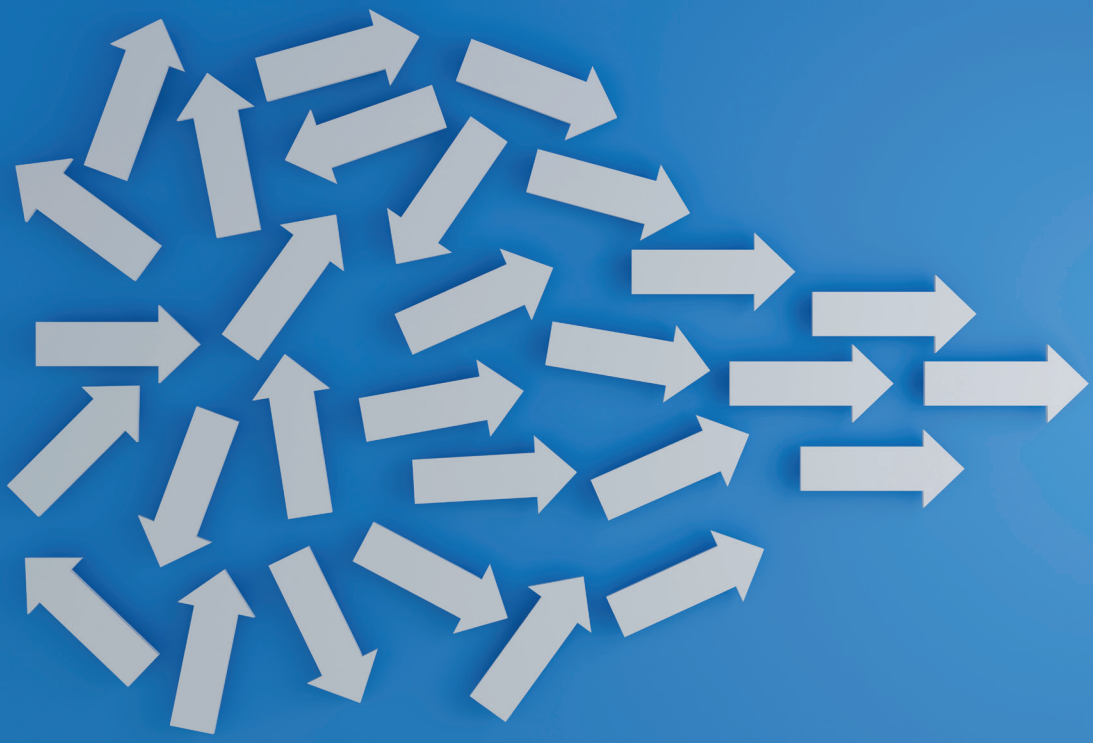
ANNA NIKULINA

Interorganizational Governance in Projects

Contracts and collaboration as alignment mechanisms



INTERORGANIZATIONAL GOVERNANCE IN PROJECTS

CONTRACTS AND COLLABORATION AS ALIGNMENT MECHANISMS

INTERORGANIZATIONAL GOVERNANCE IN PROJECTS
CONTRACTS AND COLLABORATION AS ALIGNMENT MECHANISMS

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Contracten en samenwerking als instrumenten voor afstemming

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Anna Nikulina
born in Moscow, Russia

Erasmus University Rotterdam

Doctoral Committee

Promotors:
Prof. dr. J.Y.F. Wynstra
Prof. dr. ir. L. Volker

Other members:
Prof. dr. ir E.M. van Raaij
Dr. K. Selviaridis
Prof. dr. ir. W. van der Valk

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1. INTRODUCTION

1.1. RESEARCH MOTIVATION

The twentieth century brought an extraordinary amount of change to our lives. In the new millennium, the world is continuously becoming more dynamic, global, and uncertain. The business scene has also become fundamentally different. In the past, firms were looking for stability and growth through vertical integration, whereas now they focus on flexibility and adaptability. Two major trends have evolved in many industries: increased specialization of firms and the omnipresence of projects (Johansson and Olaberría, 2014; Jensen et al., 2016).

Specialization means dis-integration (Feenstra, 2015) and keeping only a narrow range of core competencies 'in-house'. It also means increasing dependence on third parties to develop, manufacture, and deliver products and services to their customers (Suurmond, 2019). Equipped with a set of relational and contractual tools, highly specialized firms have to learn to work with many upstream and downstream parties, often even with competitors. As a result, multiple forms of collaborative arrangements flourish, such as partnerships, alliances, consortia, and joint ventures: temporary and long-term, flexible and binding, bilateral and multi-party – a variety of options that can serve every need (Jones et al., 1997). Complex forms of contracts that can align supply chain parties' interests, such as performance-based contracts (Selviaridis and Wynstra, 2015; Nullmeier, 2019), are applied in many industries, including healthcare, defense, and infrastructure. Naturally, the organizational capability to manage collaborative relationships and develop effective contracts is perceived to be a strategic advantage (Loasby, 1998; Argyres and Mayer, 2007; Allred et al., 2011).

Projectification is another major long-term trend of our time, evolved as a response to the flexibility needs (Lundin, 2016). Projects are essential in

organizational adaptations as they have a unique power for change and action (Lundin and Söderholm, 1995; Bakker et al., 2016). They can also be formed and dissolved more easily than permanent organizations being "more fluid and market-responsive organizational forms" (Grabher, 2002, p. 205). Internal projects allow firms to constantly reshape to sustain competition and survive in the fast-changing world, whereas interorganizational projects play an increasingly important role in value creation (Martinsuo et al., 2019). Such projects bring two or more independent organizations to work together on a shared activity for a limited time and pool scarce resources that firms do not have within their boundaries due to increasing specialization (Von Danwitz, 2018). Naturally, interorganizational governance is also critical in project settings, where multiple parties' motivations, resources, and actions need to be aligned to achieve the desired outcome (Artto et al., 2016).

It is both the increasing importance and sophistication of interorganizational governance, and the rising role of projects that inspired the ideas for my research. The main objective and aspiration of this dissertation is to enrich the purchasing and supply management (PSM) and project management (PM) literature by uncovering how parties can work together more effectively and align their diverging interests, using contractual and relational governance mechanisms. In particular, I intend to discover how organizations can *design* effective multi-party performance-based *contracts*, *learn to improve contracts* in ongoing projects, and *combine* various *managerial practices and behavioural elements* in project collaboration.

Section 1.2 of this Chapter clarifies the research background of the dissertation, and Section 1.3 explains the key concepts and terms. Section 1.4 discusses the applied methods and data collection. Section 1.5 describes the dissertation outline, and Section 1.6 concludes with the declaration of contribution.

1.2. RESEARCH BACKGROUND

1.2.1. Research on the interorganizational governance

The body of literature on interorganizational governance is vast and spreads over multiple theories, methods, and questions, particularly in the organizational and management field (Roehrich et al., 2020a). Research into interorganizational collaboration has established its antecedents, processes, and outcomes (Wood and Gray, 1991; Ring and Van de Ven, 1994; Doz, 1996; Hardy et al., 2003). Furthermore, the role and the importance of contracts have been reevaluated. While historically, contracts were viewed as control and safeguarding devices, research has found that they can play multiple roles, such as coordination, learning, and adaptation (Mayer and Argyres, 2004; Schepker et al., 2014; Selviaridis, 2016).

The organizational and general management literature often investigates relationships in horizontal alliances and the strategic role of contracts (Nullmeier, 2019). PSM research focuses on governance from a different point of view. It examines vertical interorganizational relationships (IORs) such as buyer-supplier dyads or supply chains and studies the applicability and effectiveness of different types of contracts or different aspects of their design and management (Wynstra et al., 2019).

Yet, the PSM literature traditionally examines manufacturing settings, paying limited attention to projects. For example, only a few papers have empirically studied project settings in the focal Journal of Purchasing and Supply Management. In the past decade, only seven published research articles (~ 3%) use empirical data from project-based firms. The transferability of findings from manufacturing to project settings may be limited due to certain specific features of the latter (Lundin and Söderholm, 1995). More project-related studies are needed given the increasing role of projects that often involve complex supply chains (Dainty et al., 2001).

1.2.2. Project settings and context of construction projects

The need for flexibility and adaptability has led to exponential growth in the number of projects in all industries (Lundin, 2016). Nowadays, projects are viewed as vehicles for defining, creating, and delivering value (Vuorinen and Martinsuo, 2019). Construction projects, in particular, play a key role, as buildings and facilities continue to deliver value for their owners and society for many years after their construction (Laursen, 2018; Lehtinen et al., 2019).

Given the importance of construction projects and the fact that this sector is a highly representative example of complex project settings (Dubois and Gadde, 2002; Hartmann et al., 2014), this dissertation investigates the interorganizational governance challenges in the empirical context of construction projects. Several important characteristics of construction projects are highlighted below.

First, both the transformation process and the 'one-off' construction product are complex (Hobday, 2000) due to the uncertain environment, the large variety and scarcity of resources, and the increasing technological sophistication of constructed facilities (Dubois and Gadde, 2002). Second, construction projects' supply chains are complex (Dainty et al., 2001). The economic volatility of the sector has led to high specialization as project owner organizations do not have the resources to design, engineer, and construct buildings and facilities and thus outsource most works (de Arajuo et al., 2017). The input of multiple specialized organizations temporarily brought together is required to deal with the complexity of products (Dietrich et al., 2010; Vuorinen and Martinsuo, 2018). Third, construction projects have a long history of arm-length, often adversarial relationships (Cox, 2001). The industry is fragmented, as clients rarely engage in long-term strategic relationships with contractors to maintain competition and avoid locking into particular technologies (Gadde and Dubois, 2010). Thus, project participants view projects as time-delimited undertakings and do not wish to make

relationship-specific investments, uncertain about future interactions (Heide and Miner, 1992). Fourth, construction projects strongly rely on contractual governance. The challenges of developing collaborative relationships, and the complexity of products, processes, and supply chains, combined with environmental uncertainty, lead to lengthy contracts, which are difficult to negotiate and monitor (Caldwell et al., 2009).

