

A contractor perspective on inter-organizational collaboration in programs

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Abstract

Working in programs is a relative novel approach in the Dutch constructions sector aiming to achieve benefits of bundling projects with common a goal or mission. However, literature and practical knowledge on inter-organizational relations in programs is rare, especially regarding the perspective of contractors. In this research, data is collected primarily by interviews, from two infra-work programs owned by a Dutch municipality. Previous concepts of literature are combined to distinguish between three layers of collaboration in programs from the perspective of contractors. The layers exist of a key partners layer, main contractors' layer, and supply chain layer. Subsequently, based on frameworks from literature on inter-organizational networks and roles, the effect of a programmatic way of working on contractors is further explored within the inter-organizational layers. The effect of programs is especially witnessed in the main contractors' layer, which is novel compared to projects. The research witnessed contractors develop towards a collaboration state without competition. Furthermore, the contractual network in the supply chain layer is influenced by programs. As contractors tend to develop long term relationships with the supply chain. Either by formalized agreements or by informal incentives. This explorative research may benefit the contractors when participating in programs, while public clients, and consultancy firms supporting them, may take advantage of the findings in drawing up programs in the future.

Keywords: Programs; Collaboration; Inter-organizational; Networks; Roles; Contractor; Supply chain

1. Introduction

Programs are considered a potential solution to overcome fragmentation, and its negative side-effects, in the construction industry (Van Buuren, Buijs, & Teisman, 2010). The origin of problems in the conservative industry, such as low level of innovation, knowledge sharing and knowledge transferring in construction sector (Ministry of Infrastructure and Water Management, 2019), may lay in the 'fragmented' or 'divided' construction industry, as characterized by (Adriaanse, 2014; Riazi, Zainuddin, Nawi, Musa, & Lee, 2020). Programs contain several related projects with common strategic and business objectives (Eweje, Turner, & Müller, 2012). Benefits are for example achieved, because investments in risky elements can be divided among the projects and programs allow contractors to build up specific knowledge over projects within programs (Arnoldussen, Groot, Halman, & Zwet, 2017).

The focus of previous research regarding programs in the Dutch construction sector is on the public client, where the perspective of the contractor is neglected (Lutt, 2021; Vosman, 2020). However, the perspective of contractors is highly relevant for both practice and literature. Since, changes and interactions in business relationships are the underlying mechanisms for changes in networks (Fonfara, Ratajczak-Mrozek, & Leszczyński, 2018). Therefore, working in programs (a new relation with public clients) is expected to result in a

different network for contractors compared to working in projects. Moreover, parties in practice from the construction sector are curious as well to the effect of programs on contractors' organization, in terms of network and roles. Based on literature the position of actors in terms of roles is related to the network (af Hällström, Bosch-Sijtsema, Poblete, Rempling, & Karlsson, 2021) and may also be subject to change in a different network (Pryke, 2005).

Some studies already investigated the inter-organizational relations in programs or multi-projects (Martinsuo & Ahola, 2022). For example, Ekeskär, Havenvid, Karrbom Gustavsson, and Eriksson (2022) focused on the relations between main contractors in multi-project context. However, besides a few studies the literature on contractors' inter-organizational relation in programs is rare. On the one hand, the program studies available are often intra-organization focussed, concerned with only one organization (Dietrich, 2006; Martinsuo & Hoverfält, 2018). Although, for example, DeFillippi and Sydow (2016) have researched the project network in general in terms of both focal projects and series of projects. This concept of series of projects differs from programs, where programs are, on purpose, strategic multi-project organizing (Martinsuo & Hoverfält, 2018). The lack of studies concerning inter-organizational relationships in programs is acknowledged by Arto, Martinsuo, Gemünden, and Murtoaro (2009) and Martinsuo and Hoverfält (2018). On the other hand, studies concerning inter-organizational network relations between (sub-)contractors or other parties in the supply chain are not satisfactory as well. Because most of these studies are conducted within project-based, temporary environments (Adami & Verschoore, 2018; Manning, 2010).

It leaves a gap in literature, where Martinsuo, Geraldi, Gustavsson, and Lampel (2020) call for a further examination of relationships between different organizations in multi-project management. In addition, Martinsuo and Ahola (2022, p. 823) state that: *"Since both contractual and informal relationships exist in PBF's (project-based firms) inter-organizational relationships, there is a need to further investigate the ramifications of the different types of relationships on the PBF's multi-project management."* Therefore, it is necessary to investigate the implications of programs, multi-project management, on the contractor's organization, regarding the inter-organizational network of contractors and the effect on their roles. In other words, how will the network and position of contractors in relation to the supply chain be affected by these new circumstances.

This paper focusses on the gap of inter-organizational collaboration from a contractors' perspective in inter-organizational programs. The literature to build this research on, is limited. Therefore, previous concepts of literature and theory on project networks are translated to explore the inter-organizational collaboration in programs. Qualitative case study method is applied to answer the research question: *'How does working in programs affect the composure of contractors' inter-organizational network and development of their roles?'* Knowing potential effects of working in programs on the inter-organizational network and role of contractors can benefit policy makers, consultants, contractors, and the remaining supply chain, in further implementing and participating in programs in the Dutch construction sector.

This paper is structured as follows. Section 2 presents the relevant theory on programs, inter-organizational relations, and roles. Section 3 discusses the methodological approach taken in this research. Subsequently, the results are presented in section 4. Section 5 consist of a discussion and section 6 closes of with a conclusion on the main findings, limitations, and suggestions for further research.

2. Theory

2.1. Program management

In literature, program management is found among a wide variety of terms and concept to describe project management and project studies (Geraldi & Söderlund, 2018). It is a form of multi-project organizing, where multiple projects are implemented and controlled in parallel or sequential (Martinsuo & Ahola, 2022; Martinsuo & Hoverfält, 2018). Although program management may have its similarities with other forms of multi-project management, it is distinguished by a group of (repetitive) projects with an overall goal or mission (Eweje et al., 2012; Fathi, Anumba, Carrillo, & Aziz, 2007; Turner, 2009). “The approach is used to implement strategy, to develop and maintain new capabilities, to manage complex information systems (IS) implementations and many other business changes” (Pellegrinelli, Partington, Hemingway, Mohdzain, & Shah, 2007, p. 41).

There is a consensus that programs achieve their benefits by managing projects all together instead of independently (Frederiksen, Gottlieb, & Leiringer, 2021; Lycett, Rassau, & Danson, 2004). If managed well, programs can be more effective and efficient compared to projects (Lycett et al., 2004). Other benefits are manifested in the allowance for inter-project learning in programs (Arnoldussen et al., 2017; DeFillippi & Sydow, 2016). Furthermore, programs may increase innovation, because contractors are able to spread the investment over multiple repetitive projects (Arnoldussen et al., 2017; Eriksson & Szentes, 2014).

