An exploration of a programmatic delivery approach for programmes in the construction sector

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ABSTRACT

The construction industry faces multiple major internal and external challenges: rewiring of current contracts or developing of new contracts, increasing the amount of innovation and cross-functional cooperation, and increasing cross-project knowledge transfer and cross-project cooperation (internally) more sustainable and circular construction industry, and reduction of greenhouse gas-emissions (externally). A programmatic delivery approach could tackle (part of) all these five challenges. The objective of this research was to develop a definition of a programmatic delivery approach, to investigate client properties that suit a programmatic delivery approach, to determine the application characteristics of a programmatic delivery approach & to develop a hands-on product for advising a programmatic delivery approach. Unfortunately, literature on a programmatic delivery approach is not available yet, since it is a new ideology. Therefore, five other collaboration focussed project delivery methods that show similarities with a programmatic delivery approach are analysed: framework agreements, alliancing, public private partnerships, innovation partnerships and integrated project deliveries. The analysis of these methods led to preliminary conclusions which were verified by means of a survey with experts in the area of contracting and procuring. Based on the results of the survey, a guideline was developed that can be used by engineering firms to advise and guide a client in the process of deciding for and designing of a programmatic delivery approach. This guideline could potentially trigger a transformation in the construction sector towards the delivery of programmes, effectively tackling multiple major challenges.

Keywords: programme delivery; programme procurement; programme collaboration; long-term collaboration; construction industry.

1. INTRODUCTION

1.1. The global construction industry

The construction industry has a strong effect on the society and economy, as well as the environment (World Economic Forum, 2017). All other industries in the society are dependant of (completed) construction projects to fulfil the needs of their sector (Cherian, 2020). Think about transportation of persons or goods via the road-, water-, or rail infrastructure, but also housing, workplaces, schools, hospitals, and commercial buildings. This also indicates that a good performing construction industry is vital for economic growth of a country (Cherian, 2020). For a countries' economy, a high performance of the built environment is essential to stay competitive. To emphasize the importance of the construction industry on the society, economy and environment, the impact of the industry on these assets is shortly elaborated below.

Impact on the society:

The construction industry influences the daily life of everyone in the society, as the quality of life is directly influenced by the quality of the built environment (World Economic Forum, 2017). Also, a high amount of the working population is employed in the construction industry (7-10%) (McKinsey Global Institute, 2016; World Economic Forum, 2017). Even more people are indirectly with or for the construction industry but are not necessarily part of the industry. Finally, almost the entire working population is employed in the built environment that is created by the construction industry.

Impact on the economy:

The construction industry is responsible for 6% of the yearly global GDP, which accounts for about 10 trillion US dollar revenue per year and 3,6 trillion US dollar added value to the society (McKinsey Global Institute, 2016; World Economic Forum, 2017). Considering all other construction-related spending, for example in the supply chain, then the construction industry is responsible for as much as 13% of the world's yearly GDP (World Economic Forum, 2017)

Impact on the environment:

The construction industry is the largest consumer of raw materials, being as high as 50% (Murtagh, 2020). In addition, the construction industry produces 40% of the total solid waste in US and 25-33% in EU (Murtagh, 2020). Finally, constructed objects cause 25-40% of carbon emissions globally (World Economic Forum, 2017).

Because of the large size of the construction industry and the huge impact on multiple assets of the daily life, even a small step made forward has huge potency. To clarify the opportunities of the industry, the average productivity growth in the construction industry is only 1% per year, compared to a yearly average of 2,6% in the entire economy (McKinsey Global Institute, 2016). Potentially, an additional 1,6 trillion US dollar yearly added value to the society could be achieved if the yearly productivity growth increases (McKinsey Global Institute, 2016). To achieve this, cross-company collaboration essential. In the current industry no full potential is reached and, moving forward, companies must agree common goals and adopt cooperative partnerships (World Economic Forum, 2017). Since the government is the regulator and the major client in most countries, the need for action measures lies with the governmental bodies (World Economic Forum, 2017). Performing these action measures, however, is not easy. Namely, the construction industry is facing major challenges in the upcoming years.

1.2. Challenges for the global construction industry

With the extent of the construction industry and the opportunities for improvement, one would expect a thriving and innovating industry. Unfortunately, the opposite is true. In recent years, several international improvement organizations have identified multiple challenges the global construction industry is facing. These challenges relate to either internal problems of the industry that must be overcome or to external problems that exist on top of internal problems of the industry. For this research the focus lies on five of these challenges, with three challenges relating to the internal industry and two

challenges to external factors. The five challenges that are treated below, all relate to the creation of cross-company collaboration, agreement of common goals and adopting of cooperative partnerships as mentioned by World Economic Forum (2017). Below, the five challenges are elaborated, starting with the internal challenges of the industry:

Challenge 1: Rewiring of current contracts or developing of new contracts

Firstly, the construction industry will continue to grow in the coming years (World Economic Forum, 2017; McKinsey Global Institute, 2019). However, especially for large projects, clients are dependent on a small number of contractors that can deal with these projects. The number of contractors that can deal with these large projects is rather decreasing than increasing (McKinsey Global Institute, 2019). This is caused by the fact that established companies are opting to execute a fewer number of large projects and that it is difficult for new companies to enter the market for large projects. Because of this, the remaining contractors are becoming pickier on their projects, causing the number of entries for large projects to decrease (McKinsey Global Institute, 2019). This is mostly caused by the way risks are handled in these projects: Contractors experience too much risk, causing incidental big financial setbacks, degrading the market position of the contractors. Additionally, the transaction costs of participating in the tender for a large project are high, causing the contractors to be even more picky on what project they would like to enter. Because of that the market forces of the construction sector are in danger of being lost. Or, in other words, the current construction sector is not financially healthy, not innovative, and not competing (McKinsey Global Institute, 2019).

To increase healthiness, innovativeness and competitiveness of the construction industry, the procurement process, execution process and supply chain cooperation must improve (McKinsey Global Institute, 2016). This can mainly be done by laying focus on relational contracts and long-term collaboration (McKinsey Global Institute, 2016).

Challenge 2: Increasing the amount of innovation and cross-functional cooperation

Secondly, the construction industry originally consisted, and for a large amount still consists of a project-based nature (Ozorhon et al., 2010; Adriaanse, 2014). This means that if a certain organisation wants something constructed, they start a project. They then consult an architect/engineering firm to design this construction and will then procure the project to a contractor who will build the object as designed. This is called the traditional way of working and this is still used in a lot of projects. Unfortunately, this traditional way of working does not generate a lot of innovation and even causes a lack of innovation (Adriaanse, 2014; Nawi et al., 2014; World Economic Forum, 2017). This is caused by the fact that the project-based nature drives the process towards costs, meaning that the amount of money invested in Research & Development in the construction sector frightening low (McKinsey Global Institute, 2019). In addition, if an innovation has occurred, there is still a slow adoption of this innovation because of the cost of the innovation. The past decade, numerous researchers tried to find out why and how the construction industry lacks innovation. Among others, Ozorhon et al. (2010), Adriaanse (2014), Hall et al. (2014), Nawi et al. (2014) and Jones et al. (2021), all found that the construction industry was fragmented, horizontally and vertically.

Horizontal fragmentation means that there are different organizations working on one project at the same time, think about subcontractors doing specialised work activities. Vertical fragmentation means that during the different project phases, different parties are responsible for the design and the construction (Adriaanse, 2014; Nawi et al., 2014). In both horizontal and vertical fragmented projects, communication between the many distinct organizations involved in a particular project is impeded, causing problems during the execution of project activities. Therefore, cross-functional cooperation and collaboration within projects must increase so companies can learn and benefit from each other (World Economic Forum, 2017).

Challenge 3: Increasing cross-project knowledge transfer and cross-project cooperation

Thirdly, on top of the horizontal and vertical fragmentation, Adriaanse (2014), Hall et al. (2014) and Jones et al. (2021) found that the construction industry was also fragmented in a longitudinal way. This means that projects are done in a singular way, project per project. The longitudinal fragmentation of the industry causes the industry to move forward slower than other industries (Adriaanse, 2014). The industry is moving forward slower, mainly because of few innovations and a low amount of knowledge

sharing between parties (World Economic Forum, 2017). In a project-structured environment, parties are hesitant to pursue innovations because it requires a front-end effort, which can possibly not be used in the next project because it is not sure whether this same party will execute this next project. Also, because project teams are generally dissolved after the project is finished, parties are hesitant to share information with their partners, because this partner might benefit from the information in a next project in a different partnership (Adriaanse, 2014). The little cross-project cooperation and collaboration between companies must increase to ensure the establishment of innovations and improvement of the industry (World Economic Forum, 2017).

Additionally, two external challenges arise for the construction industry. These challenges can be described as social-cultural challenges and are imposed by multiple governmental bodies in recent years.

