From project to programme: drivers to a programmatic procurement approach in the Dutch construction industry

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Abstract

Programme procurement can stimulate innovation and cross-project learning and offers opportunities to deal with negative effects of fragmentation the Dutch civil- and construction industry experiences. However, literature and practical examples on programme procurement is rare, and the link between programme management and project procurement is not explored yet. This study aims to investigate how public clients in the Dutch civil- and construction industry can manage the development from project-oriented procurement to programme procurement, considering barriers in this change process. Case study research is merged with survey-based research. The dataset consists of interviews and a questionnaire. Barriers to programme procurement mostly originate from the project-oriented procurement approach that is state-of-art. Public clients are in charge to overcome these and can manage the change process from project procurement towards programme procurement by clarifying ambitions and strategy, a project-transcending governance, using market consultations and framework agreements and the appointment of a change manager.

Keywords: Programme procurement; innovation; cross-project learning; procurement strategy; construction projects; construction industry

1. Introduction

Coming decades, the Dutch civil- and construction industry is facing the major challenge of increasing prosperity, growing mobility, climate change and obsolescence of existing infrastructure, resulting in an extensive investment and maintenance task (Groot, Saitua, & Visser, 2016). In addition, the Dutch government aims at a future-proof, sustainable economy and has set the ambition to achieve a circular economy by 2050 (Ministry of Infrastructure and Water Management, 2016). The Dutch Ministry of Infrastructure and Water Management states that there is insufficient innovation and improvement in the civil- and construction sector to comply with these challenges, caused by a limited long-term perspective, steering on individual project results, limited application of innovations and limited cross-project learning (2019). An intervention in this sector seems necessary, as current practices do not sufficiently lead to the desired results (Ministry of Infrastructure and Water Management, 2019). Traditionally, the construction industry is a project-based industry, served by project-oriented organizations (Barlow, 2000; Aouad, Ozorhon, & Abbott, 2010; Adriaanse, 2014). Project-oriented organizations arrange their design and production processes around projects, mostly produce one-off products and operate in diffuse coalitions of different actors (Gann & Salter, 2000; Barlow, 2000). These characteristics can be summarized as fragmentation (Winch, 2010). The Dutch construction industry experiences fragmentation in three ways: horizontal fragmentation from different organizations working on one project, vertical fragmentation from different process phases and longitudinal fragmentation from multiple singular, stand-alone projects (Adriaanse, 2014). Horizontal- and vertical fragmentation, also referred to as "internal" and "external" fragmentation, are two well-known forms of fragmentation in the construction industry (Nawi, Baluch, & Bahauddin, 2014). Longitudinal fragmentation is an overarching problem and can be explained as the separation of the industry into distinct projects, whereby the formation of construction project teams changes from project to project (Sheffer, 2011). Each project is considered to have a life of its own, without history or future (Dubois & Gadde, 2002).

Fragmentation hinders the integration of knowledge among contractors (Nawi, Baluch, & Bahauddin, 2014). Projects are both physically and mentally isolated from other projects and depended on specialized participants for knowledge (Bossink, 2018). A general consensus is that the construction

industry fails in retaining project knowledge for future reuse, as teams are being separated after completion of a project (Dave & Koskela, 2009). Projects are transient phenomena: the temporary nature makes sharing knowledge from project to project challenging (Cooper, Lyneis, & Bryant, 2002; Modig, 2007). Another result of fragmentation is the difficulty to innovate. Within the Dutch construction industry, innovation is obstructed by the limited possibilities to deploy innovations on a broader scale: a multitude of singular, unique construction projects leads to limitations on scaling- and financing possibilities for innovations (Arnoldussen, Groot, Halman, & Van Zwet, 2017). For contractors the 'one project at a time-practice' causes a poor business case to justify investments in innovations: contractors have to earn back investments for innovations within one single project (Adams, Osmani, Thorpe, & Thornback, 2017; Arnoldussen, Groot, Halman, & Van Zwet, 2017; Hart, Adams, Giesekam, Tingley, & Pomponi, 2019). Fragmentation is inherent to the construction procurement process and considered to be one of the weaknesses of current contracting strategies (Nawi, Baluch, & Bahauddin, 2014). Procurement strategies cause market-based, short term interactions between client and contractor (Dubois & Gadde, 2002). As a result, the actors involved in a construction project come from different organizations and have to work together on a temporary base to achieve the project goal (Boton & Forgues, 2017). Fragmented procurement practices do not encourage the integration, coordination and communication between different organizations and inhibit the scope for innovation (Love, Gunasekaran, & Li, 1998).

Programme management is considered to be an approach to overcome fragmentation caused by several independent organizations working side by side (van Buuren, Buijs, & Teisman, 2010) and can be adopted in the construction industry as a means to manage, align and coordinate construction projects to pursuit strategic goals more efficient and effective (Shehu & Akintoye, 2009). Programme management is defined as *"the application of knowledge, skills, and principles to a programme to achieve the programme objectives, obtain benefits and control not available by managing projects individually"* (Project Management Institute, 2017a). Programme procurement is a critical aspect of programme management (Hu, Chan, & Le, 2012), as the procurement approach has direct influence on the level of integration between construction projects (Baiden, Price, & Dainty, 2006). Bundling projects can create the scale needed for the development of innovations (Hart, Adams, Giesekam, Tingley, & Pomponi, 2019) and stimulates cross-project learning and knowledge sharing (Arnoldussen, Groot, Halman, & Van Zwet, 2017). In the Netherlands, the main focus of procurement generally lays on the single project level, where each project has its own independent ambitions (Adriaanse, 2014; Love, Gunasekaran, & Li, 1998; Klakegg, Williams, & Shiferaw, 2016). Although the application of programme management in the construction industry is a developing approach (Shehu & Akintoye, 2009; Klakegg, Williams, & Shiferaw, 2016), programme procurement remains an often-overlooked aspect of programme management (Hu, Chan, & Le, 2012).