2.2. Collaboration in multi-projects

The collaboration in multi-projects from the perspective of contractors has been investigated by Ekeskär et al. (2022). They differentiate the collaboration with the supply chain between horizontal and vertical relations. Vertical relations refer to the collaboration between contractors and sub-contractors, suppliers, etc. While in their study, Ekeskär et al. (2022) focus on the horizontal relations, which refer to the relations between main contractors. Because, on the contrary to projects, in programs or multi-projects more than one main contractor may be active (Ekeskär et al., 2022). In their study Ekeskär et al. (2022) identify a state of collaboration besides competition, between main contractors in a multi-project context. They refer to this state as co-competition. The main contractors cooperate on inter-project issues, which benefit the multi-project context as well as the individual projects (Ekeskär et al., 2022). Still, they compete for projects in the multi-project context. For such a co-competitive relationship to develop, the actors need to be involved in both cooperation and competition (Bengtsson & Kock, 2014). The collaboration benefits the process because contractors can learn from mistakes and successes of fellow contractors. While the competition keeps them sharp and motivated to perform well. This current state of co-competition in multi-projects is considered to be a driver for knowledge seeking, market expansion and technological progress and it is directly linked to innovation (Bengtsson & Kock, 2014).

Before entering in horizontal or vertical relations, contractors can decide with whom to work as every business model has key partners and key resources (Osterwalder & Pigneur, 2010). Regarding the key partners, contractors may form consortia or joint ventures with other contractors, as it is not uncommon in large and complex projects to combine forces with other parties (Ma & Voo, 2014). Reasons for establishing, for example, joint ventures are to share expertise, resources and risks (Ma & Voo, 2014). The reason to form consortia and invest in a program in-house may be related to the make or buy decision. This is a strategic decision where a company can make its consideration based on the investment and transaction costs, to chooses to invest in (make) or outsource (buy) the work (Bildsten, 2014). Where in complex projects, the investments can be done in-house within a consortium. Note, the make or buy decision works its way through collaboration in the vertical relations with the remainder of the supply chain (Bildsten, 2014).

2.3. *Inter-organizational networks*

To dive deeper in the horizontal, vertical and relations between key partners, literature of Adami and Verschoore (2018) on inter-organizational networks is introduced. Adami and Verschoore (2018) define three main network types, being supply network (a), contractual network (b) and information network (c). The distinction between networks is made to frame and cluster relationship types, while discussing the same network. In other words, in a network, partners can be linked by supply, contract and information relations at the same time. The networks of particular interest are contractual and information network. Martinsuo and Ahola (2022) also mentioned the demand for studies in the contractual and informal inter-organizational relations in multi-projects. Where the supply network (a) refers to the management and control of transactions, such as goods and services. It is also associated with the power and authority distribution between actors (Kim, Choi, Yan, & Dooley, 2011). Interestingly, according to Ekeskär et al. (2022) it is possible for contractors in multi-projects to share resources, such as sub-contractors. So, main contractors may have the same sub-contractors in a multi-project context.

The contractual network (b) relates to the control of one company over another (governance), provided by formal involvement and formal power of contracts (Kim et al., 2011). The contractual network differs from the supply network, because not all supply relations are accompanied by contractual relations (Adami & Verschoore, 2018). So, partners can be related by all network relations, but may as well be connected by only one or two network relations. In their call for further research, Martinsuo and Ahola (2022) put an emphasis on contractual relations of PBF's in an inter-organizational context. Steen, DeFillippi, Sydow, Pryke, and Michelfelder (2018) refer to relations as ties, they defined several ties in project networks. Some of these ties, such as payments, risk transfer and incentives, can be linked to the contractual network to split the network relations even further. 'Payments' are formally organized in contracts, as well as 'risk transfer'. Furthermore, Steen et al. (2018) describes the 'performance incentives' as part of the contractual relationship. In this context incentives are explained as extra-contractual, to steer behaviour in the project. Incentives are often of a monetary format, where exceptional delivery of the project is awarded with additional payment from the client. However, Manning (2017), who discusses the long-term relations of project network organizations (PNO) in their network, states that partners need to find a balance between formal contracts and more informal mechanisms such as trust. In case of uncertainty the relationship is better built on more than only contracts, due to the complexity of independent companies yet dependent in operations.

Lastly, the information network (c) refers to the routine activities, associated with the actual operation of the project network. In information networks, information exchange is claimed as an informal instrument of governance (Adami & Verschoore, 2018). The tie information send/received is also present in the study of Steen et al. (2018). The information send/received is the only tie of Steen et al. (2018) that is considered part of the information network. The networks of supply, contractual and information can influence each other. As Hällström, Bosch-Sijtsema, Poblete, Rempling, and Karlsson (2021) mention that collaborative contractual ties and common understanding of it, support the development of informal ties resulting in information exchange and knowledge sharing. In other words, the information network may benefit from a well-designed contractual network. In this context a well-designed contractual network is one that supports collaborative practices (Hällström et al., 2021). Also Ekeskär et al. (2022) mentions that information exchange may be promoted by contractual arrangements and coordination roles (Martinsuo & Ahola, 2022).

2.4. Roles

Previous studies have confirmed that new ways of working or different delivery approach methods, change the roles of actors (Pryke, 2005). Since, programs are a new delivery approach, it is relevant to look at the change of roles in inter-organizational networks. Furthermore, several literature studies consider the relation of roles with the (project) network (Hällström et al., 2021; Loosemore, Braham, Yiming, & Bronkhorst, 2020). As af Hällström et al. (2021, p. 734) state: “The perception of actors of other actors’ roles and responsibilities, and even their behaviour, became relevant in both cases and is also discussed in relation to the social ties literature”. Roles are also mentioned by DeFillippi and Sydow (2016) as import mechanisms in governing project networks. According to Bos-de Vos (2018) roles are adjusted due to a mismatch of the identity of a firm on the one hand and a desire from project (or program in this case) network on the other hand. Like in the study of Hällström et al. (2021), the focus on roles applies to both organizations and individuals in this research.

Regarding roles in programs, the inter- and intra-organisational character of multi-projects requires competences related to facilitating both single and multi-project coordination (Ekeskär et al., 2022). The study of Ekeskär et al. (2022) identified a new coordinating role to facilitate inter-organisational cooperation between contractors. In their study the role was filled by a third-party logistic provider (TPL). However, the essence of the role is more important. According to Ekeskär et al. (2022) the role for coordinating resources and activities among contractors and between the projects can benefit the process and minimize tensions between coepetitive actors in a multi-project context.