The highlighted features of complex construction projects make this empirical setting fundamentally different from the manufacturing setting typically studied by PSM researchers. This requires a dedicated investigation of the interorganizational governance in such projects. To inform my research and identify topics for the empirical studies, I first conduct a multidisciplinary literature review about the contract strategies in construction projects (see Chapter 2).

1.2.3. Research gaps addressed in the dissertation

Following the insights from the literature review, this dissertation is centred around three research gaps in the existing research, that also are persistent problems in practice: 1) the design of multi-party performance-based contracts and the motivation of parties to engage in them, 2) the ability to improve contracts during ongoing transactions (learning to contract), and 3) the relationship between managerial and behavioural aspects of project collaboration.

Due to high levels of outsourcing in the construction sector, suppliers and contractors play a key role in the project implementation (Berends, 2007; De Arajuo et al., 2017). Project owner organizations heavily rely on contractual governance in managing the relationships with these parties. For this reason, it is critically important to choose effective contracts and properly manage them (Oyetunji and Anderson, 2006). Contracts are behavioural drivers (Selviaridis and Van der Valk, 2019). The offered reward and risks associated with it strongly affect suppliers' ways

of working through which they try to maximize their profit (Cox and Thompson, 1997; Bower et al., 2002). The need to focus suppliers' efforts on the transaction outcome desired by the buyer, in other words, the need to solve the problem of moral hazard (Nullmeier, 2019), has led to the use of performance-based contracts (PBC) in many sectors, for example in healthcare, defense, and infrastructure. In a PBC, at least part of the supplier reward is linked to the achieved outcome/performance defined by the buyer (Selviaridis and Wynstra, 2015). In the construction sector, interest for such 'incentive' contracts surged in the early 2000s, following the increased interest for collaboration. PBCs can incentivize parties towards more collaborative relationships by motivating them to align and work together (Bower et al., 2002).

However, in practice, PBCs bring mixed results in all sectors. Contracts are often misapplied or used in unsuitable situations (Merrow, 2011; Nullmeier et al., 2016). Given the persistence of the moral hazard problem and the potential of PBCs to solve it, operations management, industrial marketing, and PSM research continue to search for ways to make these contracts effective. The existing literature focuses on the antecedents, design, and outcomes of such contracts primarily in the bilateral settings or triads (Sumo et al., 2016; Suurmond, 2019) and has not studied multi-party PBCs or incentive alignment in supply chains (Selviaridis and Wynstra, 2015). At the same time, multi-party PBCs are particularly relevant for complex supply chains that bring together many parties, such as construction projects (Barlow, 2000; Howard et al., 2014). Given the lack of theoretical explanation of multi-party PBCs and approach to their formation, it is unclear how to encourage suppliers to accept a highly uncertain reward that depends on the behaviours and performance of multiple parties. Chapter 3 studies this problem, investigates the design of multi-party PBCs and identifies the factors that motivate parties to engage in these risky contracts.

Contract design is one of the predictors of transaction success (Howard et al., 2014). However, the initial assumptions about the ways of executing the transaction and the parties' motivation and capabilities are often incorrect (Doz, 1996, Reuer and Ariño, 2002). Contracts can also be interpreted differently by the parties (Schwartz and Scott, 2009) and are always incomplete (Lewis and Roehrich, 2009). As a result, they can often lead to disputes (Jaffar et al., 2011). Therefore, it is important to know how to design, manage and, if need be, revise a contract so that it continuously serves as an effective alignment mechanism.

Organizations can improve their contracts over time. In other words, they can learn to contract by engaging in and managing transactions and 'learning lessons' from them (Mayer and Argyres, 2004). Given the importance of contracts as governance mechanisms, research has paid substantial attention to the learning to contract (LtC) phenomenon. However, such studies generally focus on contract design and change of contract texts in-between transactions (Mayer and Bercovitz, 2008; Vanneste and Puranam, 2010). At the same time, if a contract fails as an effective alignment mechanism during a lengthy project, which heavily relies on contractual governance, parties cannot wait for the next transaction to improve the contract text. Contract revisions need to be made during the transaction implementation (Roehrich et al., 2020b).

The literature has paid scant attention to intra-contract or intra-project learning to contract. LtC research is primarily found in the management and organizational literature, which is typically not concerned with the contract implementation phase (Nullmeier, 2019). PSM literature has paid very little attention to the LtC topic in general. Studies on the topic (Selviaridis and Spring, 2018) admit the existence of intra-contract learning but focus on the role of LtC rather than on the learning process. Thus, understanding of the intra-contract learning process, or how parties can dynamically improve the contracts during an

ongoing project, is still missing. Given the importance of contracts as governance mechanisms in complex projects, the second research gap, intra-project learning to contract, is investigated in Chapter 4.

The benefits of collaboration in alliances, supply chains, and projects have been widely recognized. Collaboration facilitates access to scarce resources and development of new products and knowledge (Hardy et al., 2003). It strengthens organizations' financial performance through supply chain integration (Soosay et al., 2008) and is a remedy to low productivity, schedule and budget overruns, and poor relationships (Barlow, 2000; Hartmann and Bresnen, 2011). However, collaboration in construction projects is particularly challenging as it requires collaboration between multiple organizations and can be complex and costly (Dainty et al., 2001; Eriksson, 2015). Moreover, the collaborating parties are mostly exposed to formal, hierarchical, arm-length relationships in the industry, and collaboration requires a fundamental behavioural change (Baiden et al., 2006). Finally, the collaboration is pursued to ensure that the project outcomes desired by the owner are met (Bresnen and Marshall, 2002). These outcomes are strategically crucial for the project owner, who will extract value from the constructed facility for many years (Artto et al., 2016). Yet for the contractors and suppliers it is in most cases just a one-time engagement in their work portfolio. For that reason, project owner organizations need various tools to encourage collaboration and align parties' interests on the project outcomes.

Many collaborative techniques are viewed as 'success factors' of project collaboration (Black et al., 2000). Some researchers stress the importance of integrative mechanisms and 'partnering tools' such as goal alignment workshops and incentives (Bayliss et al., 2004). Others focus on the key role of relational or behavioural elements (Doloi, 2009). However, the respective roles of the relational and the formal, managerial side of collaboration and their " [...] potentially dynamic

and complex interplay" are unclear (Bresnen and Marshall, 2002, p.504). Lack of understanding of how to combine and manage the relational and managerial aspects of collaboration may be a reason why project collaboration often 'stays on the paper' (Rujter et al., 2020). Chapter 5 explores the relationship between two categories of elements to advance theory of collaboration (Wood and Gray, 1991) in the project environment and provide insights into their interplay.

1.3. EXPLANATION OF KEY TERMS AND CONCEPTS

Two types of governance mechanisms form the basis of interorganizational relationships: contractual and relational (Roehrich et al., 2020a). Each chapter in this dissertation focuses on a particular aspect of contracts or collaboration and is linked to a different body of literature and theories. For that reason, relevant theories will be discussed in Section 1.5 that offers an overview of the conducted studies. This section explains the key concepts and terms used in this dissertation.

1.3.1. Contractual and relational governance

Contractual governance can be defined as a " [...] collection of [...] deliberate inter-organizational mechanisms that are manifested in formal (i.e. contractual and enforceable by law) arrangements. Such phenomena can be explicitly observed in the form of written documents and include, for instance: service level agreements and concession agreements" Roehrich (2009, p. 12). **Relational** governance is a "[...] collection of mechanisms that are manifested in socially derived arrangements, such as: norms, custom and practice. These phenomena are not, for the most part, directly accessible through written documents [...] and are not necessarily sanctioned through formal positions (i.e. courts)." Roehrich (2019, p. 15)

The literature often views contractual and formal governance as synonyms and associates relational mechanisms with informal ones (Faems et al., 2008; Cao

and Lumineau, 2015). However, recent research suggests that both contractual and relational governance have formal and informal aspects (Keller et al., 2020). The difference may lie in the interpretation. According to Roehrich (2009), 'formal' is equal to contractual and enforceable by law; and 'informal' – to non-contractual, non-enforceable, socially derived arrangements. Keller et al. (2020) associate formal with written, and informal with oral, non-codified mechanisms. Contracts are "usually written" (Vandaele et al., 2007, p. 240). However, they do not have to be written to be enforceable by law, and oral agreements may play the same role. At the same time, relational mechanisms can also be codified, i.e. in documents describing expected behaviours of the parties (Keller et al., 2020).

Enforceability may thus be the distinct feature of contractual governance rather than its written form. Another point of distinction may lie in the object of governance. Roehrich et al. (2020b), based on Lyons and Mehta (1997), suggest that contracts define the roles and obligations of contracting parties. Keller et al. (2020) state that relational governance is an agreement about behaviours expected from each other.

Hence, in this dissertation, I understand contractual governance as a set of written and oral rules and mechanisms that define the roles and obligations of contracting parties. These mechanisms are enforceable by law. Relational governance refers to the collection of written and oral behavioural rules and descriptions of parties' behaviours. These mechanisms are negotiated and agreed by the parties but are not legally binding.

1.3.2. Parties, contracts and collaboration in construction projects

A **project** is a "temporary endeavor undertaken to create a unique product, service or result" (Project Management Institute, 2004, p. 7). A construction project is a temporary undertaking in which the project owner organization has to manage

networks of loosely coupled actors with complex interfaces and interdependences between them. These diverse actors temporarily come together to plan, design, engineer and construct buildings and facilities and pool together scarce resources (Hobday, 2000; Dubois and Gadde, 2002; Kadefors, 2004).

While 'buyer' and 'supplier' are general terms adopted in the literature, in the studied context it is more common to talk about 'clients' and 'contractors'. Sometimes 'client' is used as a synonym for 'project owner'. In this dissertation, I use these terms interchangeably. I specifically apply the contextual terminology when drawing from the project management and construction management literature or describing and analysing empirical data from the construction sector.