Programme procurement is expected to support the extensive investment and maintenance challenge the Dutch civil- and construction industry is facing, by providing an integrated procurement approach that stimulates innovation and cross-project learning. However, programme procurement for the construction industry is an unexplored element of programme management both in literature and practice. The question arising is why this procurement approach has not been put into practice yet, despite the potential benefits? Also, what issues should be considered when implementing this procurement approach? This research seeks to find an answer on these questions and bridge the literature gap by identifying barriers to implementing programme procurement as procurement strategy in the Dutch civil- and construction industry and develop directions for solutions. The research question to be answered therefore is: *How can public clients in the Dutch civil- and construction industry manage the development from project-oriented procurement to a programmatic procurement approach, considering the barriers experienced or expected in this change process?* This paper starts by presenting the theoretical background of programme management and procurement theory. Hereafter, the data collection and data analysis methodology are explained in chapter 3. In chapter 4, the results are presented, followed by a combined conclusion and reflection in chapter 5.

2. Theoretical background

2.1 Programme management

According to Pellegrinelli (1997), a programme is *"a framework for grouping existing projects or defining new projects, and for focusing all the activities required to achieve a set of major benefits. These projects are managed in a coordinated way, either to achieve a common goal, or to extract benefits which would otherwise not be realized if they were managed independently"*. The terms programme and portfolio are often mis-used interchangeable (Aritua, Smith, & Bower, 2009). Programme management differs from portfolio management where the term portfolio is used to describe the total set of programmes and stand-alone projects of one organization (Department for Business Innovation & Skills, 2010). A project may or may not be part of a programme, where a programme always consists of projects (PMBOK, 2013). Projects satisfy the specific ambitions that are defined in advance by the principal of the project (van Buuren, Buijs, & Teisman, 2010). The most significant differences between projects and programmes are displayed in table 1.

The organizational strategy is the starting point for programme management and overarching to the portfolio, programmes and projects. The execution of the plans developed in the organizational strategy are performed through the portfolio components: programmes and projects (Project Management Institute, 2017b). In other words, the role of programme management is to build and maintain a connection between the organizational strategy and the delivery of projects, and so programme management occupies a position between the organizational strategy formulation and project delivery (Lycett, Rassau, & Danson, 2004; Aritua, Smith, & Bower, 2009). Programmes coordinate projects and related activities to pursuit organizational goals and reap benefits more effective (Pellegrinelli et al., 2007). A programme can run for many years and always follows more or less the same lifecycle, which roughly can be divided into three phases: programme definition, programme delivery and programme closure (Project Management Institute, 2017a). Even though programmes mostly have similar lifecycles, there is no standard approach which is applicable under all circumstances (Lycett, Rassau, & Danson, 2004).

Programme	**Project**
Organizing framework	Process for the delivery of a specific outcome
Infinite time horizon	Fixed duration
Large scope evolving in line with business needs	Set objectives
Management of multiple, related deliveries	Management of a single delivery
Programme success is measured by the degree to which the program satisfies the needs and benefits for which it was undertaken	Project success is measured by project quality, time, budget and degree of customer satisfaction
Programme manager facilitates the interaction of various managers	Project manager is responsible for single project success

Table 1 - Differences programmes and projects (Pellegrinelli, 1997; PMBOK, 2013; Project management institute, 2017b)

2.2 Programme typology

Industries are different in their structures, relationships and practices, where all industry-specific features have an impact on programme management (Artto, Martinsuo, Gemünden, & Murtoaro, 2009). The challenges and issues of construction programmes and programmes in other industries are different (Fathi, Carrillo, & Aziz, 2007). Construction programme management is defined as (Fathi, Carrillo, & Aziz, 2007): *"Construction Programme Management is the coordinated management of a group of related or unrelated construction projects that together provide a certain element that assist the organization to achieve a define business goals, objectives and benefits"*. Various programme typologies can be distinguished in relation to the mixture and nature of projects within the programme. Examples of typologies for programmes are size (small, medium, large),

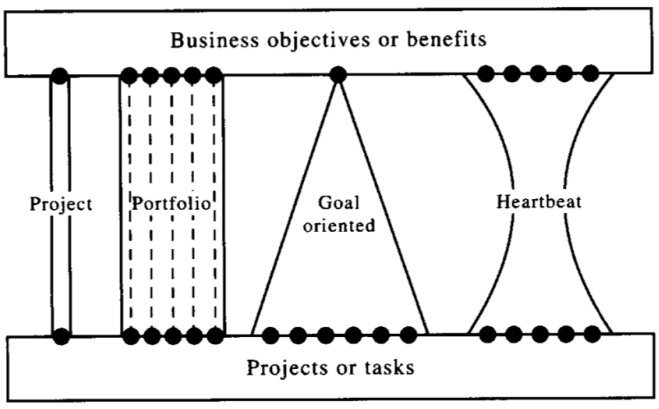

Figure 1 - Programme typologies (Pellegrinelli, 1997)

timeline (temporary, semi-permanent), lifecycle stage (pre-programme set up, programme set up, etc.) or configuration (portfolio, goal oriented, heartbeat) (Shao & Müller, 2011). A comparison of different typologies by Miterev, Engwall, & Jerbrant (2016) revealed that only few are based on empirical evidence. The categorization of programmes by Pellegrinelli is based on the motivation to create a programme and resulted in a programme typology distinguishing three types of programmes: the portfolio configuration, the goal-oriented configuration and the heartbeat configuration, displayed in figure 1 (Pellegrinelli, 1997). Pellegrini states that there are three primary reasons for the creation of a programme: 1) portfolio programmes tend to coordinate distinct projects using a common resource- or skill base, 2) goal-oriented programmes tend to develop completely new systems or services, 3) heartbeat programmes tend to improve existing systems or processes with most obvious application for IT systems (Pellegrinelli, 1997). As the construction industry desires to stimulate cross-project learning and innovation (Ministry of Infrastructure and Water Management, 2019), this goal matches the purpose of a portfolio programme best. A portfolio programme is created to exploit a common theme (knowledge, resources) among multiple independent projects which enables greater efficiency and better performance (Miterev, Engwall, & Jerbrant, 2016). The common component of the programme is the reason why the performance of projects within the programme can be improved through coordination (Pellegrinelli, 1997).

2.3 Programme procurement

Within the Dutch civil- and construction industry, procurement processes are generally arranged for the project level (Adriaanse, 2014). The procurement process is the path public clients follow when selecting a contractor to execute the project (Moonen, 2016). The procurement process can be divided into seven stages in which the public client makes decisions: 1) problem recognition, 2) specification, 3) supplier search, 4) bid evaluation, 5) selection, 6) formalization, and 7) evaluation (Eriksson, 2006). In the first stages, most influence can be exerted on details of the procurement process and the manner of how the market will be approached (Moonen, 2016). During this process, public clients are obligated to follow the rules of European procurement law and supplementary Dutch procurement law. Six general procurement principles apply for the construction industry: 1) the principle of equality, 2) the principle of transparency, 3) the principle of proportionality, 4) the principle of competition, 5) the obligation to state reasons, and 6) the protection of legitimate expectations (Chao-Davis, et al., 2018).