2.5. Theoretical framework

There are only a view studies that look into the inter-organizational relations in programs. Ekeskär et al. (2022) being one of them, with a focus on horizontal relations in multi-project context. To be able to investigate collaboration in the horizontal relations, vertical relations and relations between key partners in a program from the perspective of contractors, the theory on project networks of Adami and Verschoore (2018) is introduced. This theory aids to frame the relations of contractors, where it distinguishes between supply, contract, and information relations. Furthermore, new delivery approach methods can change the roles of actors in networks. With programs as a new delivery method, the potential change in roles is considered as well in this research. Where the adjustment of roles is caused by a mismatch between the firm identity and the requested role by the other actors in a network (Bos-de Vos, 2018). Ekeskär et al. (2022) mentions a new role facilitating single and multi-project coordination in multi-project context.

3. Methodology

3.1. Research design

Case study is an often used qualitative research method, and the most suitable for this research, because it allows for in-depth research of a contemporary event on which the researcher has no control (Yin, 2018). It applies to this research, where the influence of programs on contractors’ organization is an investigation to a phenomenon in a real-world context. Furthermore, the main research question is a ‘how’ question, where again qualitative case study research is suitable (Yin, 2018). Lastly, this research is a study on a relatively new phenomenon, where much information is unknown. Then again case study research fits, because it allows for a rather flexible approach, since relatively less pre-structuring is required

(Verschuren, Doorewaard, & Mellion, 2010). This is beneficial, since it allows the researcher to take unexpected findings into account in the analysis and utilize these findings in the remainder of the research. In line with this statement is that case study research is suitable research method for inexperienced researchers (Verschuren et al., 2010), which applies to the research in quest.

In this research a multiple case study is conducted. It concerns two programs within a larger multi-year plan of a Dutch municipality. In the next section a description of the cases is given in more detail. Multiple case study is a suitable method, because it allows for comparison between the cases and makes findings more generalizable (Yin, 2018). By a cross case analysis, the researcher may recognize patterns, in describing the effect of working in programs, that otherwise would not be noticed. Only two cases were chosen, due to the limits of one researcher. However, a strategic sample of representative cases with similar features are selected to make the findings more generalizable and robust (Verschuren et al., 2010; Yin, 2018). Furthermore, a replication design is followed to be able to find similar results (Yin, 2018). It means that the same protocol is followed in both cases. As such, the case study research is featured by prior development of a theoretical framework to guide the data collection and analysis (Yin, 2018). The theoretical framework development is necessary to collect, process and analyse the data in later stages. Lastly, this case study depends on multiple sources of evidence, i.e. forms of data collection, to increase the validity (Yin, 2018).

3.2. Case description

The program bridges and quay walls is a large multi-year plan owned by a Dutch municipality. It aims to renovate around 830 bridges and 205 kilometres of quay walls potentially at the end of their functional lifetime. The program is one of the first large programs in the Netherlands, existing of sub-programs which are procured in the form of collaboration agreements (CA), with a framework agreement as contractual basis. This research considers two CA's as two separate cases. The agreement on program level (CA) for both cases do not include details about quay walls or bridges to be constructed. Such project details are included in project agreements (PA). For each project within the program a separate PA is formed, which is a project contract between a contractor and the client.

Case A is the (sub-)program renovating quay walls (PRQW). This is a program where repetitive type of projects, renovating quay walls, are executed in a subsequent and parallel order. The CA entailed a commitment to collaboration for a period of 6 years with optional extensions to maximum 10 years. Three contractors were awarded with this contract. Note, some contractors exist of a combination of contractor firms, which chose to approach this program together.

Case B is the (sub-)program safety measures (PSM). This is a program designed for emergency calls. Whenever the functioning status of a quay wall or bridge finds itself in a potentially dangerous situation, the contractors are to develop a solution on a short term. Two contractors, sub-cases, have been awarded with this sub-program. Likewise, case A, contractors can exist of a combination of contractor firms.

3.3. Data collection

In this case study research, multiple data sources and data collection methods were examined to strive for higher levels of reliability through data triangulation (Verschuren et al., 2010; Yin, 2018). As methods for data collection informal chat with experts in the field, interviews and documents were utilized. Note, interviews are the primary method of data collection, document review and informal discussions were meant as complementary to the

interviews. Interviews are recognized for their direct focus on case study topics and insightfulness (Yin, 2018). Informal chats with experts occurred when discussing in between findings of the research. Document review included procurement documents, such as selection and contractual documents, of the client for these collaboration agreements.

The participants of the individual interviews were chosen in such a way that all the contractors were represented. Moreover, at the end any contractor firm involved in the CA contracts delivered at least one interviewee. For case A, all tactical and operational key officers from the three contractors were interviewed, and one of the strategic key officers. The program/project managers and the number two were chosen as interviewees from the contractors in the CA for case B. Resulting in a total of eleven interviews with interviewees all from the contractor side. These people were chosen because they are most involved in composing the contractors' network. Furthermore, they have best insight in the role development of contractor in the program. The interviews can be considered shorter case study interviews, where a case study protocol is followed more closely (Yin, 2018). Duration of the interviews was between an hour and hour and a half. As conversation starter questions were asked related to the background of interviewees. Subsequently, questions were posed in a semi-structured manner. Meaning, questions were derived from the theoretical background beforehand, which functioned as backbone for the interview. Moreover, the semi-structured approach allowed for follow up questions to achieve more in-depth answers.

Regarding the process, fortunately Covid19 measures and 'new habits' caused by two years struggling with a pandemic were not an issue at the time of interviewing. Only one interview was conducted through Microsoft Teams due to logistical and time issues, the remaining interviews were held in person. Note, the main language of the interviews was Dutch, because smoother conversations were expected when speaking in native language. Furthermore, the interviews were recorded, as proposed by Yin (2018).

3.4. Data analysis

The interviews were transcribed in full of the audio recordings. The transcriptions were sent to the interviewees to verify the data and to make sure inaccurate data was eliminated. The technique used to structure the data is open coding, where data is compared labelled and classified (Verschuren et al., 2010). Subsequently, the open coded labels were regrouped based on a pre-defined code and category scheme derived from the theoretical background. Some iterations took place to arrive at the final code and category system. This iterative process of labelling, coding, and categorizing was conducted in the software program ATLAS.ti.

Further analysis took place by examining the codes and categories. In a within case analysis, codes and categories were compared to each other and literature theories, as in a grounded theory approach (Verschuren et al., 2010), to find patterns, insights and concepts. Note, although the client was initially left out of the scope and analysis, it seems his role cannot be entirely neglected. The conditions established between the client and contractor and the way they designed this program influences the role and, in lesser degree, network of contractors. Therefore, influence of the client was considered as well. At first a distinction was made between collaboration with key partners, between main contractors and with the remainder of the supply chain. Then it was sought for formal conditions established between client and contractor that influenced the contractors' network and roles. Subsequently, own program approaches of the contractor that had its consequence on the network and role of the contractor were studied. The multiple case study allowed for a higher abstraction cross case analysis on some of the findings. Where, even for a case study existing of only two cases this technique is relevant (Yin, 2018).