Challenge 4: More sustainable and circular construction industry

Fourthly, the Dutch government, as well as numerous other countries in the world, aims to have a sustainable and circular construction economy in 2050 (McKinsey Global Institute, 2019). The construction industry produces 25% of solid waste on the entire globe. Also, over 30% of the extraction of natural resources is caused by the construction industry (Benachio et al., 2020; Murtagh et al., 2020). Since the availability of future resources is unclear, keeping the current linear economy running is not a smart idea (Hossain et al., 2020) Lately, the overall view of the construction industry is changing towards a circular economy rather than a linear economy (Benachio et al., 2020). However, some large hick-ups still appear: It is difficult to introduce the circular economy in construction projects, since most stakeholders have few insights in the practical applications of a circular economy in a project. Also, there is a lack of standards on how to implement a circular economy in the construction sector. Lastly, there is a lot of pointing going on by companies/organizations in the construction sector on which actor should take the lead in implementing a circular economy in construction projects. Researchers agree that the governmental bodies, or the clients of projects, should take the lead in this, by creating incentives for using sustainable and circular economy concepts in projects (Arıoğlu Akan et al., 2017; Benachio et al., 2020).

Challenge 5: Reduction of greenhouse gas-emissions

Fifthly, the construction industry is among the leading environmentally damaging industries (Murtagh et al., 2020). The emission of greenhouse gasses, nitrogen, and carbon dioxide among others, is on an unreasonably high level and must be reduced. To illustrate, in the European Union, the construction industry is responsible for 40% of the end-use emissions (Clarke, 2020). In 2030, the construction industries' emissions must have reduced by 32,5%. In 2050 the EU aims for a carbon neutral construction industry (Clarke, 2020). Change towards a lower or neutral-emission construction industry, also called sustainable construction industry, faces some barriers. Osuizugbo et al. (2020) analysed these barriers. The three most common mentioned barriers are: fear of higher investment costs, lack of regulations to drive sustainable construction and lack of skilled personnel. Multiple national construction federations (3F and IG BAU among others) have called for an ecological modernisation to overcome these barriers: emphasis on government investment, focus on technological innovation in greening processes, better collaboration between all actors in the construction process and training of employees to make sure they can deliver sustainable construction (Clarke, 2020). The latter, however, is not easy since the trade-off between economic prosperity and environmental sustainability must be made (Arıoğlu Akan et al., 2017).

1.3. Tackling the challenges for the global construction industry

To sum up, five major challenges exist in the construction sector. Of these challenges, three relate to internal problems: rewiring of current contracts or developing of new contracts, increasing the amount of innovation and cross-functional cooperation, and increasing cross-project knowledge transfer and cross-project cooperation. Solving these internal challenges is already not easy, but on top of the internal challenges, two external challenges arise: more sustainable and circular construction industry, and reduction of greenhouse gas-emissions. These challenges, fully or partly, relate to each other and can, in general, be tackled more easily by enabling cross-company collaboration, agreement of common

goals and adopting of cooperative partnerships (World Economic Forum, 2017). Obtaining these three aspects in the construction industry is difficult, which has been proved for years and years. However, change is appearing: the introduction of a portfolio or programmatic delivery approach for projects of a repetitive character is one of the potential new methods that could drive the construction industry forward (McKinsey Global Institute, 2019).

This research will explore the possibilities of a programmatic delivery approach for projects of a repetitive character, as well as large construction programmes. Namely, a programmatic delivery approach touches upon cross-company collaboration, agreement of common goals and adopting of cooperative partnerships. These three aspects all tackle (a part of) the internal challenges of the industry, while a programme can be developed for tackling of the two external challenges.

1.4. Research objective and paper outline

As discussed before, exploring the possibilities of a programmatic delivery approach in the construction industry is the topic for this research. However, multiple things are found that are still unclear: 1. what exactly is considered a programmatic delivery approach, 2. when can a client adopt a programmatic delivery approach, 3. how the process of a programmatic delivery approach is shaped, and 4. how a hands-on product can be created to help engineering firms advise clients with a programmatic delivery approach. Therefore, the objective of this research is also fourfold: *To develop a definition of a programmatic delivery approach, to investigate client properties that suit a programmatic delivery approach, to determine the application characteristics of a programmatic delivery approach & to develop a hands-on product for advising a programmatic delivery approach.*

To achieve this research objective, the following main research question is answered: *How can a programmatic delivery approach contribute to overcoming major challenges in the construction industry?* This question is supported by multiple sub research questions, which did also guide the research process. The structure of this paper is following this research process. Firstly, the methodology of the research is elaborated, without a thought-out methodology it will be difficult to answer the research questions and achieve the research objective. Secondly, background theory on projects versus programmes, the management of programmes and the delivery of programmes in the construction industry is presented. This background information is important to cover since it forms the baseline of literature regarding this topic. Thirdly, the results of this research are presented. This section starts with the development of the definition of a programmatic delivery approach for this research. Thereafter, five delivery methods similar to a programmatic delivery approach are analysed: Framework Agreement, Public Private Partnerships, Innovation Partnerships, Alliance, and Integrated Project delivery. With characteristics of these methods preliminary conclusions are formed on potential client properties and application characteristics of a programmatic delivery approach. These preliminary conclusions are then verified by experts and final conclusions are formed. These final conclusions are transformed to a hands-on product that can be used by engineering firms when advising clients in the construction industry on the use of a programmatic delivery approach. Fourthly, the meaning of findings of this research is interpreted and discussed. Fifthly and lastly, the conclusion of this research is presented.

2. RESEARCH METHODOLOGY

2.1. Research Design

The design for this research was developed with the plan described by Verschuren & Doorewaard (2015). Based on the research objective and research questions, a more in-depth approach was chosen since the questions that were to be answered are quite precise. To answer the research questions, plenty of previous research, as well as expertise of project- & contract managers is necessary. This expertise can mainly be transferred using words, thus was the research performed in a qualitative manned. In addition, this research can be described as exploratory, since not much is known about the subject yet. This research will serve to explore on how and when a programmatic delivery approach can be used. Also, the combination of a qualitative research combined with an exploratory approach is used frequently. Since the answers to the research questions were more likely be found in ideas and concepts instead of observations and data, a non-empirical research approach was chosen.

Furthermore, Verschuren en Doorewaard (2015) describe five research strategies: survey, experiment, case study, grounded theory & desk research. Based on the earlier generated properties (in-depth, qualitative, explorative & non-empirical), a predominantly desk research was the best fit for this research. Finally, the choice for a literature research, secondary research, or a combination of both for the desk research was made. For this research, a combined approach was most fitting, since the first part of the research was most likely to be answered by literature research, while the second part of the research was performed by analysing/verifying the found information from a different point of view, which is a secondary research approach. This second part of the research was performed by conducting a survey. To clarify, the research design is visualized Figure 1 below.

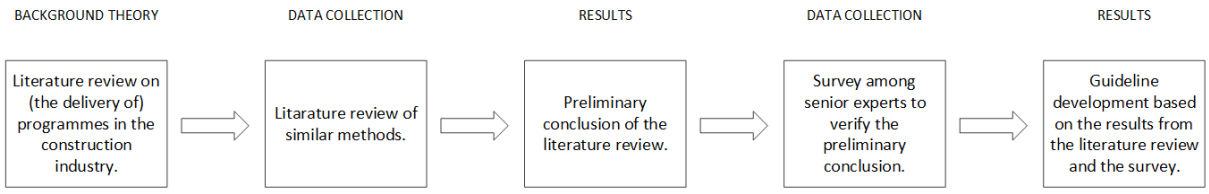

Figure 1: Research design

The internal validity of this research was covered by treating literature from different parts of the construction sector, as well as different sources, as well as literature from adjacent sectors. Because of a limitation in time, it was unfeasible to consult experts from other companies/organizations. Thus, causing the creation of a high external validity to be difficult. However, by consulting senior (minimum 10 years' experience) experts from Witteveen+Bos, it is ought that their experience covers the larger part of the construction industry and that therefore the results also cover the larger part of the industry. Construct validity relates to whether the outcome of the data collection was the desired one. This was covered by using a clear systematic approach (as explained below) for the literature review, as well as introducing the purpose of the survey to the experts. This clear system also helps making the research reliable, because if the literature review was to be replicated by using this system, the same results should be found, as well as the same preliminary conclusions should be drawn up.

2.2. Data collection 1: Literature review

The first data collection is done by literature review. A literature review can be performed in many ways. Therefore, the article of Grant et al. (2009) is used. They analyse 14 different literature review types and its processes. Based on this analysis the qualitative systematic review seems the most appropriate for this research. They describe this method as a "method for integrating or comparing the findings from qualitative studies. It looks for 'themes' or 'constructs' that lie in or across individual qualitative studies" (Grant et al., 2009, p.94). To correctly perform the qualitative systematic review, the guide to a qualitative systematic review protocol by Butler et al. (2016) is used. The following five stages were completed: 1. Developing a search strategy; 2. Reviewing the literature; 3. Critical appraisal of the literature; 4. Data extraction and 5. Data synthesis.

To start the literature review, a search strategy is developed. There is no experience on a programmatic delivery approach, so the overlap or similarities between different project delivery methods and a programmatic delivery approach are examined. The three main characteristics that were sought for in other project delivery methods in the construction sector around the world are bundling of projects, long-term collaboration, and highly integrated collaboration. Based on these three characteristics, the following project delivery methods were found:

1) *Framework Agreement (FA),* FA was chosen because of long-term collaboration between client and contracting parties, as well as the delivery of multiple projects via one contract/framework. Additionally, this method was mentioned by Vosman et al. (2019) in their drivers to a programmatic delivery approach.
2) *Public Private Partnership (PPP),* PPP was chosen because it uses a long-term collaboration between client and contracting parties. The collaboration in PPP's does potentially contain several aspects that suit a programmatic delivery approach.
3) *Innovation Partnership (IP),* IP was also chosen because it uses a long-term collaboration between client and contracting parties. An IP's goal is to create an innovation together with one

or more market parties. This type of collaboration is unique in the construction industry and could considerably also contain certain aspects that can be used in a programmatic delivery approach.