The term 'contractor' needs further explanation. Contractor[1] (also called main, general, engineer-procure-construct – EPC contractor) typically delivers design and engineering and can be responsible for the overall project, procurement, and construction management. The contractor may also conduct construction works itself, but it is likely to subcontract these works due to increasing specialization in the industry. Thus, contractors and subcontractors are organizations in tiers 1 and 2 of the project supply chain (Beach et al., 2005). They perform various works on the construction site using own personnel and equipment.

Contract is a multi-faceted and complex phenomenon: "a word of thousand meanings" (Macneil, 1980, p.4). Definitions from the project and construction management literature are selected for this dissertation as they most closely match the research context. In project-based environments, the contract aims to align the owner's and the contractor's interests (Turner, 2008). "A contract is a legally

[1] While the scope of work and responsibility of Contractor may vary depending on the selected project delivery strategy, for the purposes of this dissertation this is of no significance. For that reason, I only highlight a typical role of the contractor organization.

binding, enforceable, and reciprocal commitment governing the collaboration between two (or more) parties" (Berends, 2014, p.156).

"**Collaboration** is a process in which autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions." (Thomson and Perry, 2006, p.23). This definition stresses the formal and informal aspects of collaboration and explains why and how these happen. The purpose of collaboration in projects may need further clarification.

Project collaboration focuses on the project objectives and implicitly refers to short-term collaboration rather than the long-term, strategic type spanning across projects (Cheng et al., 2004). According to Suprapto et al. (2015), this refers to the behavioural interaction between the parties who collaborate to achieve specific project objectives by effectively utilizing each party's resources and capabilities.

1.4. RESEARCH METHODS AND DATA COLLECTION

1.4.1. Approach to data collection and overview of research methods

In addition to the construction project context, another aspect unites all empirical studies in this dissertation: the approach to data collection. As I focus on interorganizational and multi-party relationships in projects, it is critical to collect opinions of clients, contractors, and subcontractors. Data collection at the network level is often challenging and limited by the inability to get access (Easton, 2010). However, frequent focus on a dyad rather than network and observations or capturing opinions of only one side of the transaction is a limitation of the IOR literature (Lumineau and Oliveira, 2018). Understanding the multiple perspectives

of supply chain parties allows us to draw deep and meaningful conclusions in this dissertation.

In the IOR literature, surveys are used more frequently than case studies, and longitudinal research is almost absent (Lumineau and Oliveira, 2018; Roehrich et al., 2020a; Van der Valk et al., 2020). To understand the context and views of multiple parties, I use case studies in the three empirical projects. Case studies are versatile and allow studying 'why', 'what', and 'how' questions (Meredith, 1998). They can be used for all types of theory advancement, including exploration, building, elaboration, and testing (Meredith, 1998; Dul and Hak, 2007; Ketokivi and Choi, 2014). Analytical generalizability, which is at the heart of the case study method, can be very powerful and deliver creative and deep theoretical insights that also will be perceived as valid by the practitioners (Voss et al., 2002).

I use comparative cross-sectional case studies if the replication logic is needed (Miles and Huberman, 1994) and a single longitudinal case when the evolvement of a phenomenon over time is important (Langley, 1999; 2003). I also apply retrospective and current investigation methods. Retrospective cases allow for controlled selection (success or failure is known) but are prone to recollection bias as they have potential challenges in establishing a sequence of past events (Voss, 2002). Current investigations can be open-ended and time-consuming. However, they have unique advantages when studying behaviours, as they eliminate the problem of dependence on the memory of interviewees and their ability to verbalize such complex constructs (Mason, 2017).

1.4.2. Data collection

The data for this dissertation originate from four client organizations, two contractors, seven subcontractors, three consulting organizations, and two researchers engaged in a study of one of the projects. The data collection started

from the focal organization – an Engineer, Procure, Construct contractor organization (Contractor) involved in all engineering and construction projects studied in this dissertation. The Contractor provided access to the extensive project documentation and facilitated contacts with the client and subcontractor organizations involved in the five projects. Five projects were studied empirically, leading to five cases: “Alpha”, “Beta”, “Gamma”, “Delta”, and “Epsilon”.

I used multiple data collection methods in all empirical projects: semi-structured interviews and non-participant observations were complemented by an extensive study of the project and contractual documentation. This approach increases background understanding of cases and positively affects the ability to explain the phenomena (Dubois and Salmi, 2016). It also ensures that the right facts are collected and interpreted correctly (Meredith, 1998). Although the cases are centred around one focal organization, I was still able to gain various perspectives through access to the Contractor’s partners in the five project networks. “It is possible to use different cases from the same firm to study different issues, or to research the same issue in a variety of contexts in the same firm.” (Voss et al., 2002, p. 197).

The data collection lasted for about a year (see Figure 1.1. below). I joined a project team to conduct non-participant observations about evolving collaboration and interviewed multiple project team members for six months. During this time, I also engaged in an extensive retrospective study of another project through interviews and analysis of project documentation. For the remaining six months, I interviewed teams and collected project documentation for three more projects.

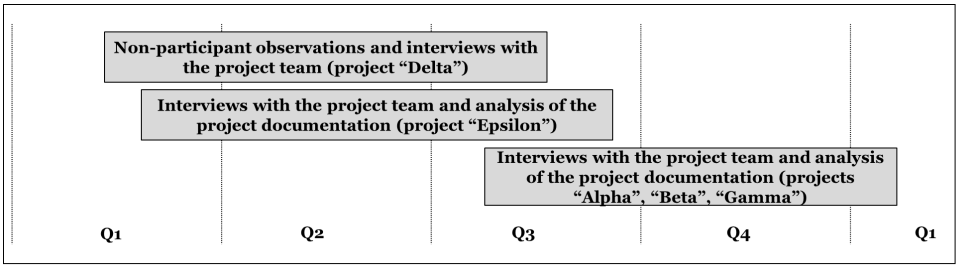


Figure 1.1. Data collection timeline

Five projects were selected based on theoretical sampling principles: application of multi-party performance-based contracts, contract revisions during the transaction course, and a collaborative approach to project implementation. In addition, availability of interviewees was key, as well as access to the project documentation; recent completion was desirable (to minimize the recollection bias and ensure easier access to data and informants). All projects belonged to the same industry and type and were of similar size (budget) to control for the variability of the context and complexity as much as possible (Eriksson, 2015).

Table 1.1. below summarizes the data collection effort and shows key constructs in each study. Data from "Epsilon" project were used in two studies. However, no data reuse or 'slicing' took place, as Chapter 4 focuses on contractual governance and Chapter 5 on relational governance. Single cases can be very rich and may provide an opportunity to study several contexts (Voss et al., 2002). Data collected from this project were indeed very rich due to multiple informants (client, contractor, subcontractor organizations and various project members) and access to extensive project documentation (38 monthly progress reports, as well as contracts, protocols of sessions on partnership set-up, and consulting reports on project collaboration).

Table 1.1. Summary of the collected data and characteristics of projects

	"Alpha"	**"Beta"**	**"Gamma"**	**"Delta"**	**"Epsilon"**
Project basic info	Location - Europe. Scope – upgrade and extension of a hydrocarbon processing facility. Budget - € 500-750 M				
Data collected from	General contractor, 5 sub-contractors	Client, two general contractors, 4 sub-contractors	Client, general contractor, 2 sub-contractors	Client, general contractor, lean/collaboration coach	Client, Contractor, 3 sub-contractors, 3 consultants, 2 student researchers
Data sources	17 interviews with the project team and consultants; project documentation and contracts	19 interviews with the project team; project documentation and contracts	7 interviews with the project team; project documentation and contracts	Non-participant observations (~ 400 hours); 26 interviews with the project team; project documentation	31 interviews (Chapter 4), 37 interviews (Chapter 5) - with the project team, consultants, researchers; project documentation and contracts
Focus of data	Contractual governance and relational governance (collaboration) (contract design phase in particular)			Relational governance	Contractual governance (Chapter 4); relational governance (Chapter 5)
Key studied constructs	Reward design, reward sharing, outcome uncertainty, collaborative shadow of the past, reputation, supplier motivation			Relational norms, integrative mechanisms	Objects and mechanisms of learning; relational norms, integrative mechanisms
Data in chapters	Chapter 3			Chapter 5	Chapters 4, 5

1.5. DISSERTATION OUTLINE

Next to the Introduction and Declaration of Contribution, this dissertation comprises four chapters: the literature review with insights of research directions for the empirical projects (Chapter 2) and three empirical studies (Chapters 3, 4, 5).

1.5.1. Chapter 2. Contract strategies in complex construction projects - a multidisciplinary literature review

While several literature reviews on relational governance or collaboration exist (Bygballe et al., 2010, Hong et al., 2012), contracts in construction projects have received little attention. To inform my empirical studies, I analyze research related to contract strategies in construction projects.

Contract strategy is a choice between the ways the contractor is paid, on one side, and the contract scope on the other (Potts, 2008; Menches and Chen, 2011). This means that the contract strategy should support project value creation (Oyetunji and Anderson, 2001), and consider the desired relationship among the parties involved (Cox and Thompson, 1997).

For this review I assume that the knowledge about contract strategies lies in the intersection of functional (purchasing), setting (project), and contextual (construction) knowledge. The review is guided by two research questions:

What are the main topics and questions related to contract strategies in complex construction projects?

What contribution do the engineering and construction, project, and purchasing and supply management research disciplines make to the contract strategies discussion?

To maximize insights of the review, I analyse academic literature between 1980 and 2019. I include in it 98 academic articles from the chosen research disciplines.

1.5.2. Chapter 3. Design of multi-party performance-based contracts: understanding the role of supply chain interdependence and supplier motivation

Performance-based contracts (PBCs) are increasingly applied in many sectors, but with mixed results (Selviaridis and Wynstra, 2015; Nullmeier, 2019). One of the factors that make PBC a non-suitable choice is the supplier's perception of a lack of control over the process of outcome creation or high outcome uncertainty (Selviaridis and Norrman, 2014). Research has identified the ways to address outcome uncertainty that originates from the external environment or buyer's behaviour (Nullmeier et al., 2016; Zu and Kaynak, 2016; Akkermans et al., 2019). However, suppliers often depend on the input of their subsuppliers in the process of outcome creation. Hence, subsuppliers' behaviours are also a source of outcome uncertainty. Such uncertainty can be addressed by engaging sub-suppliers in the PBC (Selviaridis and Norrman, 2014) and creating a multi-party contract. Yet sub-suppliers generally find such contracts too risky (Kleemann and Essig, 2013).