Programme procurement is one of the supporting programme activities of programme management (Project managment institute, 2017a). In programmes, long-term relationships are built which are based on mutual needs (Rodney & Turner, 2007). The following decisions have to be made regarding the design of programme procurement: the choice whether to exploit one overall tender including all projects in the programme or several tender actions for only one- or a part of, the projects within the programme; the best mix of contracts to be used for programme components; the best programme-wide approach to competition; and finding a balance between regulatory mandates of project managers and programme managers (Project Management Institute, 2017a).

2.4 Research design

The future challenge of increasing prosperity, growing mobility, climate change and obsolescence of existing infrastructure will increasingly form a mismatch with the civil and construction sector as it operates right now (Ministry of Infrastructure and Water Management, 2019). The request for project integration is more severe and searches for the integration of content, joint organizational structures and the melding of fixed and separated procedures into more adaptive joint decision-making processes (van Buuren, Buijs, & Teisman, 2010). Although it was founded years ago that a project-transcending approach might benefit the construction industry in this regard, no real progress was made in this field for more than a decade (Volker, 2019). Programmes provide a bridge between projects and the organizational strategy, but tension is felt in the area in-between projects and programmes (Pellegrinelli, 2002).

As outlined in this chapter, several elements play a role in the development from project procurement to programme procurement and constitute the research design (figure 2). The organizational strategy is the starting point for programme management and accordingly programme

procurement (Aritua, Smith, & Bower, 2009; Project Management Institute, 2017b; Lycett, Rassau, & Danson, 2004). The portfolio configuration is a programme typology that suits the civil- and construction industry, and focusses on the rationale of programme creation for sharing resources, knowledge or skills through programme components, whereby the programme components share a common theme (Pellegrinelli, 1997). Several programme procurement alternatives determine the design of the strategy and comprise the standard for project requirements within the programme, the option of one- or several tenders, the mix of contracts used, how to arrange competition, and finding a balance in the decision-making mandates of project- and programme managers (Project Management Institute, 2017a). General procurement regulation applies (Chao-Davis, et al., 2018), supplemented by the differences between projects- and programmes and what characterizes project-oriented organizations (Gann & Salter, 2000; Barlow, 2000).

How these subjects influence the development from project procurement to programme procurement is unknown yet. To fill this research gap, this research tends to identify barriers that are experienced or expected, and accordingly solutions, in the unexplored field in-between project procurement and a programmatic procurement approach.

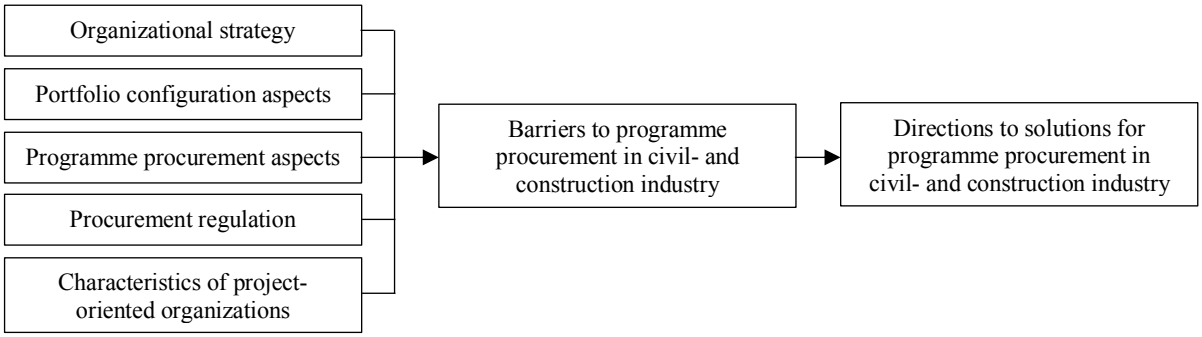

Figure 2 - Research design

3. Research approach

3.1 Data collection

In order to achieve the research goal of identifying barriers that are experienced or expected in the change process from project procurement towards programme procurement and develop directions for solutions, the research design merges qualitative case study research by conducting interviews with survey-based research, as in-depth research can be realized by making use of various methods for generating data (Verschuren & Doorewaard, 2010). Case study research is preffered in order to find an answer on 'how' and 'why' questions (Yin, 1984), and will help to investigate why tension is felt in the change process from project procurement to programme procurement, and how the most significant challenges can be overcome. As little is known on programme procurement in the Dutch construction industry, theory building from case studies is appropriate as this does not rely on previous literature nor prior empirical evidence (Eisenhardt, 1989). Conducting interviews provides the researcher with detailed information in which various processes take place (Verschuren & Doorewaard, 2010), and thus is considered to be a suitable method to identify barriers and solutions to a programmatic procurement approach. Survey based research in the form of a digital questionnaire was undertaken to find solutions to overcome challenges experienced in the change from project procurement to programme procurement. Survey based research is appropriate to find answers on 'what' questions (Yin, 1984) and therefore is suitable to identify what solutions proposed in the interviews have most potential.

3.1.1 Interviews

The potential participants for the interviews were selected based on their work experience and type of organization. A primary condition was that participants are experts in the field of construction contracting and/or procurement and possess knowledge- and have thoughts on programmes and programme procurement. Consequently, they are expected to possess a strategic level of thinking based

on their function and experience. Participants were selected from a broad range of organizations, among which seven interviewees of public client organizations, three interviewees of contractor firms, three interviewees of engineering- and consultancy firms and two interviewees of knowledge institutes in civil- and construction industry. Bias is limited by using numerous and highly knowledgeable informants who view the research topic from different perspectives (Eisenhardt & Graebner, 2007). The interviews were unstructured and lasted for approximately 90 minutes, of which fourteen face-to-face interviews and one Skype interview. Conducting unstructured interviews can lead to the identification of critical factors in the specific situation, as the interviewer does not make use of a planned sequences of questions to be asked (Hartmann, 2017). The five themes outlined in the theoretical background and that have a place within the research design (figure 2) are used as interview themes.