4) *Alliance (AL),* AL was chosen because of the highly integrated collaboration approach. This highly integrated collaboration approach has some aspects that could potentially be used in a programmatic delivery approach.
5) *Integrated Project delivery (IPD),* IPD was also chosen because of its highly integrated collaboration approach. This approach can also be expected to contain certain aspects that will fit a programmatic delivery approach nicely.

In addition, these methods originate from all around the globe (the United Kingdom to Australia and from the European Union to the United States of America) and are applied in many more countries.

The search strategy consisted of the entering of five main key words: 'Framework Agreement', 'Public Private partnership', 'Innovation Partnership', 'Alliance' & 'Integrated Project Delivery', combined with terms like 'Construction', 'Characteristics' and 'Lessons learned'. Additionally, three inclusion criteria for the literature review of all three terms are the same. 1. The focus lies on articles produced in 2011 or later (maximum 10 years old), however, if an earlier article provides valuable information, this article is not excluded from the research. 2. The article must be written in English or Dutch. 3. The article must cover the construction sector or an adjacent sector.

Reviewing the literature while searching for certain aspects of these methods that could potentially suit a programmatic delivery approach is difficult. Hence, the need for focus-points raised. Focus-points helped guiding the researcher during literature review by specifically focussing on finding information that is essential for this research. For this literature review, the focus-points were basic properties, main advantages, and main bottlenecks of the method, combined with eight process characteristics. These eight process characteristics together cover a large part of the process of a project/programme delivery. By covering a large part of the delivery process, the researcher was able to present a near-complete overview of the delivery process of all five methods. The eight characteristics originated from multiple meetings between the researcher and the supervisors of the research and are as follows:

1) Decision-making: In what case/situation is this method used.
2) Client properties: What properties must the client have to choose this method, think about project portfolio, employee capabilities, organizational vision, etc.
3) Initiation process: On what timestamp is the choice made for this method and when/how does the process start.
4) Procurement process: What procurement procedure is commonly used for this method.
5) Execution process: What does the process look like after the procurement (design phase, preparation phase and realization phase (and sometimes exploitation phase).
6) Parties: Which parties join the collaboration agreement in this method.
7) Collaboration: How is the collaboration established in this method.
8) Goal-setting: How are goals and objectives set for the project/agreement. Are these goals set in collaboration with all parties?

2.3. Data collection 2: Survey

For the second data collection round, a survey was used. The goal of this survey was to analyse/verify the preliminary conclusions of the literature review from a different point of view. For this analysis, eleven senior (minimum 10 years' experience) experts in the area of contracting and procuring at Witteveen+Bos were consulted for their expertise. Of these eleven experts, seven experts participated in the survey, one expert did not find himself qualified enough to participate in the survey and three experts were not available to participate in the survey for various reasons. The survey consisted of three parts: The first part was a section of two questions to check the baseline of knowledge of the participants on a programmatic delivery approach. The second part was a section in which 24 statements were drawn up from the preliminary conclusions. The statements used in the survey were all derived from the preliminary conclusions of the literature review on the similar methods. The statements could be rated between 1 and 5, in which 1 is completely disagree, 2 is disagree, 3 is nor disagree nor agree, 4 is agree, 5 is completely agree. Additionally, because for some situations where a statement did not fully fit the cause, the third part of the survey consisted of seven open-ended/multiple choice questions. For

all statements/questions in the survey, the respondents were asked for an explanation to the answer given.

The survey was conducted in Microsoft Forms, which is a software programme that helps with easy development of the survey statements as well as clear overview of the results. The data outcome of the survey was analysed in Excel. In Excel the results were sorted based on the eight characteristics. Then, if the results of a certain statement or question were unanimous a green colour was given to this statement. If the results for a certain statement varied, a yellow colour was given, and the result was analysed further by looking into the explanation the expert had given for the answer. With this explanation, the results could be interpreted better and used for this research. Finally, because the answers on certain characteristics varied quite a lot, these answers were sorted, and it was looked whether there were correlations between answers given.

3. BACKGROUND THEORY ON PROGRAMMES

As depicted before, this research will explore the possibilities of the delivery of programmes in the construction industry. Therefore, it is important to first gain insight in what the differences are between projects and programmes in the construction industry, how programmes in the construction industry are managed and how the delivery of these programmes is arranged.

3.1. Projects and programmes in the construction industry

Public infrastructure development is almost always organised either in a single project or in a programme of projects and/or sub-projects. Executing these public infrastructure developments can be done in many ways, varying from single works contracts (projects) to long-term collaborations that combine separate arrangements into one contract (programmes) (Frederiksen et al., 2021).

For further clarification, the differences between a programme and a project are depicted. A programme can be defined as "a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually" (Weaver & Project Management Institute, 2021). Whereas a project can be defined as "a temporary endeavour undertaken to create a unique product, service or result" (Weaver & Project Management Institute, 2021). Furthermore, Pellegrinelli et al. (1997) described four contrasting management practices of programmes in relation to projects: 1. In a programme one must respond to external change and shifting strategic goals. In a project there a generally a fixed scope and objectives. 2. Programmes live with an indeterminate time-horizon, while projects have a linear life cycle. 3. Programme management is a tool for enhancing organization wide capabilities, for example an efficient deployment of resources. 4. Programme work is determined by context, rather than common principles and processes. Finally, Pellegrinelli (1997) made up a list with six distinctive characteristics with programmes and projects. In Table 1 these distinctive characteristics are shown.

Table 1: Distinctiveness of project versus programmes, based on Pellegrinelli (1997).

Distinctiveness of projects	Distinctiveness of programmes
Is a process for delivering a specific product/service.	Is an overarching organizing framework for delivering specific products/services.
Has a fixed duration.	Can have a fixed duration but can also have an indefinite duration.
Has a set of fixed objectives.	Objectives evolve over time based on business needs and programme needs.
Consists of the management of one single delivery.	Consists of the management of multiple, related deliveries.
Focus lies on the delivery of the product/service.	Focus lies on achieving strategic/extra-project objectives.
A project manager is only responsible for the success of the single project.	A programme manager is responsible for the facilitation of interaction between multiple other managers.

3.2. Managing of programmes in the construction industry

Programme management differs from project management since it can be described as an integrated approach contributing to effective project-delivery (Shehu et al., 2009). In other words, programme management is a complementary tool for project management, streamlining between-project processes. Programme management is applied because project management has its shortcomings: "The clearly defined scope of a project and its relative isolation from its environment is not only an advantage but also one of its most significant weaknesses. The clearly demarcated boundaries of a project with the outside world are often rigidly defined and last for the entire duration of the project." (Van Buuren et al., 2010, p. 674). More and more, relying only on project management has appeared inadequate. The need for project integration has risen and this need is threefold: 1. Integrating the content of different projects, 2. Integrating the separated organizational structures into joint organizational structures and 3. Integrating the separate decision-making processes into adaptive joint decision-making processes (Van Buuren et al., 2010). Programme management is one of the main tools for achieving project integration.

Although the differences between projects and programmes are quite clear, there is no consensus on the precise definition of programme management. Multiple researchers have tried to find a widely accepted definition of programme management; however, these definitions are still inconsistent. A selection of definitions is treated below. Shehu et al. treated a number of inconsistent definitions: "Turner et al. described programme management is the selection and planning of a portfolio of projects to achieve a set of business objectives; and the efficient execution of those projects within a controlled environment, so that they realize maximum benefits for the resulting business operation. Lycett et al. and Burke define programme management as the integration and management of a group of related projects with the intention of achieving benefits that would not be realized if the projects were managed independently. Reiss et al. define programme management as the management of a portfolio of projects which call upon the same resources and concentrates on the next stage of development" (Shehu et al., 2009, p.704). In their research, they define programme management as "an integrated, structured-framework that co-ordinates, aligns and allocates resources, and plans, executes and manages a number of related construction projects to achieve optimum benefits that cannot be realized if the projects are managed separately" (Shehu et al., 2009, p. 704).

Pellegrinelli et al. formulated programme management as follows: "Programme management is used to implement strategy, to develop and maintain new capabilities, to manage complex information systems (IS) implementations and many other business changes" (Pellegrinelli et al., 2007, p. 41). Rijke et al. (2014) say: "programme management is used to create portfolios of projects implement strategies and generate change in products, business or ways of working" (Rijke et al., 2014, p. 1198). They add: "Whilst project management is typically focused on performance in terms of quality, cost and time, programme management operates more on a strategic level to create synergies between projects and deliver a package of benefits through coordination of a series of interconnected projects" (Rijke et al., 2014, p. 1198).

The varying definitions of programme management could well be explained by the fact that there is also no consensus on the precise definition of a programme itself. This contrast is encountered when the intensity of a programme is viewed upon. Sometimes the programme is a means to only better coordinate and deliver a series of common projects, sometimes the programme is used to pursue organizational change. Organizational change can, for example, relate to the development of better ways of working or expanding collaboration internally or externally. For the latter, it means that the programme is adding value to the organization which would not have been realized when all projects were executed individually (Frederiksen et al., 2021).