In construction projects, in which multiple interdependent parties contribute to the product creation (Artto et al., 2016), multi-party performance-based contracts that include sub-contractors are applied, for instance, in project alliances (Barlow, 2000; Howard et al., 2014). However, the theoretical explanation about how such contracts are designed and which factors affect subcontractors' willingness to engage in them is missing. Thus, I investigate the following question:

Which factors affect sub-supplier motivation to engage in a multi-party performance-based contract in the case of supply chain interdependence?

To understand how sub-suppliers are motivated by the offered reward, I apply expectancy theory (Vroom, 1964). This theory identifies three antecedents of

motivation: relationships between performance and expected result (Expectancy), result and potential reward (Instrumentality), and fit of reward for the one's objectives (Valence). Thus, it allows looking into the motivational effect of PBCs in a more fine-grained manner than Agency theory, which assumes suppliers are motivated to accept a PBC if the task characteristics are 'right' (Nullmeier, 2019).

I apply a comparative case study method, investigating three construction projects in which subcontractors are engaged in the multi-party PBC together with the contractor. This strategy allows elaborating PBC theory that previously clarified many aspects of bilateral contracts and addressed environmental and buyer behavioural uncertainty but has not yet explained the approach to multi-party contracts and ways to mitigate supply chain-induced uncertainty.

1.5.3. Chapter 4. Learning to contract: exploring the process of intra-project learning

Contracts play a crucial role in complex projects (Hobday, 2000; Lewis and Roehrich, 2009). Yet, practice shows that developing and managing contracts is a complicated task. The incompleteness of contracts or diverging interpretations of the texts by the parties lead to expensive and lengthy disputes and litigations, and construction is among the most 'litigious' industries (Arcadis, 2019; Norton Rose Fullbright, 2020). Reliance on contracts combined with disputes over them signals low effectiveness of contractual governance. However, research has proven that organizations can learn to contract (Mayer and Argyres, 2004).

The topic of learning to contract (LtC) lies in the intersection of organizational learning and contracting literature (Lumineau et al., 2011). Existing studies often focus on how contracts change between transactions and broadly connect these changes to the gained contracting experience (Vanneste and Puranam, 2010). However, a complete theoretical framework of the phenomenon – what, when, and

how is learned (Bacharach, 1989) is missing. It is also unclear how the process of learning to contract evolves within the transactions, despite the frequent occurrence of contract revisions (Roehrich et al., 2020b). This research gap and high practical importance of contracts in complex projects, lead to the following research question:

How do organizations learn to contract in an ongoing project?

The contributions of this study are two-fold. First, drawing on the organizational learning literature and existing LtC research, I develop a complete theoretical framework of learning to contract. Second, I empirically investigate intra-project learning and explain how learning to contract occurs in a lengthy transaction, providing insights about a previously missing part in LtC theory.

Studies of learning processes call for longitudinal investigation strategies. By engaging in a retrospective longitudinal case study in the construction sector and applying a process approach, I develop theory about intra-contract or intra-project learning, and identify how learning to contract unfolds over time.

1.5.4. Chapter 5. The interplay of integrative mechanisms and relational norms in project collaboration

Collaboration in complex projects can improve teamworking, as well as time and cost performance (Suprapto et al., 2015). At the same time, it is complex and costly due to project temporality, 'one-off' nature and the large number of engaged parties (Dubois and Gadde, 2010; Eriksson, 2015). Despite a strong interest and accumulated knowledge about collaboration, implementing it in complex projects is still challenging (Bygballe and Swärd, 2019).

Project collaboration combines two broad categories: integrative mechanisms (Eriksson, 2015; Hietajärvi et al., 2017) which are formal, designed collaborative practices; and relational norms, which are agreements about expected behaviours of the collaborating parties (Bresnen and Marshall, 2002; Thomson et

al., 2009). Prior literature has either focused on one of these complex categories or, recognizing the presence and importance of both categories, combined them in the collaboration models without examining their specific roles and relationships (Yeung et al., 2012; Bygballe and Swärd, 2019). To advance the theory of collaboration (Wood and Gray, 1991), I explore the interplay between the two categories of collaborative elements by answering the following research question:

How do integrative mechanisms and relational norms interplay in project collaboration?

I explore collaboration at the level of the project team, focusing on the 'collaboration domain' (Wood and Gray, 1991), rather than looking for similarities and differences in opinions of each of the collaborating parties. To study collaborative behaviours, I use a real-time, ongoing project and engage in non-participant observations. The real-time study is complemented with a retrospective study of another collaborative project for improved interpretation of the observed behaviours and analysis of integrative mechanisms.

1.6. DECLARATION OF CONTRIBUTION

I, as the author of this dissertation, confirm that I am responsible for the majority of the work in each of its chapters. I have written **Chapter 1** (Introduction) and **Chapter 6** (Conclusion) independently and incorporated the feedback of my first promotor Professor Finn Wynstra and second promotor Professor Leentje Volker. For the remaining chapters, I acknowledge the contribution of my co-authors – my promotors and Dr. Marian Bosch-Rekveldt. As the author, I take full responsibility for any mistakes or omissions in the dissertation.

Chapter 2. I independently conducted the majority of the work on this Chapter. I framed the scope of the literature search, developed the data collection

method, performed the data search, coding, and analysis, and wrote the text of the chapter. The first promotor was engaged in verifying the coding sheet, structuring the data analysis, and writing the conclusions. The second promotor was involved in restructuring, editing, and writing parts (introduction and conclusion) of the text.

Chapter 3. I independently conducted most of the work on this Chapter. I developed the research idea and question, and the theoretical framing. I established connections with the organizations for data collection for this Chapter and Chapters 4 and 5 and collected empirical data. The first promotor contributed to the data analysis and the coding approach. I independently developed propositions based on the interpretation of the empirical findings. The promotor was also involved in writing the introduction, literature review, and the method section.

Chapter 4. I independently conducted the majority of the work on this Chapter. I developed the research idea and research question, reviewed the relevant literature, and collected the empirical data. I independently analysed the data and developed the manuscript draft. The first promotor was involved in editing the initial draft and revising the later versions of the manuscript, and writing the introduction and conclusion.

Chapter 5. I independently conducted the majority of the work on this Chapter. I developed the research question together with my second promotor and Dr. Bosch-Redkveldt. I collected the empirical data for the study. I independently developed the theoretical framework and wrote the manuscript draft. My co-authors provided extensive feedback and participated in editing and writing the final version of the manuscript.

2. CONTRACT STRATEGIES IN COMPLEX CONSTRUCTION PROJECTS - A MULTIDISCIPLINARY LITERATURE REVIEW[2]

2.1. INTRODUCTION

Projects have long been viewed as value-creating vehicles; typically, multiple actors and organizations participate in this process (Morris, 2013; Artto et al., 2016 Martinsuo et al., 2019). Construction projects, one of the most representative examples of project organizing (Dubois and Gadde, 2002), play a vital role in global economics and society: the overall value is often created through buildings and other constructed facilities (Laursen, 2018; Lehtinen et al., 2019;). Although construction projects continuously create value during all phases of the life cycle, key decisions that affect their long-term outcomes - such as the circle of participants, the structure of supply chains, and the types of contracts, are defined early on, at the front-end of the project (Williams and Samset, 2010; Vuorinen and Martinsuo, 2019).

As the modern construction industry is characterized by high complexity, cost, and volatility, project owner (client) organizations do not have all the necessary resources to design and build the facilities themselves (de Araújo et al., 2017). Most of the works and services are outsourced, and contractors and suppliers play a key role in the project design, implementation, and overall outcomes (Berends, 2007). To maximize the value created in construction undertakings, the owners need to

[2] Earlier versions of this chapter were presented at the following conferences:
Nikulina, A. and Wynstra, F. Contracting strategies in capital construction projects In: *Proceedings of 27th Annual Meeting of International Purchasing and Supply Education and Research Association* in Athens, Greece (2018).

Nikulina A. and Wynstra, F. Selection of project delivery and contract strategies in capital construction projects (A structured literature review) In: *Proceedings of the Annual Conference of European Academy of Management*, Lisbon, Portugal (2019).

select an appropriate way of delivering the project and the actors capable of doing it. They also have to choose and design contracts that align "[…] motivations of the parties so as to maximize the likelihood of project objectives being achieved, taking account of the constraints and risks that act on the project and the strengths and weaknesses of the parties to it" (Broome and Perry, 2002, p.63).

The decision that the project owner organization makes about the ways to organize the work of third parties is typically referred to as 'the project delivery and contract strategies'. "Project delivery and contract strategies (PDCS) define the roles and responsibilities of the parties that are involved in a [construction] project, and how the project owner pays for services" (Oyetunji and Anderson (2001, p. xv). While a project delivery strategy (PDS) and a contract strategy (CS) are complementary decisions, they are also two distinct business issues that require different approaches to their selection and implementation. Within project owner organizations, various functional teams are typically responsible for these decisions. Project managers and construction experts decide about the choice and management of the PDS, whereas the procurement team is primarily responsible for the CS and its implementation.

Williams and Samset (2010) state that a project strategy is "likely to have the largest impact on [a project's] long-term success or failure" (p. 230). Recognizing the importance of this issue, researchers from different fields have studied various aspects of project delivery and contract strategies for several decades. As a result, the literature has been growing in terms of the number of publications and topics and the range of disciplines that have shown interest. Relevant articles have been published in construction management journals and project management research, supply chain management literature, and sometimes also in outlets focused on public policy, economics, or general management.

Despite this apparent interest from scholars and the high importance of such strategies for the outcome of any construction project, to our knowledge, there has been no attempt to review prior research. As we lack an overall synthesis of the literature on project strategies, there is no clarity about which topics have been adequately investigated, which theories guide researchers' work, or which methods are being used. Finally, there is no clear picture of whether existing research provides guidance and support to practitioners in resolving project challenges.