Two pilot interviews were undertaken with professionals from an engineering and consultancy firm, before finalizing the interview topics and general approach, and conducting the fifteen interviews in late 2019. As a conservation starter, the interviewees were asked to tell about their daily work, and subsequently their experience in- or thoughts on, programme procurement. Following on this, in random order and led by the previous answers of the interviewee, the interviewer asked about the five interview themes to explore and probe into the factors that might be central to the problem area to identify the main barriers to programme procurement, and accordingly suggestions to overcome these barriers. To make sure no important information was lacking, the final question was if any important aspects in the form of barriers or solution space that did not relate to one of the interview themes and that was not yet been discussed, was missing.

3.1.2 Questionnaire

The solutions proposed in the interviews were validated through a digital survey questionnaire in order to differentiate between their suitability as a solution and add other solutions. Mixed-methods research using survey-based research is used to validate findings of interviews when this data converges with data derived from the questionnaires, or disprove these findings if those seems to diverge (Young, 2016). Qualtrics Survey Software was used to design the survey questionnaire. The types of questions in this questionnaire were both open-ended and closed questions, all in Dutch. The closed questions help the respondents to make quick decisions, where the open questions allow respondents to add additional data (Hartmann, 2017). Respondents rated the solutions on the degree of appropriateness and made a ranking from most suitable solution towards less suitable solution. The open questions allowed respondents to add additional appropriate solutions. The respondents selected for this questionnaire were professionals in the Dutch civil- or construction industry, with knowledge on procurement and contracting practices, or interfaces with and/or interest and knowledge on programme procurement. A number of 46 respondents was personally invited by email to participate in the survey. In addition, the survey was placed on the online business network LinkedIn to be filled in by anyone interested in the research. For this reason, a control question about work field and function of the participants was added to assess the suitability of participants. The number of different participants to the survey was 42. Participant were not obligated to answer each question of the questionnaire. Therefore, some questions have received less than 42 responses. In total, 30 solutions derived from the interviews were tested, all linked to the barriers previously identified in the interviews. For some barriers the same solutions were tested (e.g. framework agreement is tested as solution for more than one barrier). In addition, the questionnaire allowed respondents to differentiate between the 30 prescribed solutions and pick the ones essential to support programme procurement, to which a total of 29 questionnaire participants responded.

3.2 Data analysis

The software programme ATLAS.ti was used as supporting tool for the data analysis to perform the data analysis in a structured way. The transcripts of the interviews were the primary data source. The data analysis was undertaken as an iterative process of coding, categorization and recategorization. In the first place, the codes and categories were developed in line with the subjects in the research design derived from theory (figure 2). The recategorization of the initial codes and categories led to three main categories among which the results could be divided, which were the three levels on which those were

experienced: 1) the system level, 2) the organizational level, and 3) the relational level. Hereafter, the quotations were examined to identify key insights and recurring subjects for each theme. The first round of analysis focussed on identifying the barriers, whereas the second round of analysis focussed on the proposed solutions. A within-case analysis was performed on the results of the data analysis process. A within-case analysis is a key step in analysing data, which supports in finding patterns in the data and forces the researcher to go beyond initial impressions (Eisenhardt, 1989).

Analysis of the digital survey questionnaire was supported by Qualtrics Survey Software, providing overviews of the outcomes all survey questions. The results of the questionnaire were used to validate or disprove the potential of the proposed solutions, and to analyse new solutions. The division between different solutions is made at a two-third majority that agreed with the proposed solution as supportive to the particular barrier.

4. Results

Through interviews and the survey questionnaire, barriers and solutions to programme procurement were identified (Appendix I). The barriers are grouped under three different levels on which these are experienced: the system level, the organizational level and the relational level, and the distinction is made between the identified barriers on the origin of the barrier. The system level relates to the civil- and construction industry in itself and can be considered as the context in which organizations operate. For the industry to develop a new or different system, organizations operating in this industry have to collaborate. The industry is characterized by project-based organizations operating in a context with taken-for-granted assumptions about how firms in this sector ought to be managed (Winch, 2010). The organizational level relates to particularities of public client organizations active in the Dutch civil- and construction industry. The relational level represents the cooperation between client and contractors in the construction industry and is characterized by client-contractor interdependencies.

4.1 System level barriers and solutions

On a system level, five main barriers to programme procurement were experienced or expected: 1) tension between requirements and innovation, 2) continuous competition, 3) lack of continuity for innovation, 4) an insufficient portfolio volume and 5) challenging capacity allocation. These are further explained, supplemented with solutions to overcome these barriers.

4.1.1 Tension between requirements and innovation. Contractors experience tension between requirements and innovations to be developed. Requirements public clients set are linked to one independent project: within each single project, different requirements are asked for. This project-based requirement setting seems to create the situation where it is difficult for contractors to further develop a certain innovation due to the uncertainty whether they can apply this particular innovation more often. An interviewee of a contractor firm states: *"Public clients have a short-term vision. They do not realize that, to have relevant technology in place and comply with sustainability ambitions in 2030, innovations have to be tested and developed right now. Project-based requirements cause fragmentation of innovation"*. This barrier of project-based requirement setting is inherent to the project-oriented procurement standard the industry habituates.

Most promising solutions are, for the public client individually or in collaboration with other public clients, to prepare definitions on vague concepts like circularity, to clarify for all contractors what standard is expected when demanding for circularity. Also, the client can set long-term ambitions with in-between goals to be measured by KPI's for multiple (future) projects, so that contractors know what to expect on the long. One participant of the questionnaire substantiates the value of these solutions with the statement: *"fixed ambitions or KPI's on a programme level ensure a long-term perspective, which is beneficial for the market to invest in innovations. In this respect, it is important that the public client accurately defines what is meant by, for example, sustainability or circularity"*. Also valued as a good solution to this barrier is for the public client to make use of framework agreements, so more easily a standard for the long-term and multiple projects can be set. Newly added, recurring and by several questionnaire participants named solution was for public clients to apply functional specification, to deal with tension between requirements and innovations. Functional specification is a way of specification

where requirements are formulated based on the function of the system. Requirements are specified in less detail, offering freedom to the contractor to develop solutions (Van Netten, 2005).