Not every programme requires the same amount of intensity of programme management, hence the difference in the researchers' definitions of programme management. Van Buuren et al. (2010), as well as Rijke et al. (2014) identified three levels of intensity of programme management. In addition, four types of programmes are developed by Miterev et al. (2016) based on the early findings of Ferns (1991) and Pellegrinelli (1997). An overview of the different programme management approaches and the corresponding programme types can be seen in Table 2 on the next page.

Table 2: Programme management intensity and corresponding programme type, based on Van Buuren et al. (2010); Rijke et al. (2014) & Miterev et al. (2016).

Programme management intensity	Corresponding programme type
Programme management intensity 1: Programme management is used as a mechanism to coordinate multiple projects or sub-projects. This type could also be called portfolio management.	Single-objective programmes - "Close to megaprojects often operating outside the boundaries of a single organization" (Miterev et al., 2016, p. 547).
	Business cycle or portfolio programmes - "Aims to exploit a common theme (common resources, knowledge, skills, infrastructure, etc.) among relatively independent projects, which enables greater efficiency and better performance" (Miterev et al., 2016, p. 547).
Programme management intensity 2: Programme management is used as a 'shared service centre' for projects. In this type the financial, juridical, and administrative services are integrated into a 'shared service centre'.	Strategic or goal-oriented programmes - "Arising from significant strategic reorientation following a major organizational one-time event and affecting organizational structures, strategies and policies. Represents extraordinary, one-time initiatives outside organizational standard operating procedures. The aim is to develop new services, products, systems, plants, or infrastructures by defining, scoping, and managing projects appropriately" (Miterev et al., 2016, p. 547).
Programme management intensity 3: Programme management is used as a strategy to use projects to achieve an overarching programme objective. This type is a goal-oriented programme management style.	Heartbeat programmes - "Aims to achieve evolutionary improvement of existing systems and processes or organizational change. This program type creates value by reconciling contradicting views and demands for change from various organization actors to enhance existing systems and practices while sustaining operations" (Miterev et al., 2016, p. 547).

As Table 2 shows, the three programme management intensities all correspond to one or more programme types. To elaborate on the different programme types, an example is given of all four types of programmes:

1) Single-objective programmes - The London 2012 Olympic games construction programme can be classified as a single-objective programme (Davies et al., 2014). This programme consisted of the construction of the entire Olympic village (infrastructure, venues, and housing) as well as the infrastructure in the surrounding environment of the Olympic village.
2) Business cycle or portfolio programmes - An example of this programme type is the Flanders Sport programme (Van den Hurk, 2016). This programme contained the construction of a portfolio of artificial pitches, sports halls, swimming pools and multi-functional sports centres.
3) Strategic or goal-oriented programmes - An example of a goal-oriented programme is the construction of 40 new schools and day care institutions for the City of Copenhagen, Denmark. In this programme the involved parties entered the execution phase with the intention of challenging deep-rooted practices and developing new working-methods (Frederiksen et al., 2021).
4) Heartbeat programmes - The execution programme IBA Parkstad by the province of Limburg is an example of a heartbeat programme. The objective of this programme is to make the Parkstad-region a more resilient region with a sustainable economy, more re-use of materials and a more important role for green infrastructure (Province of Limburg, 2016).

3.3. Delivery of programmes in the construction industry

Pekuri et al. (2014) mention that the correct delivery procedure is essential for the functioning of the process. A delivery procedure consists of the procurement procedure, as well as the execution procedure. With the delivery procedure the shape of the project organization is formed. Or, if the client wants the project's operating system to function in a certain way, the delivery procedure should be

supporting that function. Hence, it is strange that not much is known yet about the delivery of a programme as a whole or the delivery of multiple projects at the same time. Two articles touch upon the advantages and disadvantages of a so-called bundled procurement approach in which multiple projects are bundled, procured, and delivered together. Two advantages of using a bundled procurement approach are discussed by van den Hurk et al. (2016): Firstly, when a series of projects is procured at the same time, clients, contractors, and politicians have more certainty that their projects will be realized in the foreseeable future. Secondly, with a bundled procurement approach the procurement process is only gone through once, causing a big lowering of transaction costs. Estache et al. (2011) touch upon an important disadvantage of a bundled procurement approach. When projects are bundled, the competition might decrease, which can ultimately result in higher cost or lower quality because of the strong position of the contractor.

Obviously, the extent and objective of a programme are of great influence on whether which procurement method is the best. Unfortunately, most organizations that use programme management still procure in the traditional way: project-based. A programmatic delivery approach is a new way of procuring and is not used extensively yet. However, developing from a project-oriented procurement approach to a programme-oriented procurement is not straight-forward. Several different elements play a role in this development, namely, organizational strategy, portfolio configuration aspects, programme procurement aspects, procurement regulation and characteristics of project-oriented organizations (Vosman et al., 2019). Vosman identified the barriers that occur or can be expected in the previously mentioned elements, when developing from project-oriented procurement to programme oriented procurement. These barriers can be clustered in system level-, organizational level- and relational level barriers. The system level relates to the operating of the industry itself. The organization level relates to the operating within the client organization. The relational level relates to the cooperation or collaboration between the client and the contractors (Vosman et al., 2019). Accordingly, the solutions to overcome these barriers are presented. This includes an elaboration on who should be the initiator of this solution. Finally, based on the found solutions, five main drivers to a programme delivery approach were stated. A quick overview of the barriers can be seen in Table 2. A more elaborate version can be found in the thesis 'From project to programme: drivers to a programmatic approach in the Dutch construction industry' (Vosman et al., 2019).

Table 3: Barriers towards programme procurement (Vosman et al., 2019)

System level barriers	Organization level barriers	Relational level barriers
Tension between requirements and innovation.	Governance geared to project-based operations.	Low level of trust between client and contractor.
Continuous competition.	Lack of clear ambitions and strategy	No motive to share knowledge.
Lack of continuity or innovation.	Implementation process is underestimated.	Different interest of client and contractor.
Insufficient portfolio volume.	Negative perception of regulations.	
Challenging capacity allocation.	Insufficiently trained employees.	

Based on the above barriers and their respective solutions, five drivers to programme procurement were elaborated (Vosman et al., 2019):

1) Clarify ambitions and strategy.
2) Use project-transcending governance.
3) Use market consultations.
4) Use framework agreements.
5) Appoint responsible change managers.

These drivers form the baseline towards a programmatic delivery approach.

4. RESULTS

Now the research methodology and background theory are clear, the results of the research can be presented. This is done in chronological order, which also adheres the order of the four parts of the research objective.

4.1. Definition of a programmatic delivery approach

It is important to demarcate the definition of a programmatic delivery approach for the remainder of this research. Hence, this was also the first objective of this research. As the background theory showed, the intensity of the programme and its management can vary. However, because this research is an exploration to a programmatic delivery approach, there is no focus on a certain programme type. If there would have been a focus on a certain programme type, the possibly exists that the results cannot be applied on all programme types, which would have been regrettable according to the researcher. Based on the challenges presented in the introduction and the findings in the background theory, the researcher decided on three aspects that had to come back in the definition: 1. A programme consists of multiple engineering and construction works (Pellegrinelli, 1997), 2. The delivery of a programme comprises "the roles and relationships between the participants (organizational structure), the timing and sequence of events and practices and techniques of management (operational system), and the contractual responsibilities (contractual relationships) for defining, designing and constructing the programme" (Mesa et al., 2019, p. 396), 3. The complete body of works in the programme should be procured at the initiation of the programme and the executing parties should also be selected at the initiation of the programme (Van den Hurk et al, 2016). Without integration of these three aspects, cross-functional, cross-project and cross-company collaboration essential, agreeing common goals and adopting cooperative partnerships is seemed to be a lot more difficult. Therefore, the used definition for a programmatic delivery approach in this research is as follows: *a process, encompassing the organizational structure, operational system, and contractual relationships, in which all engineering and construction works within a programme are delivered in one bundle by parties that are selected at the initiation of the programme.*

By delivering the entire programme in one go, a long-term, intense collaboration is built between the client (or programme-owner) and the contractor. Potentially also the designing/engineering firms, suppliers and other companies on the construction industry could join this long-term, intense collaboration whenever this suits the programme objective best.

4.2. Literature review of similar methods

In the first data collection, five similar delivery methods were analysed. Below, the basic properties, main advantages, and main bottlenecks of all five methods are presented.

Framework Agreements (FA)

Firstly, framework agreements are discussed. A FA is defined as an agreement between one or more clients and one or more contractors or suppliers. This agreement can be seen as an umbrella agreement in where different projects are stored in separate work packages (Glover, 2008; Gale, 2013). In this agreement standard tariffs are captured for repeated purchasing of simple services/work and goods/products. This means that the contractors are selected in a single procurement procedure, agreeing to the standard tariffs (Giosa, 2020). During the duration of the agreement all contractors can be contacted for call-off contracts for projects that fit in the procedure. This method ensures central purchasing and causes a significant reduction of lead time and transaction costs (Karjalainen, 2011). Namely, in the regular situation, every single project had to go through a procurement procedure. Advantages of FA are contractual certainty, greater commitment by all parties, early involvement of parties, price efficiency, and reduced transaction costs (Glover, 2008; Gale, 2013; Giosa, 2020). A bottleneck is that FA could lead to low level of competition (e.g. bid rigging and collusive behaviour) (Lam & Gale, 2015; Giosa, 2020).