4. Results

The findings of the two case studies are presented in parallel. Aspects of the within case analysis of both case studies on collaboration with the supply chain are presented and findings from the cross-case analysis are incorporated as well. An abstract overview of the contractors' networks in the PRQW is shown in Figure 1. Note, only the PRQW is shown in the figures, the PSM has similar networks compared to contractor B and C in Figure 1.

This paper distinguishes between three layers of inter-organizational collaboration for contractors in programs. At first, contractors form inter-organizational collaborations with key partners (i). These are visualized in red circles in Figure 1. Key partners can be bound in consortia or in main-contractor, sub-contractor structure. The second network exists of collaboration between main contractors (ii) awarded with the program (blue circle). In programs often more than one contractor or consortium is awarded with the program. Although these main contractors are not directly bound by contracts, they do form an inter-organizational layer within the program. The last layer of inter-organizational collaboration, visualized by the green circle, is formed between the main contractor and the remainder of the supply chain (iii). Even contractors in a consortium who have a lot of in-house capabilities, need sub-contractors and suppliers to execute the entire scope.

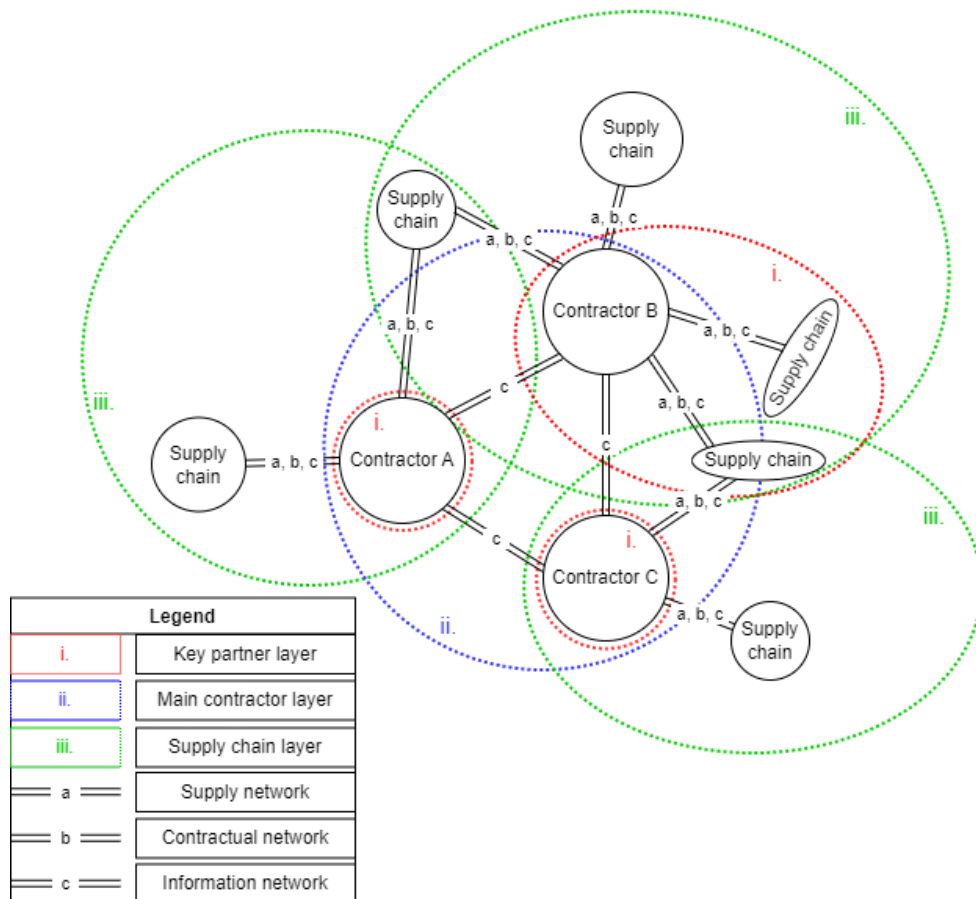


Figure 1 The three layers of inter-organizational collaboration including the distinction in networks of the PRQW

The remainder of this research zooms in on the three inter-organizational network layers. The second layer is highly interesting, because it is new compared to projects. The first and third layer can be present in projects as well. However, the layers in programs differ on the supply, contractual and information networks and on roles, compared to projects. The remarkable findings are presented. Both formal conditions established between client and

contractors and approaches of contractors are considered as causes for the remarkable findings. Note, hereafter whenever contractor or main contractor is used, it refers to the consortia or main contractor awarded with the program.

4.1. Collaboration with key partners

The collaboration with key partners (red circle in Figure 1) is the first inter-organizational layer composed by contractors. This layer can include all networks, supply, contractual and information. The layer is formed during the selection and tendering phase of the program. The key partners are defined as partners with whom one tenders for the program. The choice for key partners was partly influenced by core competences demanded by the client in both the PRQW and the PSM.

However, the three contractors awarded in the PRQW, and the two contractors contracted in the PSM took a different approach in how to formalize the collaboration with their key partners. The selection procedure for this program was elaborate, according to an interviewee of the PRQW. Some contractors chose to form consortia, such as joint venture or general partnership, with other contractors. *“In the basis you try to execute the scope on our own. If you can, you tender for yourself. (...) So, one of the reasons can be that you do not have a competence in-house. And we often chose, when the volume is large enough, to partner in a combination.”* Reasons to collaborate in consortia are, more capacity, to complement each other, to be able to execute large part of the scope in-house, or to spread risk. Other contractors approached the program with a main-contractor, sub-contractor structure. The contractors thus chose approaches with different legal implications and contractual relations. The contractual network is not uniform among the main contractors. Nevertheless, even the main contractors did formalize their long-term relationship with sub-contractors as key partners. These outsourcing contractors formalized their long-term collaboration relationship with an intention or framework agreement. It entails a commitment of collaborating with each other, including a price list for most important expenses. Reasons for not forming consortia can be, too small part of the scope or the other party is not willing to share in the risks. Figure 2 zooms in on two main contractors with a different structure, where contractor C is similar to contractor A.