4.1.2 Continuous competition. Current tender practices are project-based, where competition is an important factor for each tender. This project-based tender approach causes several unwanted consequences like high investments costs for many organizations to prepare a bid. In addition, due to continuous competition it seems that contractors do not work together in the same composition often, are unwilling to share knowledge and cannot deploy innovations on a larger scale. Interviewee of a knowledge institute notes: *"All stakeholders in the sector notice that it is crazy practice to do 'pilots' everywhere, learn something about it, and not have it reflected in any other projects afterwards"*. Continuous competition is caused by the project-oriented procurement practice, as the industry commonly operates.

To overcome this barrier, the client can use framework agreements and limit competition for a bunch of projects to a single tender at front, possibly supplemented with mini-tenders to divide projects within the framework. Motivation of a questionnaire participant supporting the use of framework agreements was: *"avoiding extensive tendering procedures and the possibility of cross-project learning"*.

4.1.3 Lack of continuity for innovations. Contractors may have a project-transcending business case, but cannot deploy it due to the single-project procurement approach of public clients. This makes that is challenging to spread investments for innovations over several independent projects. The development of innovations often is a costly affair, still price remains an important factor in awarding contracts by public clients. Interviewee of a contractor firm states: *"The project-based procurement approach of public clients causes a situation where we have to return the investments of innovations on a single project. This is not a great business model"*. This barrier is inherent to the project-oriented procurement practice.

To overcome this barrier, one solution was added by questionnaire participants besides the solutions derived from the interviews, which were not properly rated. Namely, the client can make use of an innovation-partnership to deal with a lack of continuity for innovation by contractors. An innovation-partnership is a means for the public client to start a development process with other companies, and then proceed to large-scale procurement of the solution, whereby the client can involve with one or more organizations. The procurement procedure is similar to procurement within a framework contract (Pianoo, 2016).

4.1.4 Insufficient portfolio volume. The client's portfolio is an important factor in the consideration to create a programme: a certain scale is desirable to achieve benefits efficiently and pursuit organizational ambitions. This scale is dependent on the benefits the client strives for and the level on which these benefits are expected: the material, component, sub-component or system level. The volume of the portfolio must be of a certain scale to be able to create a financially interesting programme. Especially for smaller public clients it seems that this might be a problem. Interviewee of a knowledge institute states: *"The client's portfolio must have a sufficient volume to make programme procurement interesting. A certain scale to justify the financial investments and get the market moving is needed"*. This barrier originates in the change process towards programme procurement, as the need for a sufficient portfolio volume for procurement is a new development inherent to the new approach.

To overcome this barrier, option is for public clients in the Netherlands to cluster their portfolios and this way create a programme with sufficient scale. Public clients in the civil- and construction industry have got more or less the same portfolio, clustering can increase the volume.

4.1.5 Challenging capacity allocation. A risk of a programme is that it is expected that programmes use a greater proportion of contractor his capacity in terms of people and resources. Levelling out the workload for contractors is an important factor to consider for clients. However, current practice in the industry is that clients barely consult contractors on their capacity and abilities to comply with clients demands. In a programme context, the impact on the capacity of contractors is even greater compared to the conventional project-based approach and therefore an important issue to consider. An interviewee of a public client organization states: *"The construction industry is facing a huge challenge in terms of*

projects coming the next decade. These projects need to be levelled out, instead of bringing a peak to the market". Another interviewee of a public client organization states: *"It is a risk that the winner of your tender must use the full capacity of his organization to run the programme. That is not desirable."* This barrier of challenging capacity allocation is inherent to the change process towards programme procurement, as programme procurement might cause an increased burden on the market's capacity.

Highly rated solutions to overcome this barrier were for the public client to organize market consultations before the programme is awarded, to ensure the market is able to comply with this demand. Also, the public client can initiate a joint development of the programme and planning to deal with a challenging capacity allocation. Statements that illustrate this are: *"a joint development of the programme and planning certainly contributes, but also requires a mature asset management approach from the public client"*, *"especially capacity planning with contractors and transparency are important"*.

4.1.6 Concluding on system level barriers and solutions. Table 2 summarizes the barriers experienced on a system level and solutions with potential to overcome these barriers. Also, the origin of the barrier and who is in the lead to overcome this barrier is stated. The results implicate that, even though the barriers are inherent to the industry and how this industry functions presently, it is the public client that is in the lead to overcome these barriers when implementing the solutions. For preparation of definitions and clustering of public clients, collaboration between multiple public clients operating in the industry is required, which implies the industry being in the lead for implementing these solutions.

Barrier:	**Inherent to:**	**Solutions:**	**Initiator:**
Tension between requirements and innovation	Project-oriented procurement	Framework agreement	Public client
		Prepare definitions of vague concepts like circularity	Industry/ public client
		Fixed ambition levels/ KPI's for multiple projects	Public client
		Functional specification	Public client
Continuous competition	Project-oriented procurement	Framework agreement	Public client
Lack of continuity for innovation	Project-oriented procurement	Innovation-partnership	Public client
Insufficient portfolio volume	Change process towards programme procurement	Clustering of Dutch public clients	Industry/ public client
Challenging capacity allocation	Change process towards programme procurement	Market consultations	Public client
		Joint development of programme and planning	Public client

Table 2 - System level results

4.2 Organizational level barriers and solutions

On the organizational level, five main barriers to programme procurement were experienced or expected: 1) the governance is geared to project-based operations, 2) public clients lack clear ambitions and strategy, 3) implementation process is underestimated, 4) negative perception of regulations, and 5) insufficiently trained employees. These barriers are further explained in this section, thereby also explaining the proposed solutions.

4.2.1 Governance geared to project-based operations. The governance of public clients, which can be explained shortly as the organizations structure and culture, is geared to project-based operations. Standard processes are followed, different departments are in lead in different project phases and procurement is a short link in the chain, but does not have any strategic value. Current project-based operations are embedded in the company culture, which makes change more challenging. Interviewee of an engineering- and consultancy firm states: *"Organizations in this industry simply are organized around projects. The public client's organization consists of all different departments working on one and the same project, and have an influence on the change processes of the organization".* This barrier is inherent to the project-oriented procurement approach that is the standard and responsible for a culture and structure geared to project-based operations.

