keep each other focused and therefore also to ask, for example, whether the price is in line with the market.	- 33. Employee says that mutual trust is always good with the parties he works with.
Miscellaneous	- Employee indicates that due to the various areas of market issues that are going to be involved in the coming years, he would like to not only conclude partners for projects but also look at long-term agreements. - Employee indicates that for a number of years he tried to be the catalyst to convince everyone to look at partnerships.	- Employee experiences the contract type as a catalyst to cooperate more with a partner by being allowed to work solution-oriented.	- Employee does not find the contract guiding the way we work together, but it does influence how open everyone is.	- Employee has no additional comments.	- Employee indicates that price is often the decisive factor and that, despite the fact that working together in an Early Contractor Involvement is much more important, the price is always considered first.	- Employee says that, in the case of an UAV-IC, a partner is usually not proposed until later or is included in the tender by default. - Employee emphasises that people make the difference.

Appendix F | Transcriptions of interviews

[FILE]

Appendix G | Sub-criteria of CRF's influencing the case's supply chain integration

	Case A	Case B	Case C	Case D
Front-end definition	<p><i>Communication of Front-end definition & reviewing the basic design</i></p> <p>Subcontractor had difficulties comprehending the project context of the broader front-end definition based on the principal contractor its communication in the design phase. Although it led to more frequent contact between the parties, it also introduced challenges in pricing and potential missed requirements.</p>	<p><i>Clear roles and responsibilities</i></p> <p>The principal contractor had the intention to establish a long-term partnership rather than a project-specific supplier relationship, by selecting partners with relevant expertise.</p> <p>Although, challenges emerged in terms of communication and established relational norms between the principal contractor and the supplier.</p>	<p><i>Communication of Front-end definition & reviewing the basic design</i></p> <p>Principal contractor and subcontractor had challenges in understanding and effectively communicating front-end definition. The subcontractor found it difficult to grasp the broader front-end definition, leading to potential misunderstandings, missed requirements and impacted their ability to accurately price the work and meet the principal contractor's expectations.</p>	<p><i>Communication of Front-end definition & reviewing the basic design</i></p> <p>Subcontractor faced difficulties in thinking along with the project as a partner, as they were more accustomed to traditional forms of contracts where their role was primarily focused on calculations. The transition to integrated projects required them to actively engage with the principal contractor and the client to understand the front-end definition.</p>
Collaborative practices	<p><i>Team integration & joint working processes</i></p> <p>Despite the initial conflict, both parties were able to see beyond their individual organizational boundaries and prioritize the project organization's interests.</p>	<p><i>Joint working processes</i></p> <p>The principal contractor sought a supplier capable of cooperating in ECI projects and with substantial knowledge and expertise. However, conflicts arose between the principal contractor and the supplier, stemming from differences in communication expectations and decision-making processes.</p>	<p><i>Team integration</i></p> <p>The subcontractor faced difficulty in integrating into the project team compared to suppliers. They struggled to understand their role and the project's context, impeding their ability to collaborate effectively.</p>	<p><i>Joint working processes</i></p> <p>Subcontractor, being relatively new to the cooperation approach in integrated contracts, required additional support and guidance from the principal contractor to successfully navigate their role as a collaborative partner during a framework agreement.</p>
Relational attitudes	<p><i>Sr. management commitment & trust.</i></p> <p>The escalation of the conflict to sr. management resulted in honest conversations and the acknowledgment of errors thanks to the commitment from sr. management and the collaborative approach that went beyond traditional roles.</p>	<p><i>Relational attitudes</i></p> <p>Both parties had a different opinion about the definition of openness in the project and its decision-making.</p>	<p><i>Relational attitudes</i></p> <p>The lack of honesty and open communication during the tendering process eroded trust and hindered the development of a strong working relationship. This lack of trust and commitment had a detrimental impact on the integration of the supply chain partner network.</p>	<p><i>Interviewees did not mention something notable about this CRF</i></p>
Teamworking quality	<p><i>Communication, coordination & Mutual support</i></p> <p>Effective "communication" played a vital role in addressing the conflict and fostering understanding between both parties.</p> <p>In terms of "coordination," the case reveals challenges in demarcating common ground and managing shifting responsibilities due to organizational fragmentation. This results in "mutual support".</p>	<p><i>Communication</i></p> <p>The conflicting expectations and assumptions about decision-making and control negatively impacted the integration of the supply chain partner network and hindered the achievement of shared goals.</p>	<p><i>Communication, coordination & aligned effort</i></p> <p>The absence of clear communication, transparency, and alignment of expectations during the tendering process resulted in subpar teamworking quality.</p>	<p><i>Mutual support</i></p> <p>The principal contractor's level of assistance fell short of the subcontractor needs, hindering their integration into the broader supply chain partner network which hindered effective communication, decision-making, and synergy among team members.</p>