Alliancing (AL)

Secondly, the concept of alliancing is introduced. An AL is a partnering agreement between multiple parties. Every party in the agreement complements the AL and thus provides added value. A performance driven approach in which a no-dispute and no-blame culture exists, is key (Nalewaik & Mills, 2018). This is all possible because of an integrated team which makes unanimous decisions on important issues (Pargar et al., 2019). Main principles of the method are pain/gain sharing, open communication and mutual goals and objectives (Jefferies et al., 2014). Advantages of an AL are reduced energy expended in administrative routines, multiple possibilities for innovation and flexibility and the number of claims can be expected to be minimum (Elemans, 2016; Nalewaik & Mills, 2018). Bottlenecks are that the client is more exposed to risks. Full effort and commitment from all actors are necessary, which places a high demand on senior executives of the actors. This causes that expansion of AL is difficult (Walker et al., 2015). Lastly, the tender costs of AL are relatively high (Elemans, 2016).

Public Private Partnerships (PPP)

Thirdly, a public private partnership is elaborated. A PPP is a long-term partnership between a public sector client with a private sector party. A PPP characterized itself by the transfer of risk from the public party to the private party. This usually means the project can be seen as an investment by the private party. Therefore, most of the times the PPP is issued for the entire lifetime of an infrastructure asset (Çigdem Demirel et al., 2016). In the operating phase of the asset, there is a possibility to earn money back what was invested in the project. A PPPs mission is to realize added value: a better-quality end-product for the same expense or a same quality product for a lower expense. The private party could choose a higher quality end-product to have less maintenance costs in the operating phase (Leiringer, 2006). Also, PPP can be seen to enhance private sector efficiency, cause business growth opportunities for the private sector and cause market penetration and innovation opportunities for the private sector (Robert et al., 2014). Two advantages of a PPP are shared risk between parties in the PPP and enhanced partnership between public and private parties (Tang et al., 2019). A bottleneck for PPPs is that multiple disincentives exist within a PPP when, for example, deadlines are missed, or the performance of the asset is experienced too low (Clifton & Duffield, 2006). The costs for participation are usually high, which causes limited competition if the project is large (Bing et al, 2005).

Innovation Partnerships (IP)

Fourthly, the relatively new innovation partnership is explained. An IP is a development procedure in which a client can develop a new product/service with another party. This means a long-term collaboration in which the client creates a market-pull on innovation for a certain product (Rasenberg & Hofmeijer, 2018). In this partnership, the client and one or more parties start a development phase in which the knowledge of all parties is bundled, and a prototype is developed. After this, the prototype can be tested and validated whereafter the client can purchase the 'innovation' (Innovation-procurement, 2015). Advantages of an IP are engaging of Small-Medium sized enterprises (SME) in the innovation process, faster innovation solution generation and an increase in innovative solutions (Eadie & Potts, 2016). A bottleneck is that conflicting motives and cultures can occur between parties in the IP (Brogaard, 2019).

Integrated Project Delivery (IPD)

Fifthly and lastly, integrated project delivery is described. IPD is a relational contract that emphasizes the process instead of the product. This means that all parties in the agreement are involved early in the project and that the people, systems, business structures and practices of all parties are integrated (Streamer, 2016). The heart of the project is a core group consisting of members from all organizations in the project, that makes day-to-day decisions unanimously (El Asmar & Hanna, 2012). This core group can also be called a virtual intertwined organization, in which virtual means not actually an organization but only for this project (Streamer, 2016). The IPD practice reduces the number of project-changes, lowers the number of conflicts and disputes and drives waste out of the project (El Asmar & Hanna, 2012). A main principle of IPD is the risk/reward sharing amongst all parties and the jointly developed project objectives. Advantages of an IPD reach widely: Incentives can be created for exceptional results. Also, the operational and maintenance costs can be reduced. Additionally, waste can be reduced due to better planning and shared costs (Roy et al., 2019 & Piroozfar et al., 2019). Two

bottlenecks of an IPD relate to the novelty of the method. The integration of information and knowledge management systems between all participating companies can be troublesome. Also, the relational approach to the project is new for most companies and employees and their inexperience could lead to some problems (Roy et al., 2019).

Besides the basic properties, main advantages, and main bottlenecks, also a thorough analysis of all five methods was performed on the eight process characteristics: decision-making, client properties, initiation process, procurement process, execution process, parties, collaboration and goal-setting. The results of the literature review are compared to the definition and characteristics of a programmatic delivery approach. Based on the findings of other methods that seem to fit best within a programmatic delivery approach, preliminary conclusions were drawn up. To show how this comparison has been done and de conclusions were drawn up, two examples will be given.

Example 1: In a programmatic delivery approach the client will form a long-term (the duration of the programme) relationship with the executing parties of the programme. Then, the literature showed that within Framework Agreements it is essential that the client must be able to make a strategic shift from project procurement to long-term relationships. On top of that, functions of employees within the client organization could change and the client must be willing to accept this and (re)train its employees. Based on this information from Framework Agreements, the preliminary conclusion can be drawn that if the client want to pursue a programmatic delivery approach, it must be able to make this strategic shift and be willing to (re)train and refunction employees.

Example 2: In a programmatic delivery approach the focus lies on achieving overarching objectives. Then, in the literature, a Framework Agreement's goal is to order multiple individual projects/activities to a contractor in the agreement, no more, no less. This does not correspond with the principles of a programmatic delivery approach, so for this characteristic, another method's principles should be used. This was done for all characteristics and methods, leading to the preliminary conclusions.

4.3. Verification of the preliminary conclusions

As discussed in the research methodology, the preliminary conclusions from the literature review on similar methods are verified on practicality in a programmatic delivery approach. This is done with a survey that was conducted under senior experts of Witteveen+Bos in the area of contracting and procuring. As discussed before, seven experts participated in this survey. The start of the survey tried to create a baseline for the knowledge of the participants on a programmatic delivery approach. This was done by asking for the essence of a programmatic delivery approach. Answers varied between a long-term collaborative approach to efficiency and optimization enhancement and to increased value by the bundling and/or upscaling of projects. These aspects touch upon the definition and characteristics of a programmatic delivery approach and this shows that the respondents have the desired knowledge on this topic to be an added value for this research. Secondly, the respondents were asked to rank the analysed methods, based on which method showed the most similarities to a programmatic delivery approach. The final ranking was as follows: 1. Framework Agreement, 2. Integrated Project Delivery, 3. Innovation Partnership, 4. Public Private Partnership, 5. Alliance.

The remainder of the survey consisted of the verifying of the found preliminary conclusions from the literature review of similar methods. Overall, the majority of the statements were endorsed by the experts, unanimously or by the vast majority. In general, whenever the experts were not sure about their vision to a statement, their main explanation was that in a programme work is organised flexible and dependant on programme content, context, and objectives. Finally, there were a few statements to which the opinions of the experts had no consensus at all, and their visions varied a lot. The final conclusions of the literature review, combined and altered with the verification results of the survey are presented in Table 4 on pages 14 and 15.

Table 4: Final conclusions for characteristics of a programmatic delivery approach

Characteristic	Programmatic delivery approach
Decision-making: In what situation can the decision be made to use a programmatic delivery approach.	• The client foresees multiple construction-activities or execution-contracts (or else formulated: projects) and is willing to bundle these projects in one programme. • The projects should preferably show similarities since upscaling and the coupling of projects is possible more easily. Also, the supply chain will consist of similar partners for the entire programme duration. However, a successful programme is always dependent on the objectives, so if a project can contribute to achieving the objectives, there should be a possibility to add it to the programme. • The programme must comprise overarching goals, because otherwise the need for a programmatic delivery approach is not present. A programmatic delivery approach is more beneficial when the programme comprises ambitious overarching goals (as in a heartbeat-programme), but it is also beneficial in a less ambitious programme.
Client properties: What properties must the client have to choose a programmatic delivery approach	• It can be useful to have some experience in practising programme management, especially when the client wants to pursue a programme with ambitious overarching goals. However, experience should not be a requirement to practise a programmatic delivery approach, every client should get the opportunity to deliver a programme for the first time for, also without experience. Whenever this is the case, then it is advised to have the right controlling measures, guidance, and supervision during the entire process. • Employees of the client that participate in this programme must be trained in programmatic thinking. • The client organization should be able to work project-oriented and programme-oriented at the same time. However, a good organization and division between disciplines within the client is needed. Nevertheless, some experts state that a lot more flexibility is needed in a programme-oriented organization and quite some struggles could occur if the client has both orientations. • The client must have capacity and willingness to participate in the collaboration team for a long period of time.
Initiation process: On what timestamp is the choice made for a programmatic delivery approach and when/how does the process start.	• The definition of the programme and its contents could potentially start with a consultation of the market, because then the programme can better connect to the market. However, as some experts state, it must also be noted that the client is always the owner of the programme and that the client must be aware that the contents and end-product of the programme is their wish. • The client must elaborate the programme in outline prior to the procurement process. Otherwise, an open question is too difficult and too risk full. However, it is advised not to fill in too much of the programme, because it might be that innovation and development opportunities are missed when this is done. On the other side, experts state that it can have strength to jointly elaborate on the programme together with the market. • The formulation of overarching programme objectives can be done by the client in cooperation with participating parties/combinations, but it is not per se necessary. However, some experts state that the formulation of the overarching objective should be done by the client, but with the formulation of the subobjectives and determination of the feasibility of these objectives the participating parties/combinations can play a vital role. • the parties in the collaboration should be involved early in the process. This means that there is plenty of time to build trust, comfort, commitment, and familiarity among the participants.