Several solutions are highly valued to deal with his barrier. The public client's organizational structure and culture should be adapted to programmes. The governance has to support collaboration between employees and departments involved in the procurement process. A governance of all separate departments causing an individually oriented mentality should change to a governance where all departments pursuit a common goal. Also, the development of a long-term vision can support programme procurement, where the governance geared to project-based operations should take a project-transcending view. Another highly valued solution is to increase knowledge on programme management and moving the focus from projects to programmes. In addition, the public client can reorganize the governance and cluster people and departments that are involved in the procurement process. Questionnaire respondents emphasize the value of these solutions with the statements: *"those are all good solutions"*, and *"for so long, I have tried to get those things done at the public client organization I work for. It never succeeded but what a blessing this would be. You have to work on all these solutions integrally"*.

4.2.2. Lack of clear ambitions and strategy. Often, ambitions are too abstract and cannot be translated into actions. There is ambiguity on what the client wants to achieve and how projects can contribute to this. As the organizational strategy is the starting point for programme management and accordingly programme procurement, it has to be clear what goals are to be achieved and how the programme can contribute to this. Interviewee of a contractor firm states: *"Ambitions are too abstract, they cannot be translated into actions"*. This barrier originates in the change process towards programme procurement, as programmes demand for ambitions and strategy for the long-term.

To overcome this barrier the public client can adapt a long-term management approach with short-term interim objectives. This way vague and abstract ambitions are broken down into manageable parts. Another solution is to incorporate the new working method into the organizational strategy. As public clients make use of standard work procedures for the procurement process, incorporating programme procurement in the organizational strategy and develop a 'standard' for programme procurement as well, makes it easier to apply programme procurement to pursuit ambitions. In addition, public clients can develop a long-term vision. To support programme procurement, the public client has to map what projects are to be expected the coming years. A clear overview of the current portfolio and to be build projects is critical. All solutions are highly valued. Motivations illustrate this: *"you actually need all these solutions"* and *"you must start by developing a long-term vision, then steering on this and implement it in the organization"*.

4.2.3 Underestimation of implementation process. Programme procurement is a new and different approach compared to regular project procurement, and it seems that the implementation process of a new working approach is highly underestimated. Especially in large public organizations, changing current working standards is a slow process with high resistance from employees. An interviewee of an engineering- and consultancy firm states: *"Public clients are afraid to leave the well-trodden paths"*. This barrier is inherent to-, and experienced in the change process from project procurement towards programme procurement.

Solutions to deal with this barrier are for public clients to develop a change strategy to support the change from project procurement to programme procurement and create support within the entire organization for the new working method. An interviewee of a public client organization states: *"programme procurement really starts as a philosophy, that must gain support from employees, the board and further in the organization to be successful"*. For programme procurement to be implemented, everybody involved must support the purpose of the approach. Also, coaching during the change process is valued as a supportive solution, as it is important to pay attention to the changing behaviour, not only within the public client organization but also in relationships with contractors. Coaching can help to keep employees focussed and dedicated to the change process. Last solution is to continuously monitor the change process. The implementation process of a new work approach costs both energy and time. The management should realize that the implementation process is a daily task, not something that can be measured with a periodically progress report. Continuous adjustment to the main goal is important.

4.2.4 Negative perception of regulations. For programme procurement, regular European and national regulation apply. Public clients experience regulation often as hinderance which is an unjustified believe, as within these boundaries programme procurement can be realized flawlessly. The barrier is the perception of regulation by employees who are reticent to deviate from the working standard. An interviewee of a knowledge institute states: *"Regulation in itself is not an obstacle, but the people who have to give substance to it are. There are more options than usually felt"*. This barrier is inherent to the change process towards programme procurement, as this approach might demand for an alternative application to standard approaches.

Suggestions to deal with this barrier are to stimulate creative thinking of employees that play a role in the regulatory process and initiate solutions other than the standard. Also, for public clients to organize market consultations and involve the market in plans on the procurement of a programme. Contractors get the opportunity to object plans which, in principle, do not comply with regulation (e.g. proposing a framework agreement with a duration other than the prescribed 4 years). If contractors agree with the plans, it is allowed to deviate from regulation in principle. Another option is to simplify the governance structure of public client organizations, so that fewer steps need to be taken in the regulatory process.

4.2.5 Insufficiently trained employees. Often-named is that employees working in procurement are not sufficiently educated or only have experience in industries other than civil- and construction. Especially for programme procurement, strategic thinking is required to oversee actions and be able to make long-term decisions. An interviewee of a public client organization states: *"Functions are fulfilled by people without education in the particular field. Everyone is just doing something"*. This barrier is inherent to the project-oriented procurement approach as employees working in procurement are used to project-oriented procurement practices and processes, contrary to programme procurement.

Training employees for the particular function and required skills is rated as valuable solution. Also, the appointment of a change manager responsible for the change process within the organization is suggested. The change manager can support other employees in the change process and keep everyone dedicated.

4.2.6 Concluding on organizational barriers and solutions. Table 3 summarizes the barriers experienced on an organizational level and solutions with potential to overcome these barriers. The questionnaire results (Appendix I) imply that the solutions to barriers on an organizational level are nearly all high rated to be good solutions. The public client is in charge for all barriers when implementing the particular solutions.

Barrier:	**Inherent to:**	**Solutions:**	**Initiator:**
Governance geared to project-based operations	Project-oriented procurement approach	Project-transcending governance	Public client
		Develop long-term vision	Public client
		Focus on programme management	Public client
		Bringing people or departments involved in procurement process together	Public client
Lack of clear ambitions and strategy	Change process towards programme procurement	Long-term management with short-term interim objectives	Public client
		Incorporating the new working method into organizational strategy	Public client
		Develop long-term vision	Public client
Implementation process is underestimated	Change process towards programme procurement	Develop change strategy	Public client
		Create support within organization for new working method	Public client
		Coaching during change process	Public client
		Continuously monitoring change process	Public client
Negative perception of regulations	Change process towards programme procurement	Stimulate creative thinking	Public client
		Market consultations	Public client
		Simplifying governance	Public client
Insufficiently trained employees	Project-oriented procurement approach	Training employees	Public client
		Appoint responsible change manager	Public client

Table 3 - Organizational level results

4.3 Relational level barriers and solutions

Three main barriers were experienced or expected on the relational level, in the change process from project procurement to programme procurement: 1) low level of trust between client and contractor, 2) no motive to share knowledge, and 3) different interests of client and contractor. In the rest of this section, these barriers will be further explained, followed by proposed solutions.