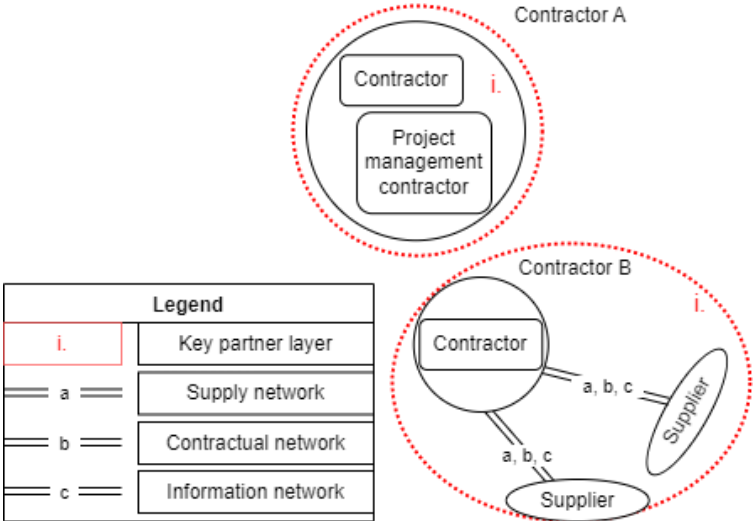


Figure 2 Collaboration in consortia (contractor A) and main-, sub-contractor structure (contractor B) in the PRQW

Regarding the supply network of this layer, some partners are primarily attracted for their project management skills. Because of the program size, with a focus on collaboration and inter-project learning the project-transcending aspect is deemed important. Contractors recognized

this and formed collaborations with parties experienced in project management. The management of projects is as well necessary in project-based working. However, in this program there seems to be an emphasis on inter-project management within the program. As an interviewee mentioned: *“If this would have been only a project, the additional value of [the project management firm] would have been less. [The project management firm] has a certain tactical and measuring philosophy, process management which is project transcending.”*

Lastly, contractors in the PRQW and the PSM that have more in-house capabilities, due to the collaboration in a consortium, tend to invest more in resources. For example, investing in new specialized equipment for building the quay wall in the small quays of the municipality. Due to the long-time span of the program and the goal to develop themselves in their own role, it seems logic for these in-house contractors to invest in own materials. One of the interviewees of the PSM states: *“If the projects remain the same, one can search for a long-term partner, or one chooses to invest.”* However, given the outsourcing structure, apparently in programs, where investments may be needed to accelerate and achieve a learning curve, it is not necessary to have all competences in-house (within a consortium) and invest yourself. One can still choose to leave investment in equipment to sub-contractors or other suppliers. This may also be interesting for the position of suppliers in general. Especially since it can be seen in Figure 1 that some suppliers are attached to more than one contractor.

4.2. Collaboration between main contractors

The second inter-organizational layer entails the collaboration between main contractors (Figure 3). This inter-organizational layer consist of only the information network. The formal conditions in both programs mention the wish for collaboration between the contractors. Interviews with contractors, especially from the PRQW, gave the impression that they are willing to collaborate and share knowledge to achieve a successful program. This applies for collaboration between main contractors, as well as collaboration and information sharing towards the client. As interviewees mentioned their wish to be early involved in preparing the projects and share their knowledge and expertise in this stage already. The question arises why the contractors are willing to share information as an interviewee mentions that: *“It is new to share information among contractors (...) to suddenly share firm sensitive information.”* At first, it may just be due to contractual obligation to meet on regular basis. Besides, some contractors also included the cooperative intention in their tender bid. Several interviewees responded that they now see the benefit of working together to improve each other’s processes and together achieve a successful program. One interviewee mentioned a general shift in the market to intensify collaboration, partly because of the current scarcity in human capital and resources.

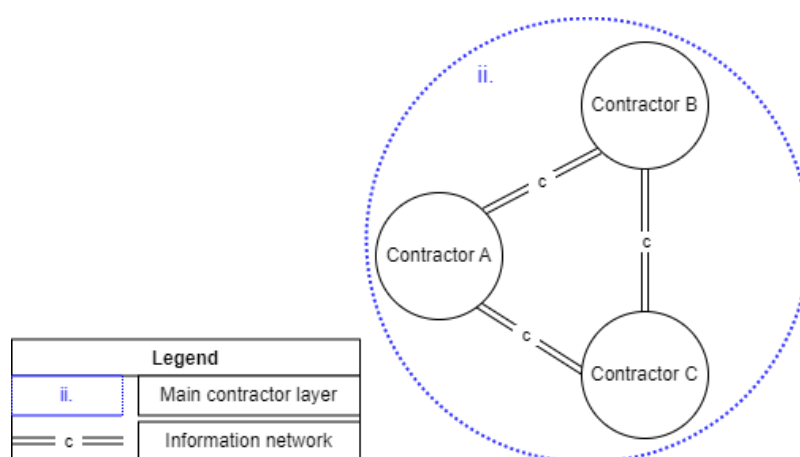


Figure 3 Collaboration between main contractors in the PRQW

Moreover, the willingness for collaboration may lay in another organisational aspect originating from the client. At the start of the PRQW the contractors were assigned, in consultation, to certain areas within the program. The idea was that contractors receive projects within their assigned area. The contractors are assessed on performance of their work by Key Performance Indicators (KPI's). The KPI's are used to determine whether the agreement at program level is extended after 6 years. In this concept they do not compete directly against each other, rather they compete against themselves. In the PSM the projects are equally divided in the first year. After that, projects are assigned based on KPI scores. The best performing contractor receives most and largest projects. In other words, contractors compete for the same projects within the program. Consequently, it seems that contractors in the PRQW are more open to share knowledge and collaborate with fellow contractors. Contractors in the PRQW even mentioned the willingness to share developments of project management tools. Although not explicitly mentioned, the rivalry aspect in the PSM may be a barrier in fully collaborating and sharing knowledge, both important for a learning curve. They are in a state of cooperation. This seems to be confirmed by the fact that several interviewees referred to the other contractor as competitor. Note, they mention the need to work together as well. However, in interviews with key officers from the PRQW, no one referred to the other contractors as rivals. The contractors in the PRQW are in a collaboration state. Considering the statement that they do not compete against others, but against themselves, it seems even beneficial to share knowledge with each other. Since, utilizing each other's expertise and knowledge will result in better performance, which in turn will lead to higher KPI scores. With higher KPI scores it is more likely that the program level agreements are extended. This perspective may explain why contractors in the PRQW are eager to collaborate and to share knowledge.