The importance of suppliers' and contractors' contribution to projects and the interest of PSM research in contracts as governance mechanisms motivated us to examine the literature related to the contract strategies in particular. Conclusions drawn from this effort will inform the empirical projects in this dissertation. In our multidisciplinary review of CS, we investigate the literature related to engineering and construction management (ECM), project management (PM), and purchasing and supply management (PSM). This choice allows us to combine knowledge from the function (procurement), production organization type (project), and empirical context (construction sector).

In our literature review, we treat contract strategy as a multidisciplinary research problem, because we believe that this approach to studying such a complex phenomenon may result in new perspectives and improve the overall quality of the research (Volker, 2019).

We intend to provide a critical review of the current state of the literature and to identify future research avenues. We aim to answer the following questions:

What are the main topics and questions related to contract strategies in complex construction projects?

What contribution do the engineering and construction, project, and purchasing and supply management research disciplines make to the contract strategies discussion?

The rest of the study is organized as follows. Section 2.2 describes our research methodology. Section 2.3 reviews the main research topics, and Section 2.4 provides a comparative analysis of the ECM, PM, and PSM literature. The paper concludes with an overview of the findings, suggestions for future research, and a discussion of the research limitations.

2.2. METHODOLOGY

2.2.1. Types and definitions of contract strategies

Scientific interest in project strategies has spread over time to different regions, sectors, and academic disciplines. This growing diversity has given rise to multiple definitions, synonyms, and potentially ambiguous terminology. In this paper, we cannot provide a complete comparative evaluation of all the existing definitions. Still, we need to ensure that all the relevant terms are identified, clarified, and included in the literature search.

'Contract strategy' essentially means the approach to reimbursement of contractors. Oyetunji and Anderson (2001) also call it 'compensation approach, or strategy'. Eriksson (2017) uses term 'reward system'. Some authors also refer to a CS simply as a 'contract' (Gordon, 1994), and 'contractor payment terms' or 'arrangements' are also mentioned (Ward and Chapman, 1994; Turner and Simister, 2001). However, in some cases, 'contract strategy' term is used more broadly to include PDS, CS, and selection methods (Chua and Loh, 2006). As many terms are used interchangeably, we verified their actual meaning in the coding process.

CS can also be viewed as part of a larger procurement decision, the project procurement system (Kumaraswamy and Dissanyaka, 1998), route (Lædre et al., 2006), or strategy (Eriksson, 2017, which includes several interrelated elements.

The classification of these elements differs among scholars but incorporates CS, PDS, and other elements, for instance, supplier selection methods.

In addition to the general terms that define the CS, we also identified a list of commonly applied strategies in the construction sector. We referred to the Construction Industry Institute (CII) publications, one of the most reputable research institutions in the sector. We used the Project Delivery and Contract Strategy Selection report of Oyetunji and Anderson (2001) and refined the list of terms by using several more literature sources (i.e., Van der Puil and Van Weele, 2014). We included the traditional cost-reimbursable and fixed-price strategies and innovative incentive contracts – guaranteed maximum price, target cost, cost plus incentive fee, and incentive/disincentive arrangement. Appendix 2A provides a list of the strategies mentioned in this literature review with their definitions and a brief explanation.

2.2.2. Coding sheet, approach, and classification categories

Following the approach of Cooper (1998), we developed the coding sheet before conducting the search and analyzing the literature, as this helped us decide how to design the search process and what information we needed to retrieve from the collected material. The first author developed the initial coding sheet, which was then discussed with the other authors and refined. After test coding ten articles, it was revised again, and additional fields were added (e.g., type of project ownership). Table 2.1 shows the coding sheet.

Table 2.1. Literature coding sheet

Basic classification categories	Title, authors, publication year, journal, literature discipline (ECM, PM, PSM), abstract, research question/intended contribution, findings
First and second level codes	First level: PDS, CS, PDCS Second level: 1 – selection criteria/factors; 2 – decision support; 3 – other (specify)
Project ownership	Ownership type (public, public/PPP, private, not specified)
Contract strategy	Fixed-price, cost-reimbursable, incentive (specify – TC, GMP, CPIF, I/D), other (specify), not specified
Publication type	Conceptual qualitative, conceptual mathematical modelling, empirical, mixed
Research strategy	Literature review, case study, survey, secondary data analysis (SDA), interviews, experiment, mathematical modelling (MM), mixed (specify), not available/applicable (N/A)
Data analysis method	Quantitative, qualitative, mixed
Intended contribution	Theory building, theory testing, descriptive (exploratory), decision support
Theoretical lens	Open coding applied (name of theory; none; N/A); in which part of the article theory is first mentioned; application of theory – full (if the entire article is written using a particular theoretical lens) or partial (if constructs are used/mentioned only in certain parts of the paper)

2.2.3. Information sources and material collection

Given that many different terms are used in the study of CS (see section 2.2.1), our list of search terms was quite extensive, as shown in Appendix 2B. We used two databases, Scopus and Web of Science (WoS), as together they cover a wide range of journals across the disciplines of interest (Rashman et al., 2009).

As there have been no previous systematic reviews of the topic, we aimed to cover as large a period as possible. Many journals relevant to the topic are only available online from the early 1980s onwards, and access to earlier sources is limited. In addition, covering 40 years of research provides sufficient opportunity

to track trends and develop a clear picture of the existing literature. Hence, we included the academic literature from 1980 to 2019 in our review.

To ensure that the sources in our study were of consistent quality and that we could conduct a suitably rigorous analysis, we limited the search to original articles published in English in peer-reviewed academic journals. We excluded conference papers because of their limited availability and because the most promising and high quality are usually published in academic journals. We also excluded PhD dissertations since chapters from those are also typically available as academic articles. Including them would thus potentially result in duplication. Finally, books were excluded from the search due to their limited availability and the impossibility of conducting a comprehensive search of all such material.

We restricted our search to journals focusing on ECM, PM, and PSM[3]. To identify the research discipline of a journal, we used the journal's title and description of purpose/statement. When in doubt, we examined several issues to determine the topics of the published articles. As we searched for identified terms in article titles, keywords, and abstracts, the number of retrieved publications at this stage amounted to 3,066 (after filtering the initial results by the time range (1980-2019), language (English), type (Article), relevant source titles, and the removal of 377 duplicate titles in WoS and Scopus). Appendix 2B shows the search protocols.

We then read the titles of all the articles in this list. While this approach created a substantial amount of work in terms of reading, it was necessary to avoid false negatives, especially given our broad range of search terms and the fact that our review was the first attempt to systematize the literature on this topic. This step resulted in 207 potentially relevant titles.

[3] As PSM can be viewed as part of the broader operations and supply chain management (OSCM) research field (Wynstra et al., 2019), we did not filter out OSCM journals, as potentially relevant publications can be found in them. However, to stress our focus on the PSM field, we use 'PSM' term to describe such literature in the chapter.

Next, we read the 207 abstracts and further refined our list. We removed articles related to other sectors (such false positives primarily related to incentive contracts), project delivery rather than contract strategies, or payment terms rather than contract types. Finally, we read and analyzed the full text of the remaining 91 publications related to CS, out of which 15 mention CS as part of a discussion of a broader procurement route (or strategy) problem. Although we do not expect these 15 papers to focus on CS fully, they are informative for our review as they clarify how CS is connected to other elements of a procurement strategy. We then checked the references in these articles and added seven more publications that had not been identified through the regular literature search due to specific terminology used in them (five on CS and two on procurement route). The final list comprises 98 publications (see Figure 2.1). Appendix 2C lists the papers included in the review.

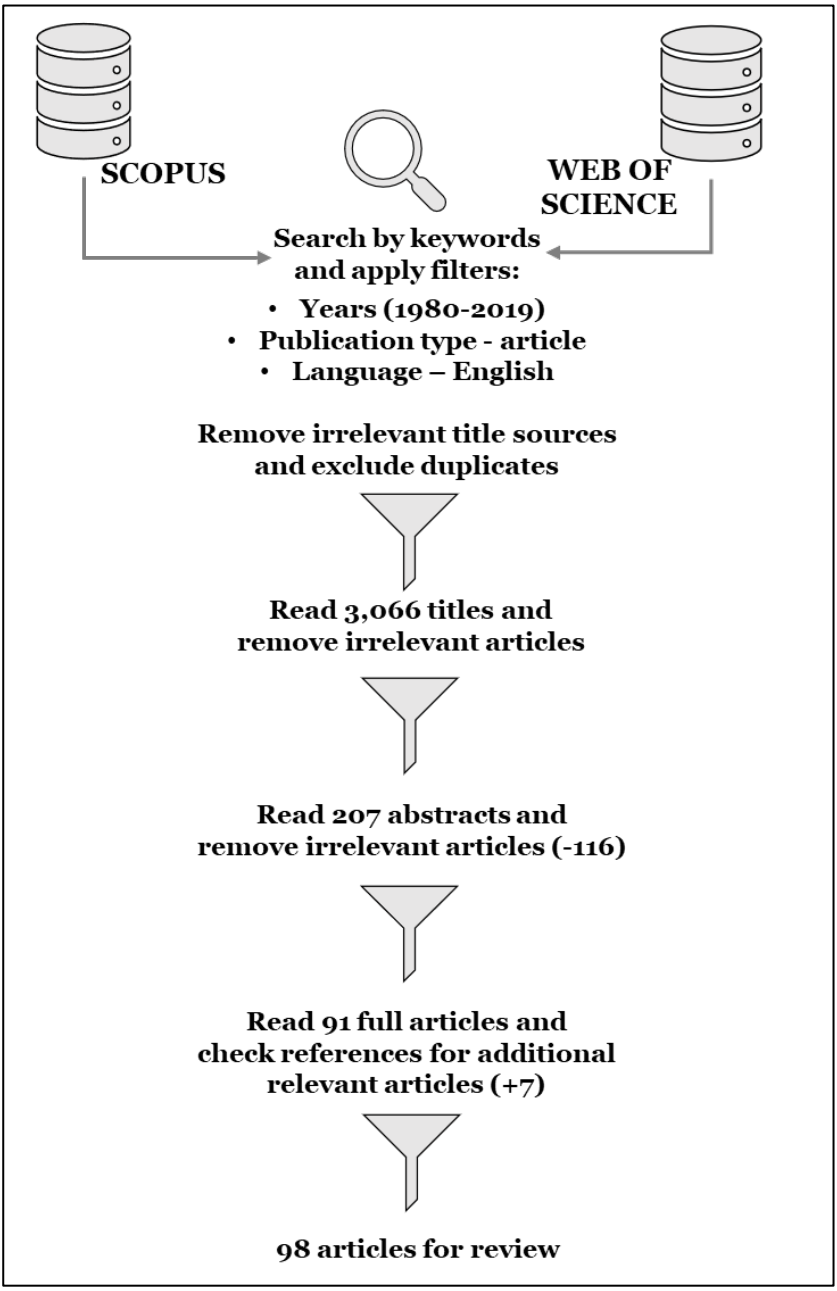


Figure 2.1. Literature search process

2.3. KEY TOPICS IN THE CS LITERATURE

Analysis of the relevant articles from the PSM, PM and ECM literature shows that studies on contract strategies can be divided into three broad topics:

- Studies that focus on individual contract strategies (including strategy benefits, reasons and drawbacks to applying them, strategy design, and success factors) – 65 papers[4].
- Studies that compare the performance of contract strategies – 20 papers.
- Studies that focus on contract strategy selection (factors that influence the choice; the process/decision support tools for selection), including those that view CS as part of a broader procurement route problem – 24 papers.

2.3.1. Studies that focus on individual contract strategies

At the highest level we can distinguish among three types of contract strategies: cost-reimbursable, fixed price, and incentive (performance-based) contracts (Ward and Chapman, 1994; Al-Harbi, 1998). The first two types together are often called 'traditional', as opposed to the 'innovative' incentive contracts (Ibbs, 1991). The distinguishing factor is the allocation of financial risks of not achieving project results. "A cost-reimbursable contract is an agreement that the owner will pay all of the audited cost of the project plus some fee to the contractor [...] Under a fixed-price contract, the contractor 'agrees that any cost to the project above the fixed price will be borne by him, except for changes, changed conditions, errors and quality modifications." (Griffis and Butler, 1988, p. 84). Thus, these two contracts are direct opposites in terms of the financial risk allocated to the owner and the general contractor. Incentive contracts allow parties to share financial risks in a certain proportion (Berends, 2000).

[4] The number of papers does not equal 98, as some publications may relate to two topics (for instance, by extensively discussing individual strategies and then comparing them). Relevant topics for each reviewed paper are indicated in Appendix 2C.

Traditional contracts: cost-reimbursable and fixed price. Traditional contracts do not seem to generate much interest among researchers. Griffis and Butler (1988) state that project owners often avoid cost-reimbursable contracts because of the risk of cost overruns, the need for more supervision and thus more resources, and little motivation by the contractor to finish the project on time and budget. However, they also argue that if such contracts are managed properly, they can save time, cost, and increase quality. Smith (1997) focuses on positive implementation results of cost-plus contracts based on case studies in Canada and concludes that with proper management, such contracts can deliver benefits in terms of cost, time, and quality compared to traditionally applied lump-sum agreements. Rosenfeld and Geltner (1992) criticize cost-reimbursable contracts for their disadvantages regarding the timing of payment (money is spent while the project is still not complete) and the risk of adverse selection.

Publications related to fixed price contracts focus on ways to improve such arrangements. Hartman and Snelgrove (1996) stress that it is essential that both parties understand the allocation of risks in the contract clauses in the same way (based on the empirical study, this is typically not the case), as this helps to avoid potential conflicts over changes/scope during project implementation. Kaplanoglu and Arditi (2009) suggest that owners and contractors conduct peer reviews of fixed-price projects before implementation to identify and mitigate any missed risks in the design phase and thus avoid unnecessary changes and potential arguments between the parties.

Incentive (performance-based) contracts. Studies related to incentive contracts are the most popular topic in the contract strategy literature. Incentive contracts represent an attempt to resolve problems with schedule and cost overruns and adversarial relationships in the industry (Bower et al., 2002) and for that reason attract much attention in research in practice.

Research interest in incentives and incentive contracts dates back to the 1980s (Stukhart, 1984), although their application in the construction sector was rare. Early studies (e.g. Heerten and Peeters, 1986) report limited use of incentives in the construction industry, whereas more recent research shows that the application of incentives has substantially increased. The topic developed in the 1990s, both from a theoretical and practical point of view, due to increased interest in collaboration in the sector (Bresnen and Marshall, 2000).

Based on the focus of the studies, we further divided this topic into two subtopics. The first group of articles studies the general applicability, design, and effects of incentive contracts in construction projects without examining particular contract types. The second group focuses on specific incentive contracts: target cost (TC), guaranteed maximum price (GMP), cost-plus-incentive-fee (CPIF), and incentive/disincentive (I/D, applied in highway construction in particular).

Incentive contracts in general. Stukhart (1984) defines and explains contract incentives as "the means by which an owner intends to secure certain project goals through the contracting process [...] Incentives are used in construction contracting to reduce overall contract cost, to control time and to increase support of specific performance goals such as productivity, quality, safety, technological progress, innovation and management" (p.34). Incentives are applied in order to ensure alignment between the owner's project objectives and the contractor's motivation (Abu-Hijleh and Ibbs, 1989).

This literature investigates various topics such as the conceptualization of incentive contracts, various types of incentives and reasons to apply them, the design of incentive schemes, and their success factors, effects, and limitations. Several of these topics are often combined in one paper (e.g. Rose and Manley, 2010c; Meng and Gallagher, 2012). Stukhart (1984), Herten and Peeters (1986), Abu-Hijleh and Ibbs (1989), Howard et al. (1997) and Bower et al. (2002)

conceptualize the applicability of incentive contracts in the construction sector. Essentially, incentives are a project management tool (Herten and Peeters, 1986), and their role is to motivate the contractor to adopt the project owner's objectives (Bower et al., 2002). Incentivization generally means transferring part of the owner risk to the contractor for a fee linked to results/performance on specific objectives. Incentives should align with the project objective and the contractor's capability to perform the incentivized task (Berends, 2000). If the level of uncertainty is too high when incentives are applied, the perceived benefits will not be sufficient to overrun the high risks perceived by the contractors (Rose and Manley, 2010c).

Design of incentive schemes is a topic that attracts substantial attention. A number of steps in the incentive contracts design that are necessary for their success has been identified, for instance, linking incentives to the key project objectives, collaborative development of incentives with contractors, achievability and flexibility of set targets, clear and transparent performance measurement processes (Bower et al., 2002; Broome and Perry, 2002). For example, Hosseinian and Carmichael (2013) develop a model to design an optimal incentive contract for a risk-neutral contractor, and Chapman and Ward (2008) and Kerkhove and Vanhoucke (2016) propose models for an optimal incentive agreement.

Research has also examined the effect that financial incentives have on the project results, but the findings are inconsistent. In their survey, Meng and Gallagher (2012) find a direct link between incentives and project performance regarding cost, time, and quality. Bubshait (2003) finds a positive effect on project completion time, using case studies in industrial projects. However, Suprapto et al. (2016) state that there is no direct impact, and incentives only positively affect the relationship among the parties and thus affect project results indirectly. Finally, Rose and Manley (2010c) study critical mistake (or success factors) factors of financial incentives' implementation. Problems such as inaccurate cost estimations,

misalignment between incentives and project objectives, or unfair measurement of incentives can lead to a failure of incentive contracts.

Incentive contracts (TC, GMP, CPIF, I/D). Studies on particular types of incentive agreements appear around the year 2000. This literature investigates topics that are similar to the papers related to incentive contracts in general: reasons to apply them, contract design, success factors, effects and potential limitations.

GMP and TC contracts in particular are extensively covered in the literature; they are also reported as the mostly used incentive contracts in the industry. TC agreements (also sometimes referred to as 'gain/pain share') can be applied in multi-party project alliances that combine the client and general contractor and certain key subcontractors under one contract (Barlow, 2000). Broome and Perry (2002) explain target cost contracts in the following way: "[In TC contract] a target price is introduced. Any cost under- or over-run against this target is split [between the client and the contractor] at pre-agreed, specified proportions… there is motivation for both parties to work […] together to minimize actual costs: for the [client] to minimize the total sum paid out, and for the contractor to maximize his profit above that included in the fee." (p. 60).

Perry and Barnes (2000) and Lahdenperä (2010, 2016a,b) conceptualize the design of TC contracts in general. Boukendour and Hughes (2014) conceptually study the design of a risk/reward sharing model in TC contracts in alliances and focus on development of such contracts in a cooperative way, where the contractor participates in setting the target cost and risk sharing portion. Broome and Perry (2002), Badenfelt (2008), and Laryea (2016) empirically investigate how practitioners design TC contracts (in particular, how sharing ratios of cost over/underruns are set) and find that there is no one approach or agreement in this aspect. Some argue that the client should get a larger portion of the savings (70/30), whereas others posit that the contractor who performs most of the work should

receive it. We found no empirical studies about the effects of risk/reward (gain/pain) sharing contracts and their impact on project outcomes.

"[In the GMP contract] the contractor is paid his actual cost in addition to an agreed upon fee while he guarantees that the total cost to the owner will not exceed a stipulated maximum amount." (Boukendour and Bah, 2010, p.564). Kaplanogu and Arditi (2009) explain that a GMP contract is typically applied when the scope of work cannot be defined clearly enough to sign a fixed price agreement. The contractor should keep track of all project costs and if they are below the GMP, savings are shared between the parties. If the cost exceeds the GMP, the contractor is responsible for all additional costs. "This type of contract is as risky for the contractor as a lump-sum contract." (p.176). Chan et al. (2010, 2011a,b) empirically study GMP contracts in Hong Kong, why and how they should be applied, how they should be designed, and discuss their success factors and risks. They find that clients primarily choose such contracts to achieve cost savings and ensure good relationships with contractors..