Characteristic	Programmatic delivery approach
Procurement process: What procurement procedure fits a programmatic delivery approach.	• The procurement of a programme is different to the procurement of a project because the scope and goals of a programme are also different. However, the client is stuck with applicable procurement principles and legislation. • The programme itself can be procured at once, but the single projects are not specific enough yet at the start of a programme. Therefore, these single projects must be procured separately (for example, in a mini-tender), whenever this project is ready for execution. However, some experts argue that the client could procure all content of the programme at once if the content of all projects is clear. • The procurement of a programme should contain a dialogue phase. • The mostly mentioned selection-criteria are communicative competences, collaborative competences, and innovative capability. • The mostly mentioned award-criteria are degree of adaptivity and experience with projects as in the programme.
Execution process: What does the process look like after the procurement (design phase, preparation phase and realization phase, exploitation phase).	• The projects not necessarily need to be executed consecutively. This is fully dependent on the objectives of the programme. If the projects are executed simultaneously, there are still plenty of ways to achieve cross-project learning. For an optimum learning curve, projects should be executed consecutively and have a small parallel overlap. • The addition of projects/activities to the programme in a later stage should be prevented, since this merely causes high demands on the flexibility of participants. However, if a project can highly contribute to the achievement of the overarching programme objective, it can be considered to add this project to the programme.
Parties: Which parties join the collaboration agreement.	• The number of contracting parties/combinations is dependent on the extent and objectives of the programme. Some experts mention that the client could opt for a minimum of 3 parties, so there is encouragement to perform better. • Multiple parties could be part of the collaboration agreement: Client, contractor, designer, engineer, supplier, contract manager, process manager, jurist, and financing party. Some experts conclude that only the client, contractor, and designer (potentially engineer and supplier) should enter the collaboration. Others state that all parties could enter the collaboration but that it is all dependent on the programme objectives and extent. • The overall strategy of participating parties/combinations does not necessarily need to comply with the set programme objectives. However, the experts mention that there should be at least sufficient similarities and points of support of the parties' vision in relation to the programme objectives.
Collaboration: How is the collaboration established.	• The vast majority of experts state that a virtual intertwined collaboration combination with a core team consisting of employees of the different participants of the collaboration has a lot of advantages, since decisions are taken together with all parties, consulting the interests of all parties. However, two experts mention that the programme objective can well be achieved without having a highly intensive collaboration. • The use of open book accounting across all parties drives the programme's focus on the objectives instead of money. • Open communication between all parties in the programme is also found essential since this creates consciousness of all parties' interests and because this creates maximum potential for the learning process. • A pain/gain and risk/reward sharing approach can be considered to create trust in the collaboration. However, some experts state that this could potentially lead to wrong incentives.
Goal-setting: How are goals and objectives set for the programme and the agreement.	• Having an overarching programme goal is essential. Having an overarching goal keeps all participants sharp and faced towards this goal. • Intermediate goals and project goals are also essential. Without intermediate goals and project goals it is too difficult to keep track of the progress towards the overarching goal.

Two aspects where no consensus was reached by the experts were about the degree of intertwining for the collaboration form and about whether the method of collaboration should be focused on the competences of participants and/or the objective of the programme. Since these two aspects are related, they were combined and featured in Figure 2. The degree of intertwining was set on the X-axis while the focus of the collaboration was set on the Y-axis. By doing this, four quadrants were created that all represent a form of collaboration. Figure 2 shows a tendency towards quadrant 2: using an intertwined collaboration combination does offer advantages. Also, the method of collaboration and the type of participants in a potential intertwined collaboration combination are more dependent on the objective of the programme, rather than the participants' competences. However, it is interesting to see two results that are outliers.

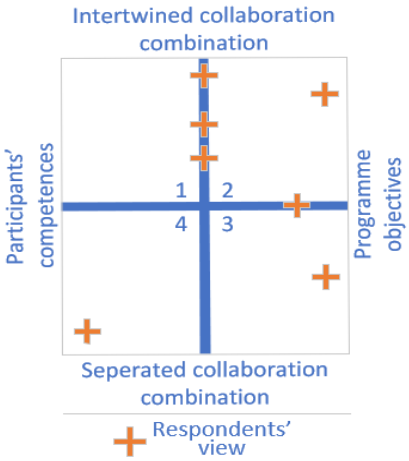

Figure 2: Survey results regarding collaboration form

4.4. Guideline for a programmatic delivery approach

Now that the final conclusions of the literature review and the survey are known, the third and final objective of this research can be achieved: The development of a hands-on product that can be used by engineering firms to advise the client when delivering a programme. This hands-on product can be called a guideline for a programmatic delivery approach. This guideline consists of two products. The first product is a directory that has two purposes: firstly, to decide whether a programmatic delivery approach is feasible considering the given preconditions. Secondly, the follow-up stages after the decision is made for a programmatic delivery approach (initiation-process, procurement-process, and execution-process) are put together in a roadmap. On the different stages of the roadmap, a summation of attention points at this stage is given. These attention points are important to, at least, touch upon in this stage of the process. The second product is an overview of the four potential collaboration forms that can be chosen for the execution of the programme. These four potential collaboration forms are based on the quadrants as discussed in the previous section. This second product helps engineering firms in guiding the client in choosing a preferred collaboration form.

The directory (see Figure 3 on the next page) starts with the decision-making where is checked whether the right boundary conditions for a programmatic delivery approach are present. This is done by identifying project characteristics and client properties as were the outcome of the literature review and survey. If this identification comes out low, then the client should probably be advised to choose a different project delivery method and procurement procedure. If the identification is high, then a programmatic delivery approach might be the right method to approach this programme. If the identification is medium, then a programmatic delivery approach might still be suitable, however, then it can be smart to consider advising several controlling measures to ensure a successful process. These controlling measures are derived from the survey results. Next, for the initiation-process of the programme, two paths are defined. This is done, because in the survey, the experts were not unanimous on whether the market should be consulted with defining the programme and its (overarching) objectives. The difference between the paths lies in the client being self-sufficient or having a market consultation and consulting of market parties for the development of (overarching) programme objectives. By defining two paths, the engineering firm can advise the client to choose the path that fits the best in this case.

After the programme and its objectives are defined, the procurement process is elaborated. In this procurement process, the mostly mentioned selection criteria that could be used to create a pre-selection of parties: communicative competences, collaborative competences, and innovative capability. Then, the dialogue-phase is conducted with participants. In this dialogue-phase, the overarching programme objectives/goals, intermediate goals and the submitted proposal can be discussed and negotiated. Finally, a number of participants can be elected based on proposed selection criteria. Criteria to consider as a client are degree of adaptivity and experience with projects/activities as in the programme. When the parties with which the programme will be executed are being selected, a programme collaboration form can be chosen. Obviously, an interaction between the party selection and the collaboration form is