The collaboration between contractors appears to be stimulated by a lack of competition. Another aspect that can benefit the collaboration are competent individuals. Besides, a general collaboration and learning role demanded by the client, key officers on strategic, tactical, and operational level were requested in the PRQW. Such role specification in contracts can also occur in regular projects. However, the tactical key officer is new and specifically established for the program. The tactical level seems important for achieving the project-transcending focus. The role is especially devoted to intra-program, inter-project, and intra- and inter-organizational coordination. According to the contract, the tactical key officer is responsible for project division, capacity of teams, team performance. In practice, the tactical key officers mostly embody the sharing of knowledge and innovations between contractors. This happens within and outside the coordination meeting with the client and other tactical key officers. Furthermore, the tactical key officer may also embody the general change in culture and attitude related to collaborating and learning in a program. Interviewees agree that the tactical key officers require other competences than 'initial' project managers. It appears to require careful selection on whom to put on the program. The contractors put up candidates with different background, regarding position in the firm, for the role of tactical key officer. Their positions vary from company director, business unit director and project (program) leader. What they have in common is the mindset to collaborate and to recognize the benefit of sharing knowledge to achieve a successful program. *"The [tactical key officer], that is different, not how we used to work in the past. A role which has a specific position in this program. (...) For that a collaboration focus is of huge importance. How you look at industrialized thinking optimisation is an important competence. To my opinion you must be process oriented as well. So, more focused on the learning process."* Another interviewee on sharing sensitive information with other contractors, while seeing the benefit of improving and fastening your own process: *"For that it is of importance to have somebody at a key position who believes in the concept. Otherwise, it will not happen."* So, for successful collaboration in the inter-organizational layer of main contractors, the individual roles seem important as well. In the

PSM the client did not demand roles on three levels from the contractors as in the PRQW. The contractor did try to mirror the clients' organization to have short lines of communication.

4.3. Collaboration with the supply chain

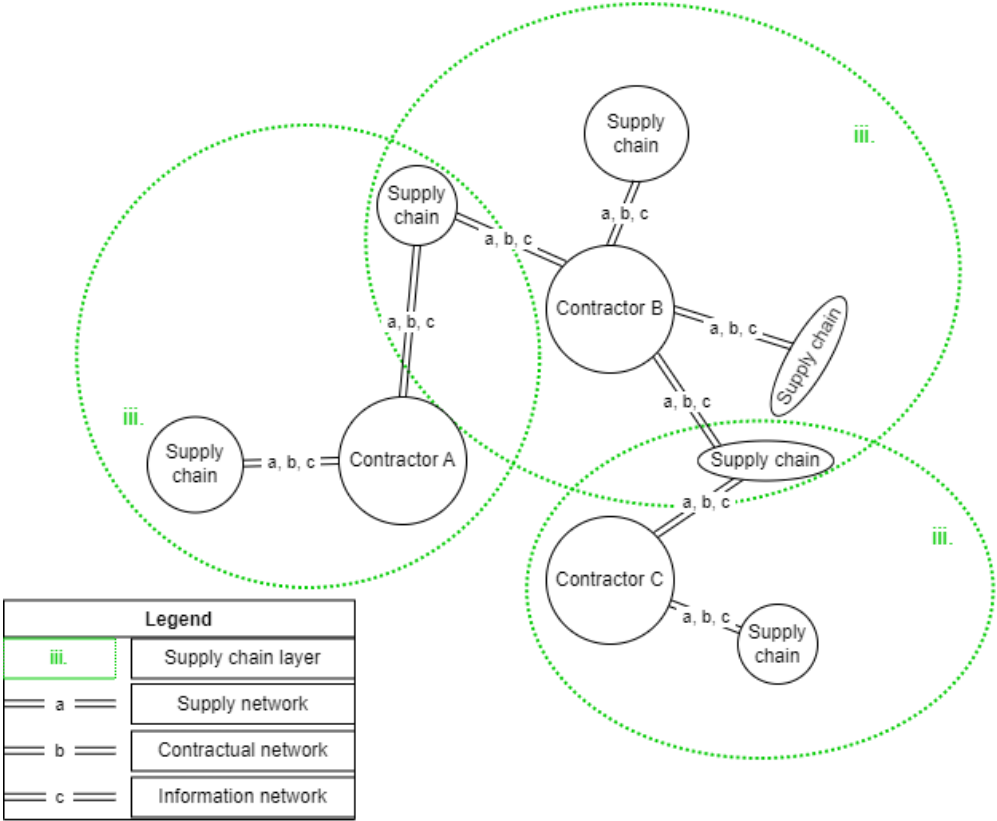


Figure 4 Collaboration with the supply chain in the PRQW

The last inter-organizational layer concerns the collaboration between contractors and the supply chain (Figure 4). Where contractors mentioned the intention to establish long term relationships with their supply chain. Regarding, the choice of sub-contractors, or other suppliers, there are only some contractual clauses prescribing such parties should meet general terms and norms. Thus, the contractors are independent in composing their network. This means that contractors can have overlapping supply chain (Figure 4). In this layer supply, contractual and information networks are present. When comparing to projects, the supply network remains roughly the same in this layer. In other words, the same parties are required to execute renovation of quay walls.

Regarding the contractual network, one may expect long term agreements to secure supply of goods and services. In programs the contractual relations thus may be different compared to projects. Indeed, there are several forms of formal long-term relations. Varying from framework or intention agreement to references used in the tender phase. Interestingly, especially in-house contractors of both the PRQW and the PSM seem to recognize the benefit of framework contracts, which are used in combination with a pricelist to simplify delegating work to sub-contractors. It prevents negotiating prices repeatedly. Durations may differ from one year to the duration of a program. The framework agreement is formed from a strategic perspective because it requires less time to delegate the work to sub-contractors. For such a framework contracts, evaluation of the bids is not merely on price. Instead, it appears to be on service, quality, and additional value to the program. In that way the contractor tends to transfer the

clients program ambitions to the supply chain. The application of framework agreement for the supply chain seems to be an influence of working in programs on the contractual network of contractors. Also, because the framework agreements are project-transcending, but within the period of the program. In that way lessons learned can be considered in sequential projects in the program.

On the other hand, contractors may not need contract to 'bind' sub-contractors for the long term, they can manage as well with informal incentives. As one of the participants poses: *"If one works together for the long term, it is a matter of trust to be built. It is, of course, possible to seriously damage that once, but then one is immediately done. (...) If one just wants to collaborate well, it is not possible to seal it in a contract. It comes down to trust, a long-term relationship, it is something one does together."* An informal incentive in general is, if a sub-contractor performs well on the first project, it is likely that it will be involved in sequential projects. The sub-contractors first must prove themselves on one or more projects. This structure, where the only legal basis are project contracts, can keep the market competitive, in contrast to long term contracts such as framework agreements. The latter is acknowledged by outsourcing and in-house contractors. Where outsourcing contractors lay the focus on remaining flexible in choosing the best sub-contractor on price/quality ratio. *"For a framework agreement one should be convinced of a sub-contractor's knowledge and expertise."* In-house contractors lay the focus on remaining flexible for all it could be that they invest in a certain technique in the future to be able to execute the work themselves. Another reason can be that contractors are not able to specify framework agreements in detail.

4.4. Synthesis of the findings

This paper distinguishes three layers of inter-organizational collaboration from a contractor perspective. As shown, these layers are compatible with the networks of supply, contract, and information. The networks of supply (a), contractual (b) and information (c) can be present within each layer. So, for example within the supply chain collaboration layer, a contractor can have supply, contractual and information relations with actors in the supply chain.