Al-Harbi (1998) defines the cost plus incentive fee (CPIF) contract in the following way: "The owner and the contractor agree to share the risk associated with the project execution. The two parties negotiate and agree on a target cost and a target profit. Any deviation between the actual target costs will be shared by both in an agreed upon ratio. On completion, the contractor receives the target fee plus or minus his share in cost deviation." (p. 73). In a CPIF, the contractor knows ex ante the maximum possible profit amount or percentage, whereas in a TC contract, it is not known until the savings from the project cost are realized. Incentives can be related to cost, schedule, or other desired client objectives (Berends, 2006). Al-Harbi (1998) focuses on risk allocation and mathematical investigation and explains the views of contractors and owners on how sharing ratio should be set in CPIF

contracts. Berends (2000, 2006) empirically demonstrates how such contracts can be designed and applied in large engineering and construction projects

A separate body of literature examines incentive/disincentive (I/D) contracts, which have been used in road construction since the 1980s. In the infrastructure sector, this means a contract that includes time-related incentives in particular. The contractor receives an incentive fee if the project is completed earlier than planned. A penalty applies for each day of the delay (Arditi et al., 1997). Jaraiedi et al. (1995) and Bayraktar and Hastak (2009) analyze the success factors of such contracts and develop guidelines for their application. Arditi and Yasamis (1998) and Shr and Chen (2004) empirically study the design of incentive provisions in I/D contracts.

2.3.2. Studies that compare the performance of contract strategies

These articles mostly compare incentive contracts to traditional fixed price and cost reimbursable agreements and conclude that incentive contracts lead to improved project results in several performance areas. Based on case studies in processing industries, Bower and Merna (2002) conclude that incentive contracts show the lowest increase in direct and indirect costs compared to budget. Suprapto et al. (2016), using surveys in processing industries, compare fixed price, cost-reimbursable, and collaborative (incentive) contracts. The authors find no difference between the three types of strategies directly affecting project outcomes (cost, quality, schedule, etc.). However, they discover that incentive contracts have a stronger indirect effect and positively affect the relationship, and thus team-working quality. Choi et al. (2012) compare the effect of various contract types on the schedule in road construction projects and find that contracts with schedule incentives show consistently better performance in terms of the project schedule.

Several papers compare the effectiveness of contract strategies in connection to a specific project delivery strategy (PDS), focusing on how the combination of a

CS and PDS affects project cost and schedule; in other words, how CS 'performs' within specific delivery strategies. For instance, Cheng et al. (2016) compare fixed price and GMP contracts in Design and Build (DB) delivery strategies. They conclude that GPM contracts perform better than fixed price (although fixed price is still the most common contract type, especially for public procurement) in terms of cost overruns and schedule delays. The authors recommend using a GMP contract when the cost certainty is a key owner project characteristic/project driver.

2.3.3. Studies that focus on contract strategy selection

Such papers typically examine the factors that drive strategy selection or discuss the selection process/algorithm. They look at the CS at an aggregated level as a general project management problem. Oyetunji and Anderson (2006) argue that the choice of contract strategy is inherently linked to allocating risk among the parties involved in the project. The literature shows that other factors may also play a role in CS selection. Veld and Peeters (1989) propose a qualitative decision algorithm for selecting the type of contract based on several criteria, including cost, schedule, and technical uncertainty. Ward and Chapman (1994) state that the contract type should help the owner solve issues of moral hazards, adverse selection, and unfair risk allocation. They develop a conceptual framework that can be used for selection of the appropriate contract strategy based on cost uncertainty and risk-taking by the owner and the contractor.

Several papers apply mathematical modelling to help make decisions about a suitable strategy. Bayraktar and Hastak (2009) develop a decision-support tool to choose contract types in road infrastructure projects. Motawa and Kaka (2009) use modelling to optimize the choice of payment mechanisms. They include the contract type and the payment schedule (advance payment, interim, and stage payments) in the decision and consider how these would affect contractor cash flow.

Some articles focus on the overall problem of the procurement route or procurement strategy selection, and CS is viewed as one of its essential elements interconnected with others such as PDS or contractor selection methods. As these papers may improve our understanding of contract strategies, we include them in our review. Gordon (1994) discusses the procurement strategy selection process. He suggests that it starts by analyzing the key owner's objectives and the characteristics of the project and then defining a suitable organization and scope. Next, market analysis is used to define an appropriate supplier selection method. Contract (remuneration) is the final step linked to the risk assessment and desired risk allocation. According to Kumaraswamy and Dissanayaka (1998; 2001), a procurement system includes five elements. The first two, functional groupings and payment modalities (equivalent to a PDS and a CS), form 'type of contract'. The other three elements are selection/award methodology, form of contract (standardized templates), and work packaging (splitting the project into functional or geographical packages). Although each of these five elements can be selected separately, they should at least be compatible. The authors offer a short algorithm with steps that should be followed to select a suitable procurement system, which is based mainly on expert judgements. Overall, the choice of strategy is based on a list of contextual factors (project and owner characteristics) and key owner objectives. In addition, the reward system and template contract form depend on the desired risk allocation. Eriksson (2017) includes five elements in the procurement strategy: reimbursement and work scope (CS and PDS), relationships, organization staffing, and contractor selection methods. Yet, Lædre et al. (2006) empirically find that theoretical algorithms are rarely followed in practice, and project owners rely on traditional strategies without necessarily evaluating their applicability to a particular project.

The literature that focuses on the project procurement route sometimes connects contract strategy choice to relationships with supply chain parties. For instance, Cox and Thompson (1997) and Thompson et al. (1998) propose a particular order in which elements should be selected. They suggest that the type of relationship (arms-length or collaborative) should be determined first as it drives the division of responsibilities (PDS) and the allocation of risk. This, in turn, determines the type of reimbursement (CS). Turner and Simister (2001) and Turner (2004) also stress the importance of relationships established through project strategies. They argue that the desired project organization (governance structure) is the starting point for the selection. It should be set up to facilitate a collaborative attitude among the parties.

Having identified main topics of interest in the research of contract strategies, we now examine the contribution of three research disciplines, ECM, PM, and PSM, to these discussions.

2.4. COMPARISON OF THE ECM, PM, AND PSM LITERATURES

When looking at the number of papers in each of the three literatures (see Appendix 2D for the number of publications across the journals), we found that most of the articles related to the contract strategies have been published in the ECM literature (72 papers). Over the years, PM researchers have published 19 articles in three journals, and the PSM discipline has contributed to the discussion with only seven articles, also in three journals. In other words, ECM literature accounts for 74% of all publications, PM research – for 19%, and PSM – for 7%. ECM literature is also the only one that shows an increasing interest in the topic over the years. Figure 2.2 presents a summary of the descriptive literature analysis. Below we will review each

research discipline separately to understand its contribution to the three identified topics and explore the methods and theories that assist and guide them.

ECM research, being the most prolific, is the primary contributor to all identified topics through empirical (39) and conceptual (33) studies. In the 1980s and 1990s, discussions focused on the advantages and drawbacks of cost-plus contracts (Griffis and Butler, 1988; Rosenfeld and Geltner, 1991) and fixed-price contracts (Willoughby, 1995; Hartman and Snelgrove, 1996). Newer studies focused on individual strategies are primarily related to incentive contracts. ECM literature conceptualizes the use of incentives in construction projects, discusses reasons to apply incentive contracts in general, and examines their effects (Stukhart, 1984; Abu-Hijleh and Ibbs, 1989, Ibbs, 1991, Bower et al., 2002). Conceptual literature is also concerned with the design of incentive contracts (Jaafari, 1996; Chapman and Ward, 2008). These studies are complemented by empirical research on incentive contracts (28 papers). Bresnen and Marshall (2002) and Rose and Manley (2010 a,c) investigate the overall role, effect, and risks of incentives through case studies. Surveys intend to discover attitudes to and applications of incentive contracts in various countries (Ling et al., 2006; Gruneberg et al., 2007; Tang et al., 2008). Many ECM researchers use data from public infrastructure in their studies. Empirical papers also examine particular incentive contract types. Arditi and Yasamis (1998) and Hasan and Jha (2016) investigate attitudes to incentive/disincentive contracts in public road infrastructure projects, Berends (2006) studies the application of CPIF contracts in the oil and gas projects, and Chan et al. (2010, 2011) investigate the perception of risk and overall application of GMP contracts.

ECM literature also actively discusses strategy selection process. For example, ten publications develop decision-making tools related to strategy selection (Witt and Lias, 2010; Ding et al., 2018). It also offers a more generic conceptual discussion about selecting procurement routes in projects (Gordon,

1994; Kumaraswamy and Dissanyaka, 1998, 2001; Chua and Loh, 2006), often connecting the CS choice to risk allocation. We also identified some empirical studies related to strategy selection. For example, Lædre et al. (2006) employ comparative case studies to investigate how public organizations approach the procurement route decision and find that they mostly rely on their own prior experience and do not apply decision-making tools or follow research recommendations about what would be the best strategy. Eriksson (2017) and Eriksson et al. (2019) discuss how the procurement route is selected and how different strategies affect innovativeness and efficiency in infrastructure projects.

Comparison of CS performance is the topic almost exclusively developed within ECM research (except 2 papers found in PM journals). Herbsman et al. (1995) and Arditi et al. (1997) compare the effects of different incentive contract types in road construction. Bower and Merna (2002) employ case studies to identify that incentive contracts deliver better results in industrial (process plants) construction projects than traditional contracts. Choi et al. (2012) conclude that incentive contracts lead to better schedule performance in public infrastructure.