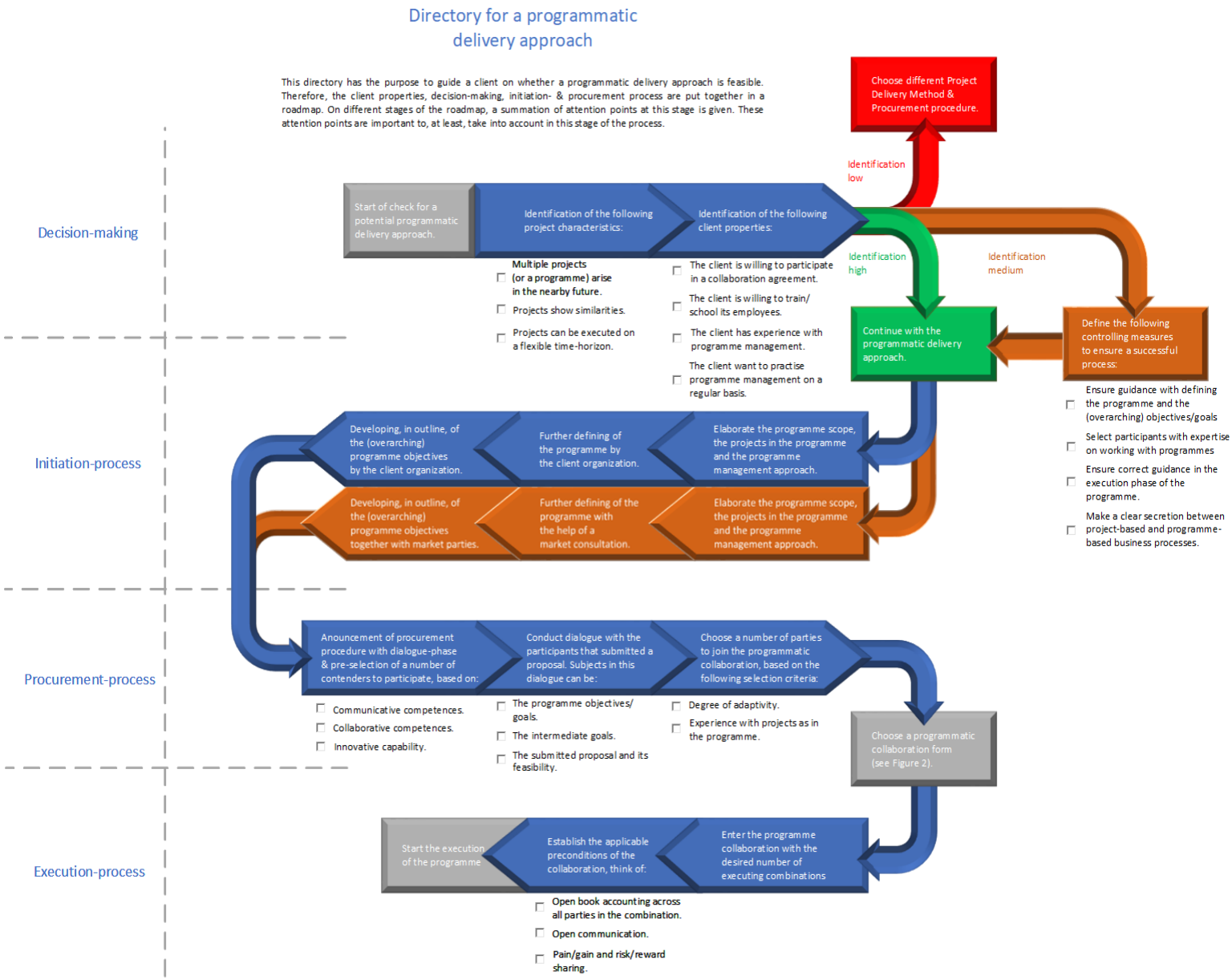

Figure 3: Directory for a Programmatic Delivery Approach

present. Advising the client on the potential collaboration form can be done with the help from the second product of this research, which will be explained in shortly. The final part of this directive treats the execution-process of the programme. Firstly, the client can enter the programme collaboration with a number of executing combinations. The number of contracting parties/combinations is dependent on the extent and objectives of the programme. Finally, the applicable preconditions of the collaboration can be established. Potential preconditions that came from the survey are explained.

The second product of this research treats the potential collaboration forms during the execution phase of the programme. Earlier in this paper, the results of the survey showed that there was no consensus on the most suitable collaboration form for a programme delivery approach. Four possible options for the collaboration form were distinguished by having a high or low degree of intertwining and having the focus on participants' competences or programme objectives. Figure 4 (on the next page) shows all four options for the collaboration form. The top of the figure shows the characteristics/attention points that are relevant for all four collaboration forms. The remaining part of the figure focusses on the basic characteristics/attention points of the single options. On the next page, all four collaboration forms are shortly explained:

1) Option 1, Competence-focussed intertwined collaboration: This collaboration form is intertwined, meaning that a highly intensive collaboration is established by integrating the people, structures, and systems of all participants. The participants in this collaboration are chosen based on their competences to deliver specific parts of the projects in the programme.
2) Option 2, Objective-focussed intertwined collaboration: This collaboration form is also intertwined; however, the participants are chosen based on their potential contributions towards the (overarching) programme objective.
3) Option 3, Objective-focussed separated collaboration: The participants of this collaboration form are chosen based on programme objectives. The collaboration is, however, not as highly intensive as in the previous two options. Namely, the integration of people, structures and systems of all participants does not take place.
4) Option 4, Competence-focussed separated collaboration: In this collaboration form the integration of all participants does not take place. Also, the participants are selected on their capability to deliver specific parts of the programme.

With both these products, a hands-on guideline for engineering firms to advise clients with the delivery of programmes, both in the decision-making and in the following phases.

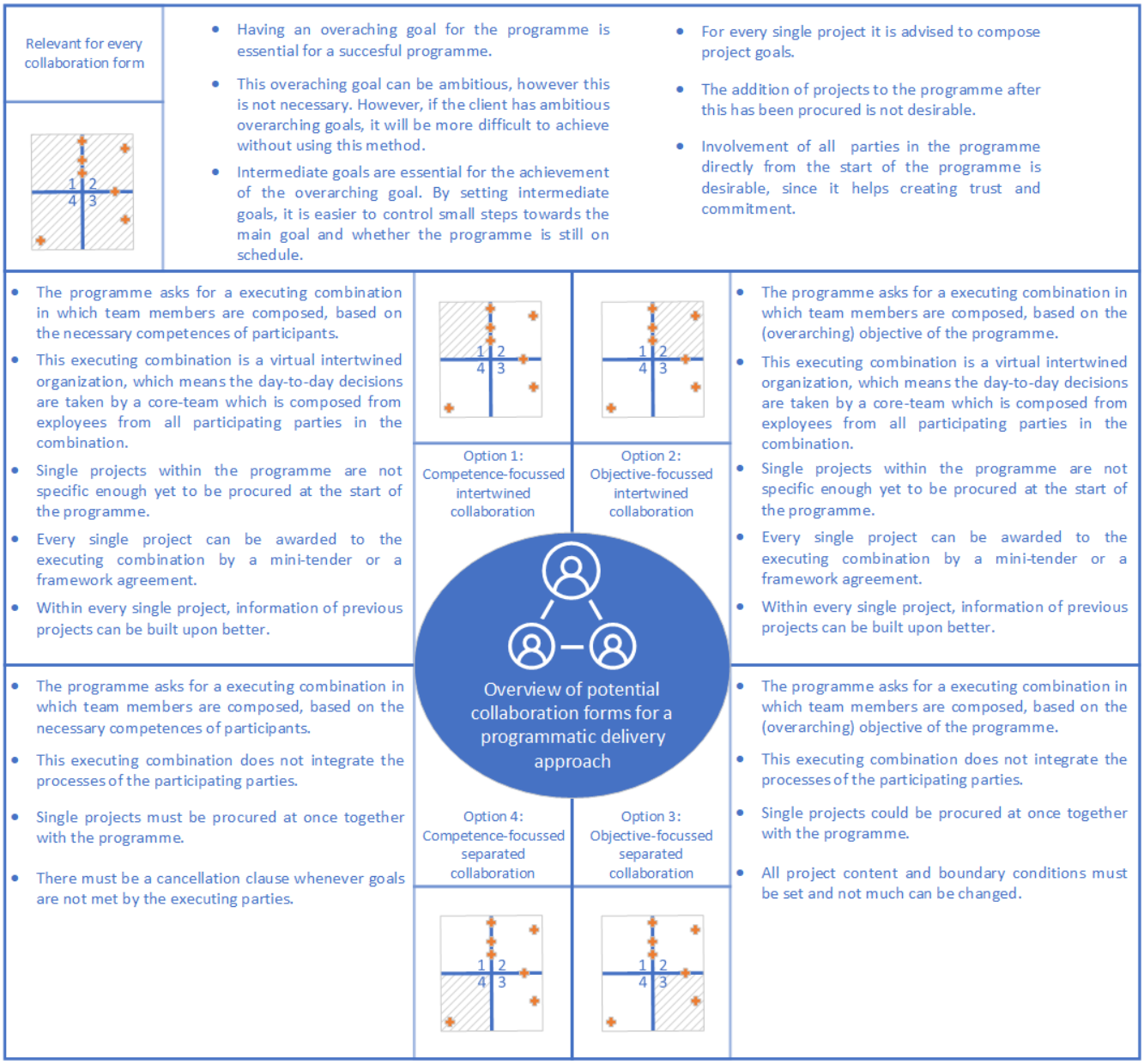

Figure 4: Overview of potential collaboration forms for a Programmatic Delivery Approach

5. DISCUSSION

5.1. Potential collaboration forms for a programmatic delivery approach

Regarding the difference in vision of the experts on the preferred collaboration form for a programmatic delivery method, it is reckoned that this is caused by the way of viewing a programme by the experts. As discussed in the theoretical background, some variating types of programmes exist. For example, collaboration option 2, an objective-focussed collaboration form, shows similarities with programme type 3 and 4, a goal-oriented and heartbeat programme. In these programmes the focus lies on achieving overarching goals, or even ambitious overarching goals. These programmes are less likely to be successful whenever the cooperation between the involved parties is not intense. Collaboration option 1 and 3 on the other hand, shows similarities with programme type 2, a portfolio programme, where the sole goal is to deliver this portfolio projects more efficiently, possibly by creating a handy innovation. In these kinds of programmes, a good cooperation is wishful, but certainly not as intense as in programme type 3 or 4. Finally, collaboration option 4 shows similarities with programme type 1, a single-objective programme (or a mega-project). In this option all single projects or sub-activities are procured at once and the sole goal is to deliver this mega-project as efficient as possible, timewise, and finance-wise.

5.2. Drivers towards a programmatic delivery approach

It is interesting to look back to the baseline of a programmatic delivery approach: the research performed by Vosman et al. (2019) on the shift from project-based to programme-based working in the construction sector. They identified five drivers towards a programmatic delivery approach. This research has gained many insights on the delivery of programmes. Therefore, these five drivers are revisited by strengthening, retaining, or toning down the driver:

1) *Clarify ambitions and strategy (Retain)*: This driver is the most important for a programmatic delivery approach. When a client has clear ambitions and a clear strategy, it is easier to develop overarching goals for a programme so the ambitions and strategy can be achieved.
2) *Use project-transcending governance (Retain)*: If a client wants to use a programmatic delivery approach, it must certainly pursue project-transcending governance. Without project-transcending governance (and cross-project learning) the benefits of a programmatic delivery approach are a lot less.
3) *Use market consultations (Retain/Tone down)*: As stated before, this research found out that quite some experts are hesitant on the use of market consultations. This is probably caused by the fact that a lot of market involvement can cause problems regarding procurement legislation and policy. However, the use of market consultations could be useful for the alignment of the programme scope and objectives with the market.
4) *Use framework agreements (Tone down)*: It is true that a framework agreement is a great tool for the procurement of multiple similar projects. However, with a framework agreement, a highly intensive intertwined collaboration form might be difficult to achieve. Namely, the strength of a framework agreement is the use of fixed unit prices, however, in a large programme multiple things can change over time and having certain things fixed from the start of the agreement seems difficult. A slight alteration to the framework agreement could solve this.
5) *Appoint responsible change managers (Strengthen)*: The appointment of a change manager, or rather a change pioneer could be very useful. If a change pioneer's task is to drive the client organization towards a programmatic delivery approach, the client organization and its employees will probably be more committed towards this approach. This change pioneer should also push the client organization into the use of a programmatic delivery approach.