Summarizing, the collaboration with key partners (i) and with the supply chain (iii), may exist for project-based contractors as well. Although, there are differences on supply, contractual and information network within these layers. For example, there is more focus on project management in the key partner layer. Furthermore, compared to projects there is a broader vision and implementation on long term collaboration in the supply chain layer. On the contrary, the collaboration between main contractors (ii), is a novel layer compared to projects. Often in projects only one main contractor or consortia is awarded with the contract. In that sense there is no collaboration between main contractors at all. Moreover, main contractors in current portfolio or framework agreements of public clients are often in a co-competition state, like in the PSM. However, in the PRQW the main contractors are in a collaboration state. This can be a result of another division of projects within the program and individuals in project-transcending role with more process focussed competences.

5. Discussion

Despite the well-intended collaboration through the inter-organizational layers, during the research another factor came up that seems to affect the networks. In the PRQW and in lesser degree the PSM the client promised a steady flow of project for the contractors. However, during the interviews, a current lack in continuity or predictability of projects was often mentioned in a negative context by interviewees. As a result, the research contractors in the PRQW were only at the beginning of the execution phase, while they planned to have some

projects executed by them. At the moment the continuity of the programs is even more in decline since current economic factors lower the available budget for projects within the programs. It hinders collaboration and progression on several levels. From the perspective of contractors, continuity of work seems to be required to keep the same employees on the projects within the program. As one of the interviewees mentions: *“The start of the program is difficult, you immediately see the effect on [the learning curve] (...) if you scale down then it is gone. So, continuity is an important part to make the program a success. It is more than a traditional framework agreement, where one is called whenever necessary.”* Furthermore, it affects the contractual and information network, especially regarding the supply chain layer. The vision of contractors, regarding long term collaboration with the supply chain to achieve the goals of the client, requires continuity of projects. If there is a continuity of consecutive projects, the contractors can work towards standardization, which is also mentioned in the contract established between client and contractors. Regarding standardization an interviewee responded: *“If we can achieve standardization, we get more predictive capabilities. Then we can look at the programming of quay walls until 2030 and know what we need on materials for these projects. As a result, we get other roles and relationships with suppliers. The supplier will then share in the planning until 2030. We need him to determine capacity and availability, he will be a fellow decision maker when it comes to speed of the projects. We can speed up, but if we do not involve him in that process, we will not keep up the pace. (...) In that case we demand another thinking capacity and organisation talent from him.”* This can change the contractual network in the supply chain layer, because then there would be a need to assure capacity. Which can result in more formal long-term relations such as framework agreements. Interviewees mentioned that the current lack of continuity in projects, prohibits them from formalizing long-term relationships with the supply chain. In case of standardization the information network may change as well since the sub-contractors and suppliers become more important for constant supply of services and goods. Anyway, continuity of projects in the programs may influence the supply chain layer even more, compared to the current situation.

5.1. Implications for research

This explorative research contributes to the literature on program and multi-project management in an inter-organizational instead of intra-organizational context. It discusses inter-organizational relations in a multi-project context which have been discussed by e.g., Martinsuo and Ahola (2022) and Ekeskär et al. (2022). The research combines previous concept from literature on key partners and horizontal and vertical relations and structures the inter-organizational collaboration of contractors in programs in three layers. Furthermore, the project networks of Adami and Verschoore (2018) are translated to the program context. The networks are investigated within each of the inter-organizational layers to explore the influence of programs on contractors. It leaves several implications for research.

At first, the layer of inter-organizational collaboration between main contractors in a multi-project context has recently been investigated by Ekeskär et al. (2022). They referred to this layer as horizontal relationships between contractors in a multi-project context. They found that the relation of contractors in multi-projects can end up in an in-between state, a combination of collaboration and competition referred to as cooptation. This research confirms the horizontal relationships between contractors in multi-project context. Furthermore, findings of this research confirm the possibility of a cooptation state. On top of that, it shows the possibility of a collaboration state of main contractors, without mediation of a third-party logistics (TPL) provider. In the PSM the contractors collaborate, while they still have to compete as well, referred to as a state of cooptation (Bengtsson & Kock, 2014; Ekeskär et al., 2022). In the PRQW, the contractors are more open to collaborate with other main contractors. The lack of

mini-competition for projects and positioning of competent individuals on project-transcending roles are considered factors that drive contractors in the PRQW towards a state of collaboration instead of competition. This is an addition to the competition state as mentioned by Ekeskär et al. (2022). As a result, the contractors in the PRQW share more knowledge and experiences and they collaborate more than contractors in the PSM.

Regarding the roles in programs, Ekeskär et al. (2022) identified the potential for a third party to facilitate cooperation. The TPL provider is not found in the inter-organizational layers of contractors in the case studies. Apparently, the third parties are not necessary to facilitate inter-project coordination and cooperation in the programs of this research. The main contractors, together with the client take care of this themselves. Nevertheless, the coordination and cooperation facilitation roles are recognized in individual roles. The contractors have their own tactical key officers who are expected to manage project-transcending activities and resources and to facilitate collaboration. Subsequently, this study points out that individual roles in programs require other competences compared to projects. Especially roles concerned with an inter-project focus, such as the tactical key officers, require other competences. It underwrites the research of Miterev, Engwall, and Jerbrant (2016) on competences of program managers, which stated that specific competences are required for management of programs. Some of the competences, such as emphasis on communication skills, contextual awareness (not the project but the process), planning and control, and team building (collaboration) are in line with the findings of Miterev et al. (2016).

Regarding the supply chain collaboration layer, this research presents the contractual network of contractors with e.g., sub-contractors and suppliers. Thereby this study contributes to the literature of Martinsuo and Ahola (2022) who suggested to further investigate inter-organizational relations of PBF in programs and in particular the contractual and informal inter-organizational relations. By exploring the contractual network in the supply chain layer this study identifies several forms of how e.g., sub-contractors and suppliers are formally bound. As some sub-contractors are contracted for the long-term by framework or intention agreements. This shows some similarities with the framework of Kraljic (1983), who described the supply chain purchase by a quadrant existing of strategic, bottleneck, leverage, and non-critical items. The framework agreements in the program were partly established, to prevent repeatedly negotiation of prices. Kraljic (1983) devotes this efficiency of process to the non-critical items. However, in this program the framework agreements may as well be perceived as long-term contracts belonging to strategic suppliers. Whether the contractors see the framework agreements with sub-contractors indeed as non-critical items or more strategic purchase for the program, may be studied in future research. Moreover, regarding the informal relations of Martinsuo and Ahola (2022), this research identified that the long term collaboration with the supply chain does not always entail a formalized contract. The long-term collaboration can also be based on project contracts, with the incentive that if a supplier performs well, it will be invited for sequential projects. In that case the incentive is not incorporated in the contract, rather it is an informal incentive. This is in contrast with the literature on incentives by Steen et al. (2018), who described incentives to be part of the contract. Apparently in programs the incentives can be separate from the contracts and more informal or relational based.