4.3.1 Low level of trust between client and contractor. Programme procurement tends to long-term collaborations between client and contractor. For long-term collaboration, trust is an important factor (Van Oppen, Croon, & De Vroe, 2018). Naturally, there is no trust between these parties: both organizations are suspicious and contracts allocate all possible risks to either client or contractor. An interviewee of a contractor firm states: *"Contractors have ruined the trust with the Dutch building fraud. Now, all possible risks are included and assigned in contracts".* This barrier is inherent to the project-oriented procurement approach, causing collaborations with the duration of one project in which agreements are formalized by contracts rather than mutual trust.

To deal with this, transparency on both costs and risks on the programme are rated as good solutions, to strive for an equal and transparent collaboration between client and contractor. This is confirmed in statements of questionnaire participants: *"traditionally, costs have been a factor that quickly introduces distrust. Transparency on costs can avoid this",* and *"an open-book method on costs is theoretically a great move, and I certainly have heard positive experiences on this, but in the 'extreme' form it is a step too far for many. With 'mostly open-book' you also come long way with probably less resistance*". Another option is for the public client to choose for a construction team to develop the projects in the programme jointly with the contractor, or to jointly develop the programme to increase the level of trust.

4.3.2 No motive to share knowledge. Learning is an important feature of programme procurement but sharing knowledge with other organizations reduces the contractor his ability to be competitive. Sharing innovations or ideas, thereby allowing other contractors to reap benefits by continuing with these issues, is contrary to competitive entrepreneurship. An interviewee of a knowledge institute states: *"When the contractor has to compete with other contractors within the programme, he will keep his cards close to his chest and is not willing to share knowledge".* This barrier is inherent to project-oriented procurement approaches, as contractors seek for optimal project results in their own interest instead of enhancing competitors.

To deal with this, the public client can guarantee continuity of projects for the contractor to eliminate the risk to be excluded when he shares his knowledge and other parties might profit from that. O, award the programme as a whole to one contractor, so that this contractor can use the knowledge obtained from the first project in the programme and apply this in the other projects in the programme. Public client can reward the sharing of knowledge by contractors financially or with follow-up projects. Last solution valued as supportive is to strive for an open and transparent cooperation between the organizations involved in the programme.

4.3.3 Different interests of client and contractor. The interests of client and contractor generally are quite different. It seems that both organizations share their personal interest above the common interests. Programme procurement asks for long-term collaborations, a way must be found to share every organization involved behind the programme goal. An interviewee of a public client organization states that *"Self-interest is more important than the common interest".* Another interviewee of a contractor firm says: *"to us, a good business case is the most important driver".* This barrier is inherent to the project-oriented procurement approach, rarely resulting in the pursuit of a common interest.

To deal with the different interests of public client and contractor several solutions were suggested of which none was rated as a valuable solution.

4.3.4 Concluding on relational barriers and solutions. Table 4 summarizes the results on a relational level. All barriers on a relational level are inherent to the project-oriented procurement approach the industry habitudes. To all these barriers, the public client is in the lead to overcome these when

implementing the solutions. To the barrier on different interests of client and contractor, four solutions were tested (Appendix I) of which none received a convincing majority.

Barrier	Inherent to:	Solutions:	Initiator:
Low level of trust between client and contractor	Project-oriented procurement approach	Transparency on costs	Public client/ contractor
		Transparency on risks	Public client/ contractor
		Construction team	Public client
		Joint development of programme	Public client/ contractor
No motive to share knowledge	Project-oriented procurement approach	Guarantee continuity of projects for contractor	Public client
		One tender for the whole programme	Public client
		Reward the sharing of knowledge	Public client
		Open and transparent cooperation	Public client/ contractor
Different interests of client and contractor	Project-oriented procurement approach	Not applicable	Not applicable

Table 4 - Relational level results

4.4 Drivers to programme procurement

Of the 30 solutions tested, the following solutions were designated as essential to programme procurement most often: 1) clarify ambitions and strategy; 2) project-transcending governance; 3) market consultations; 4) framework agreement; 5) appoint responsible change manager. These five solutions can be interpreted as drivers to programme procurement and guide public clients in the change process from project- to programme procurement.

1. *Clarify ambitions and strategy.* Clear ambitions and strategy seem to be supportive to programme procurement. Interviewees state that, to clarify the ambitions and strategy of the public client organization, the development of a long-term vision is key. The organization should steer on long-term goals, with short-term interim objectives to pursuit. Incorporating the new working method into the organizational strategy is helpful.
2. *Project-transcending governance.* The public client organization can change from a governance geared to project-based operations towards a project-transcending governance to support programme procurement. Helpful are the development of a long-term vision and focusing on programme management. In addition, the governance has to support collaboration between employees or departments involved in the procurement process.
3. *Market consultations.* Organizing market consultations is named as a means to help motivate deviations from regulation and to align the market's capacity in terms of available resources and employees to the programme.
4. *Framework agreement.* Making use of a framework agreement for programme procurement is appointed to be supportive as a greater alignment between requirements can be achieved and it is not necessary to have a separate tender for each independent project. Also, a framework agreement ensures a more attractive business case for contractors and can support a more efficient pursuit of organizational ambitions.
5. *Appoint responsible change manager.* Appointing someone who is responsible for the change-process towards a programme approach is expected to help keeping all employees of the organization committed.

5. Conclusion and reflection

5.1 Conclusions

In this study, it was investigated how public clients in the Dutch civil- and construction industry can manage the development from project procurement to a programmatic procurement approach, considering the barriers experienced or expected in this change process. It was found that barriers to programme procurement often originate from project procurement practices that are the state-of-art in Dutch civil- and construction industry. Project procurement practices come along with habits or standards not ready yet for programme procurement. Fewer barriers originate in the change process towards programme procurement, which induces new challenges that have not been dealt with before.

Barriers to programme procurement originating from project-oriented procurement practices are: 1) tension between requirements and innovation, 2) continuous competition, 3) lack of continuity for innovation, 4) governance geared to project-based organizations, 5) insufficiently trained employees, 6) low level of trust between client and contractor, 7) no motive to share knowledge and 8) different interests of client and contractor. Barriers to programme procurement originating in the change process towards this different procurement approach are: 1) insufficient portfolio volume, 2) challenging capacity allocation, 3) lack of clear ambitions and strategy, 4) implementation process is underestimated and 5) negative perception of regulations.