5.3. Do's and don'ts for a programmatic delivery approach

In the survey-closing the experts were asked for three tips for clients who would like to practise a programmatic delivery approach. They were also asked when they would not advise to use a

programmatic delivery approach. These answers were interpreted and the do's and don'ts that were given by experts the most often were recorded. To start, the most common tips are analysed:

1) *Have a clear overarching programme goal*: This tip is partly overlapping with the first driver to a programmatic delivery approach and partly overlapping with the definition of a programmatic delivery approach. Indeed, it seems like having a clear overarching goal for a programme, makes the use of a programmatic delivery approach very useful.
2) *Ensure broad and sufficient embedding of the programmatic delivery approach in the client organization*: This tip completely relates to driver 5 and is obvious. Whenever the participating employees of the client organization do not embrace this method, the potential success of the programme is ought to be low.
3) *Utilize market parties in the development of this new method and make clear what is expected from all market parties*: This tip partly relates to the third driver and is also very important, because otherwise the method will probably not connect to the market as good as could have been. However, it is odd that some experts state that the client must elaborate on the programme delivery approach themselves instead of involving the market with this. In several analysed similar delivery methods, a joint objective elaboration is the main cause of the success of the delivery method. When the market is involved in the development of the programme, the programme is better tailored to the market. Also, the interests of all market parties can be included in the development of the programme, making participation in the programme more interesting and rewarding.

Below, the most common comments for discouraging the use of this method are analysed:

1) *If the context and overarching goals of the programme are not clear or if the context and goals do not fit this approach*: Without a clear ideology or dot on the horizon for the goals of the programme, it is unclear for participating parties what the programme is aiming for. Then, it indeed seems that it will be difficult to achieve a successful programme delivery.
2) *If there is not enough commitment from the client organization or if the client is hesitant to change its structures/processes*: This relates to the willingness of the client organization. If the client organization is not 100% committed to try this new programme delivery approach, it seems unlikely the programme delivery will be a success.
3) *If the programme is straight-forward and there are few spaces for (goal-)development*: This is an interesting comment, since all programmes can be executed with a programmatic delivery approach. It may be that a more innovative programme better suits this approach, but only exploring with the actual use of this method can answer this.

5.4. Call for action

A programmatic delivery approach is possible with all programme types. However, programme type 3 and 4 (goal-oriented or heartbeat programmes) will be very hard to succeed without a programmatic delivery approach. Unfortunately, the development of a type 3/4 programme is not done that often, since it requires a lot more effort and investment from the client organization. Meanwhile, the two external challenges as mentioned in the introduction of this paper, seem perfectly fit for shaping a type 3/4 programme. Sustainability and circular economy advancement, as well as emission-reduction are perfectly suitable (ambitious) overarching programme objectives. On top of that, there is no more time to lose regarding these two challenges. The execution of programmes containing overarching objectives regarding sustainability and circular economy advancement and emission-reduction must start on a short term. This research can provide tools to help start up and deliver a type 4 programme and show that it is not impossible to execute this type of programmes. Hopefully, this research can help engineering firms will trigger engineering firms to try activating client organizations to use this approach. Or even better, it could be regarded by clients as a call for action that the change from a project-based delivery approach towards a programmatic delivery approach should happen, the sooner the better.

6. CONCLUSIONS AND REFLECTIONS

6.1. Conclusions

In this research, an exploration towards a programmatic delivery approach was performed. This was done by, chronologically, *developing a definition of a programmatic delivery approach, investigating client properties that suit a programmatic delivery approach, determining the application characteristics of a programmatic delivery approach, and developing a hands-on product for advising a programmatic delivery approach*. By performing these activities, the following research question can be answered: *What is a programmatic delivery approach and how can this approach contribute to overcoming major challenges in the construction industry?*

A programmatic delivery approach can be described as a process, encompassing the organizational structure, operational system, and contractual relationships, in which all engineering and construction works within a programme are delivered in one bundle by parties that are selected at the initiation of the programme. This process comprises several phases: the decision-making phase whether a programmatic delivery approach is possible, the initiation process where the programme and its objectives are defined, the procurement phase in which the participating parties for the programme are selected, and the execution phase where the execution of activities in the programme is performed. For every phase, this research found attention points that should be paid attention to. These attention points are captures in a guideline that consists of two products: a directory and an overview of collaboration forms. These two products can be used by engineering firms when advising a client organization on a programmatic delivery approach. In the decision-making phase advantageous project characteristics and client properties are found. If these project characteristics and client properties are not (largely) present, the engineering firm should advise the client that a programmatic delivery method is probably not the right method for this situation. If the characteristics and properties are partly present, a programmatic delivery method might still be the correct method to use, but the client could be advised to consider certain controlling measures to ensure a successful process. If the characteristics and properties are fully present a programmatic delivery approach could be the correct method.

Whenever the decision is made to use a programmatic delivery approach, the initiation of the programme can start. In this phase, the client can choose two paths: the first path in which the client organization fully decides themselves on the programme scope, definition and (overarching) objectives. Or the second path in which the programme scope is defined by the client, but the further programme definition is done with the help of a market consultation and the (overarching) programme objectives together with market parties. The choice of which path to take is completely to decide by the client, but factors as experience with programmes and the extent and content of the programme could be used by the engineering firm to advise the client on a path-decision. During this programme definition-phase, the procurement of the programme can also start up. In this procurement process parties could be pre-selected based on, for example, communicative and collaborative competences, as well as innovative capability. These criteria are ought to be essential when delivering a programme with multiple parties. Also, it is found essential to have a dialogue phase in the procurement process. Since the collaboration will be long-term, having a dialogue in the procurement process helps all parties aligning their vision on the programme, objectives, and interests. When selecting the parties to enter the collaboration the client can be advised on a collaboration form. This collaboration form can be intertwined or separated and focused on participants' competences or programme objectives. The activities in the programme can be executed by only one preferred combination, but the activities can also be divided under multiple combinations. The collaboration form and number of combinations can be advised by the engineering firm, based on the information on the programme and client properties. Lastly, in all situations, the use of open book accounting, open communication and pain/gain & risk/reward sharing can be considered to endeavour a smooth, successful delivery of the programme.

When client organizations around the globe eventually start using a programmatic delivery approach, the internal challenges of the construction industry (rewiring of current contracts or developing of new contracts, increasing the amount of innovation and cross-functional cooperation, and increasing cross-project knowledge transfer and cross-project cooperation) are more likely to be overcome. A programmatic delivery approach consists of multiple characteristics that enables cooperation between parties in the construction sector on multiple facets. Also, a programme, consisting

of multiple projects, can be seen as the perfect environment to practise innovations, and practising cross-project knowledge transfer. Regarding the two external challenges (more sustainable and circular construction industry, and reduction of greenhouse gas-emissions), an elaborated approach and advisory role of engineering firms on a programmatic delivery approach could lead to the realisation of programmes that tackle these challenges.

6.2. Contribution to theory and implication of results

This research contributes to the literature on the delivery on programmes in the construction sector. A definition of a programmatic delivery approach was formulated. Also, attention points in the decision-making, initiation-phase, procurement-phase, and execution-phase are mapped. Finally, the potential collaboration forms for delivering a programme are elaborated. In addition, not necessarily relating to literature on the delivery of programmes, this research contributes to general research in the construction sector by comparing five collaboration-focused project delivery methods. The guideline can be used by an engineering firm when a client needs an advice on whether to use a programmatic delivery approach or not. The attention points in this guideline could also help clients directly in realising what to expect when delivering a programme.

6.3. Limitations and further research

Several limitations still exist for this research. Firstly, the external validity could be enhanced. In this research only experts from the engineering and consultancy firm Witteveen+Bos are consulted. In further research on this topic, experts from different engineering and consultancy firm could be consulted, as well as experts from client organizations, contractors, suppliers, etc. Secondly the generality of this research topic could be augmented: the number of experts that responded in the survey was seven. For this research, since it was an exploration, this number could be sufficient, but for general use of these results in different sectors this number should be raised. Thirdly, because of time limitations it was not possible to validate the guideline. It would have been valuable to test the guideline, internally at Witteveen+Bos on usefulness for advising clients and externally on usefulness for clients when considering a programmatic delivery approach in a case study.

Further research could relate to filling the research limitations as described above. On top of that, further research could focus on the needs of all parties when willing to deliver a programme. Also, it could be researched how clients can be encouraged to change towards a programmatic delivery approach more quickly. Or more urgent: how should a client design a programme with ambitious overarching goals regarding a higher level of sustainability and circular economy principles or lower emission-levels of greenhouse gasses.

COMPETING INTEREST

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