Lastly, programs, which bundle projects with common goals or mission, are recognized in literature as beneficial for learning, innovation, and efficiency (Arnoldussen et al., 2017; Frederiksen et al., 2021; Lycett et al., 2004). However, the interviewees mentioned lack of continuity of projects as a hindering factor for the latter mentioned benefits. This study pointed out that, promise and foresight of future projects, referred to in literature as shadow of the future (Zhang, Fu, & Lu, 2021), may not be taken for granted to automatically result in success. Zhang et al. (2021) state, on shadow of the future in construction, that it is not necessary for parties to

struggle for immediate benefits if they have strong expectations for future cooperation. However, despite that contractors in this program have sight on repetition of projects in the future, they struggle with the current lack of projects. Interviewees mentioned the need for consecutive projects to start and preserve the inter-project learning curve and to establish long term relations with the supply chain. The findings imply that, in programs in the construction industry, the shadow of the future may be applicable, whenever there is a continuous consecutive repetition of projects right from the start.

5.2. Implications for practice

The study structures the inter-organizational collaboration of contractors in programs, as it distinguishes between three inter-organizational layers. Within these layers, the study explores the effect of programs on the supply, contractual and information network, and roles. The implications for practice are twofold. At first, the research leaves practical implications for contractors' approach in programs. For example, contractors value the participation of project management companies in programs more than compared to programs. So, one could say that more projects relate to more additional value of project management companies. Looking at the layer of collaboration between main contractors, the collaboration may be a success due to competent individuals on roles with an inter-project focus, such as tactical key officers. The competences of individuals must be more on collaboration, industrialized thinking, and management of the process. A relation was observed between the level of inter-project focus of individual roles and the nature of competences, being more process focussed, which benefits collaboration. Another example is the vision of contractors on long-term relationship forming with the supply chain. Either by relational incentives or by formalized contracts, the contractors aim to bind parts of the supply chain for the long term. In some cases, the contractor indeed decided strategically to form framework agreements with the supply chain, to prevent repeatedly negotiation of prices. So, a relation was observed between the approach of contractors, working in a program, and the contractual network in the supply chain layer, evolving towards long-term relationship such as framework agreements or based on informal incentives.

Second, the study identifies the potential effect of formal conditions established between client and contractor on the inter-organizational layers of contractors. Especially, in the collaboration between main contractors the formal conditions are of influence. In the PRQW the formal conditions included division of projects to contractors within their own assigned areas. As a result, the contractors do not have to compete for projects based on KPI's. This lack of competition seemed to make contractors more willing to share information with co-contractors and the client. So, the level of competitiveness established in the formal conditions is related to the level of information sharing in the main contractor layer. Furthermore, the tensions in the predictability and continuity of projects affects the contractors' organization, especially in the collaboration with the remainder of the supply chain. Contractors are cautious in formalizing long term relationships with their supply chain, which in the end may also have its effect on the information exchange between contractors and the supply chain. A relation was recognized between the degree of continuous workflow and degree of long-term relations with the supply chain.

6. Conclusions

This paper is meant to explore the effect of working in programs on supply chain collaboration from the perspective of contractors. A case study on two cases related to infra works in a Dutch municipality is conducted, to answer the main question: *'How does working*

in programs affect the composure of contractors' inter-organizational network and development of their roles?' This research combines previous literature and distinguishes three layers of supply chain collaboration from the perspective of contractors in programs: a key partners layer (i), a main contractors' layer (ii), and a supply chain layer (iii). While the layer of collaboration with key partners and between the supply chain may be present in projects as well, the collaboration between main contractors is considered to be an effect of programs. In addition, previous research identified a state of cooperation between main contractors in multi-project context. Where this research not only confirmed the possibility of cooperation, but also witnessed a state of collaboration between main contractors in programs. This is considered to be caused by a lack of competition for projects and appointment of competent individuals on project-transcending roles. Furthermore, within the other layers of inter-organizational collaboration the research identified the influence of programs on the supply (a), contractual (b) and information (c) networks of contractors and their roles. So, although the layers of inter-organizational collaboration with key partners and with the supply chain may be present in projects as well, the networks within the layers differ compared to programs. Especially the contractual networks in both layers are of interest and subject to change. For example, in the supply chain layer, contractors establish long term relations with e.g., sub-contractors and suppliers. The long-term relations can be formalized in framework agreements, or they can be based on informal incentives. The findings of this explorative research leave several implications for research and implications for practice, for both contractors and public clients.

6.1. Limitations and future research

This study has several limitations. At first, at the moment of data collection not all the contractors had started the execution phase. Results may be subject to change if, within a few years, contractors are more experienced in executing projects. At such a point especially the supply chain layer may have matured, and contractors may know better how the supply chain participates regarding the contractual and information network. Second, in this study only the programmatic way of working is considered as an influencing factor on the contractors' organization. However, it may well be that other factors, such as current scarcity in resources and capital, force contractors to re-organize and adjust their roles and networks in the inter-organizational layers. In that sense, it cannot be posed with certainty, that network or role changes in the layers are explicitly influenced by working in programs only. Third, in terms of external validity, this research only consists of two case studies, which make findings less generalizable. Therefore, one should be careful in utilizing the findings to other programs in the Dutch or other construction sectors. Fourth, this research focuses on contractors, and did not include interviews with supply chain partners. Actively involving other parties of the supply chain would probably have resulted in other findings on collaboration in the inter-organizational layers.

The explorative character of the research leaves suggestions for future research. At first, future studies can verify and validate the structure of three layers of inter-organizational collaboration from a contractor perspective in other programs. Second, for these studies it is recommended to investigate more mature programs with continuous flow of projects, where contractors have had time to complete their networks in all layers and executed some projects. Such studies may be able to better investigate the influence of programs on contractual and information network in the supply chain layer. It is expected that in more mature programs with a continuous flow of projects the contractual network (and as a result the information network) will change even more than witnessed in the programs of this study. Third, with the identified cooperation and collaboration state in the main contractor layer, future studies may investigate which state is most beneficial to achieve program goals. Lastly, future research may study the

effect of programs on collaboration from the perspective of other parties in the supply chain. For example, take the perspective of sub-contracts. Apparently, main contractors do not have to have all parts of the scope in-house, thus they can leave investments to sub-contractors, as it became clear from the key partner layer. Furthermore, interviewees mentioned that in a mature program with continuous projects and standardization, sub-contractors and suppliers may become more important in the supply chain layer. On top of that sub-contractors may have relations with more than one main contractor in the program. Therefore, it is suggested to study the effect of programs on the inter-organizational relations and position of sub-contractors.

Conflicts of interest

This research is not funded by any entity in the public or private domain, and as such, has no conflict of interest.

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