The study exposed five drivers that can guide public clients in the change process towards programme procurement. First is for the public client organization to clarify the ambitions and strategy, and to develop a long-term vision. Second is to move from project-oriented governance towards project-transcending governance. Third, organizing market consultations to deal with regulation and capacity allocation. Fourth is to make use of framework agreements to achieve a greater alignment between requirements. Fifth is appointing a responsible change manager, who is in charge in the change process and has to keep all employees committed. The public client is in the lead in this change process towards programme procurement.

5.2 Theoretical contributions and managerial implications

The study offers important contributions to the literature on programme procurement. First, the drivers to programme procurement identified in this research can support taking decisions that determine the design of a programme procurement strategy (Project Management Institute, 2017a) by providing directions helping to differentiate in these considerations. Second, this study confirms and strengthens the view that the organizational strategy is the starting point to programme procurement (Lycett, Rassau, & Danson, 2004; Aritua, Smith, & Bower, 2009; Project Management Institute, 2017a) as the results imply that the public client is in the lead in the change process towards programme procurement. Third, the research adds to the demand for project-integration and project-transcending procurement approaches for the Dutch civil- and construction industry (van Buuren, Buijs, & Teisman, 2010; Volker, 2019) by increasing knowledge on programme procurement and presenting a link between project procurement practices and programme management. The research confirms that programme procurement is a rather unknown part of programme management (Hu, Chan, & Le, 2012) and limited organizations in the Dutch civil- and construction industry have put this into practices. The industry is gradually realizing that the single-project approach can not comply with the complex and growing demand for sustainable and innovative solutions (Ministry of Infrastructure and Water Management, 2019), however it is not the intend for programme procurement to replace project procurement as both strategies can coexist and deployed depending on the specific demands.

The drivers to programme procurement identified in this study can guide public clients but do not guarantee a successful change process towards programme procurement. Through limited research available on this subject, there might be other factors of influence not considered in this study. For public clients to clarify their ambitions and strategy is a noble endeavour, still translating long-term ambitions into concrete actions is highly influenced by current developments. For public clients, developing a future-proof strategy is challenging due to uncertain events occurring and demanding for change, like current nitrogen-, PFAS, or COVID-19 crisis. Second, making use of framework agreements is designated to be an essential element for programme procurement, nevertheless framework agreements come along with disadvantages. The pool with potential providers and innovative ideas is limited in advance, the public client runs the risk that contractors with good ideas are left out for coming years. Also, for small- and medium size contractors the framework may become too large, excluding these organizations. Although the data for this study were collected in The Netherlands, the results should also be relevant for practitioners in civil- and construction industry in other countries.

5.3 Limitations and further research

The study has several limitations. At first, the study focusses on barriers and solutions on a highly strategic level of management. Tactical and operational barriers are neglected but also might be of influence. Second, the research outcomes are to a great extend based on expectations instead of practical

experience, due to the limited practical application of programme procurement in the Dutch construction industry. Although the interview participants were carefully selected and all experts in the field of civil- and construction industry, only few of the interview participants had practical experience. Third, the validation questionnaire on proposed solutions would have been more reliable with more participants.

For further research it is recommended to empirically test the drivers to programme procurement in a case study and to expand the knowledge base on programme procurement. Also, as the research outcomes highlights the role of the public client in the change process from project procurement towards programme procurement, further research might focus on the role and implications to this change for the contractor.

Competing interest

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Appendix I

	Barrier	**Solutions**	**% dis-agree**	**% neutral**	**% agree**	**n**
System level	Tension between requirements and innovations	Construction team	31	13	56	39
		Research & Development project	37	21	42	38
		Framework agreement	11	21	68	38
		Prepare definitions by the client of vague concepts like circularity	8	15	77	39
		Fixed ambition levels or KPI's for multiple projects	8	8	84	39
	Continuous competition	Framework agreement	15	15	70	34
		Pre-selection of bidders when tendering	50	15	35	34
	Lack of continuity for innovation	Framework agreement	6	29	65	34
		Performance contracts	35	12	53	34
	Insufficient portfolio volume	Clustering of Dutch public clients	19	9	72	32
		Different level of focus (material, component, sub-system or system)	9	31	60	32
		Clustering of Dutch public clients with European clients	44	25	31	32
	Challenging capacity allocation	Market consultations	9,5	9,5	81	32
		Joint development of programme and planning	6	6	88	32
Organizational level	Governance geared to project-based operations	Project-transcending governance	0	10	90	31
		Develop long-term vision	0	6	94	31
		Focus on programme management	3	3	94	30
		Bringing people or departments involved in procurement process together	10	6	84	31
	Lack of clear ambitions and strategy	Long-term management with short-term interim objectives	0	7	93	30
		Framework agreement	13	23	64	30
		Incorporating the new working method into organizational strategy	3	20	77	30
		Develop long-term vision	3	7	90	30
	Implementation process is underestimated	Develop change strategy	13	10	77	31
		Create support within organization for new working method	3	6	91	31
		Coaching during change process	0	6	94	31
		Continuously monitoring change process	19	6	75	31
		Develop 'serious game'	13	58	29	31
	Negative perception of regulations	Stimulate creative thinking	10	16	74	31
		Market consultations	13	16	71	31
		Simplifying governance	13	20	67	30
	Insufficiently trained employees	Training employees	0	6	94	31
		Reward culture within organization	13	42	45	31
		Appoint responsible change manager	3	6	91	31
Relational level	Low level of trust between client and contractor	Exit-clause for both client and contractor in contract	42	10	48	31
		Transparency on costs	13	3	84	31
		Transparency on risks	0	6	94	31
		Construction team	10	16	74	31
		Framework agreement	23	39	38	31
		Joint development of programme	3	3	94	31
	No motive to share knowledge	Guarantee continuity of projects for contractor	17	3	80	30
		One tender for the whole programme	24	7	69	29
		Programme consisting of projects of the same type	33	17	50	30

		Programme consisting of successive projects	47	13	40	30
		Sharing knowledge is an assessment criterion in tender	38	24	38	29
		Establish knowledge center for the programme	17	17	66	29
		Reward the sharing of knowledge	14	14	72	29
		Open and transparent cooperation	0	10	90	29
	Different interests of client and contractor	Framework agreement	20	30	50	30
		Interviews as contractor selection method	24	52	24	29
		Performance contracts	40	20	50	30
		Selecting a contractor based on his vision	29	21	50	28