ECM research is traditionally known for little application of theories. Only a quarter of ECM papers (18) included in the review applied some form of theory. Lack of theory may be justified in some naturally 'applied' topics (i.e. articles related to CS performance comparison). Theory is primarily used in papers related to incentive contracts – agency (Badenfelt, 2008), motivational theories (Bresnen and Marshall, 2000; Rose and Manley, 2010 a,c), and in papers related to strategy selection, primarily TCE (Ive and Chang, 2007; Boukendour, 2007). However, a theoretical lens is rarely consistently applied to the whole paper. It is more common to mention or borrow certain theoretical constructs or describe alternative theories in the literature review without further analyzing them. This conclusion also applies to PM research.

The PM literature primarily contributes to the discussion of individual (incentive) contract strategies and the strategy selection process in ten empirical and nine conceptual publications. PM research conceptually discusses the advantages of incentive contracts (Herten and Peeters, 1986). Some empirical studies examine incentive contracts in general (Rose and Manley, 2010b) or analyze their effect on the project performance (Meng and Gallaher, 2012; Suprapto et al., 2016). Empirical literature also studies particular types of incentive contracts, for example, the application of various incentive agreements such as TC (Broome and Perry, 2002), GMP (Chan et al., 2010; 2011), CPIF (Berends, 2000), or I/D contracts (Bubshait, 2003). Case studies and surveys are equally applied, and data comes from various industries such as mining, industrial construction, oil and gas, or across construction industries, and from both public and private sector projects.

PM research also contributes to the discussion of the contract strategy selection by conceptually discussing the importance of the right contract type choice and process (Veld and Peeters, 1989) or facilitating the choice between the contract type (Ward and Chapman, 1994). It also discusses the approach to the overall procurement strategy selection (Turner and Simister, 2001). Brahm and Tarzijan (2015) study how prior interactions and project complexity affect contract strategy choice. Overall, PM research is not substantially different from ECM literature, as their interest, theories, and methods are similar, although PM turns to a wider range of industries in the empirical investigations.

Less than 50% of PM papers (seven out of 19) apply any theoretical lens. Except for one case, articles related to incentive contracts use theories. Primarily, theory application is limited to just mentioning several theoretical concepts, such as explaining target cost contracts and sharing ratios (Chan et al., 2011; Lahdenperä, 2016; Broome and Perry, 2002) utility or agency theory. CPIF contracts are studied using utility theory (Al-Harbi, 1998).

PSM papers written in the 1990s discuss procurement strategy selection and focus on the link between relationships and strategies in particular, adopting a theoretical approach of relational competencies (Cox and Thompson, 1997; Thompson et al., 1998). The rest of the PSM articles are related to the incentive contracts. They are quantitative (based on mathematical modelling) and search for the optimal performance-based reward and contract design (e.g. Kerkhove and Vanhoucke, 2016; Ward and Chapman, 1995). We found no papers in the PSM literature that compare the performance of various strategies. All seven PSM publications are conceptual. All papers except one apply theory (relational competencies or capabilities) in the articles mentioned above and agency theory in four publications. It seems that the PSM literature is more focused on topics such as supplier selection methods or supply chain integration in the construction sector. When scanning the literature, we came across such papers but did not include them in our analysis, as they do not focus on strategy selection per se. Overall, the number of publications and the contribution to the overall CS discussion is so small that it is difficult to offer any meaningful analysis of PSM publications.

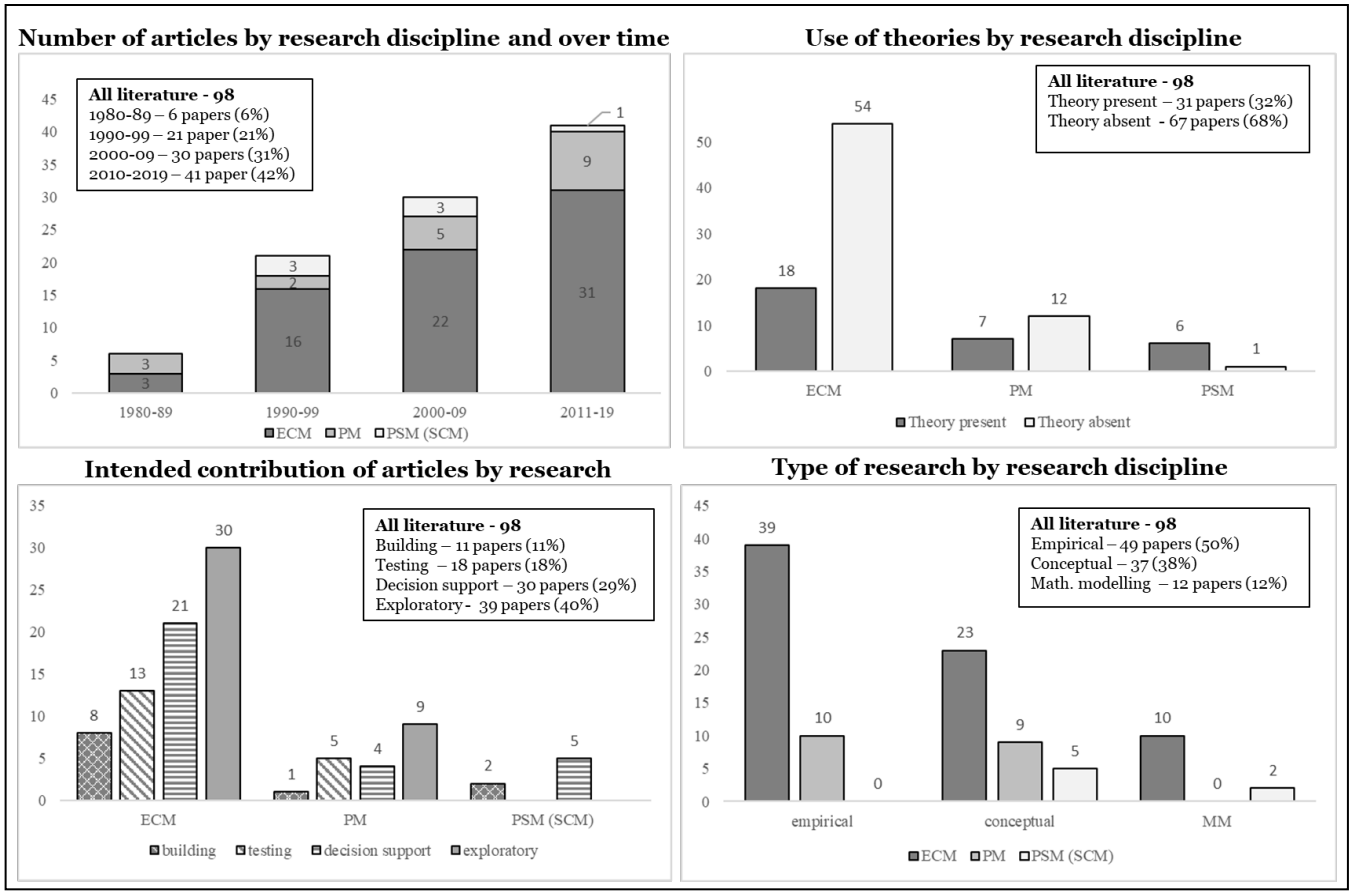


Figure 2.2. Comparative analysis of ECM, PM and PSM literature

2.5. CONCLUSIONS, DIRECTIONS FOR FUTURE RESEARCH AND LIMITATIONS OF THE STUDY

In our literature review, we explored the main topics related to contract strategies in complex construction projects. We identified the contributions of ECM, PM, and PSM research to the contract strategy discussion. Based on our literature analysis, we now discuss the conclusions, suggestions for future research, and our study limitations.

2.5.1. Conclusions about the three identified contract strategy topics

Studies that focus on individual contract strategies. We found very few studies on traditional contract strategies. The identified papers written in the 1990s mostly build their argumentation about the advantages and disadvantages of cost-reimbursable and fixed price contracts conceptually. Traditional contract strategies continue to be applied in the construction industry. Hence, it is important to study ways to overcome their weaknesses (misalignment of parties' interests, poor relationships) and examine how these contracts can be successfully designed and managed, potentially combining them with performance incentives or applying suitable control types.

Much attention has been devoted to incentive contracts that are complex to design and manage but have a unique potential to balance the financial risks among the project parties. Although dispersed over many articles, a particularly substantial body of knowledge has been accumulated around the principles of successful design of incentive schemes. Although incentive contracts have been studied quite extensively, there are still topics that are under-investigated: e.g. there have been no studies about effect of behavioural, or input, incentives combined with performance-based, although such 'hybrid' contracts are applied in practice. The existing studies are implicitly or explicitly focused on client-contractor dyad,

whereas in practice multi-party agreements are applied. Which specific challenges appear in these complex contract types and how they are solved, requires a clarification.

All the empirical papers in our study are examples of variance research and focus on contract design or its performance (thus, antecedents and outcomes). As scientists, we still know little about how the selected contracts are managed. Such questions call for longitudinal studies and process research. Finally, we found papers only at the organizational level of analysis. Research has not studied the role of different teams in the selection and management of contracts in projects.

Studies that compare the performance of contract strategies. This literature primarily advocates the use of incentive contracts as they perform better than traditional ones. Yet, the approaches to measure the performance of contract strategies are inconsistent. Moreover, although there have been attempts to measure CS in terms of its effect on project results (cost, schedule, quality, etc.), it is unclear how CS affects these results. So far, we have identified only limited work on this topic. Rose and Manley 2010 a,b,c) attempted to find the effect of incentives in the project results, and Suprapto et al. (2016) investigated how different contract types influence project outcomes. It is a question of high importance. If we do not understand the mechanisms through which contract strategies are linked to project outcomes, we cannot properly evaluate their effectiveness or provide valuable recommendations about their improvement. It is a challenging problem, as many other factors besides contract type influence project outcomes. However, there is a need to continue searching for the answer, possibly in moderating of mediating relationships.

Studies that focus on contract strategy selection. The literature traditionally links contract strategy selection to the desired risk allocation. While other factors may affect the choice of CS, it is unclear which factors organizations

actually take into account. Most studies about this topic are conceptual and do not investigate how the strategy selection process actually happens. Papers that examine the overall procurement strategy of projects consider CS as one of its elements. Although they mention that all elements are interconnected and should not be conflicting, it is unclear which connections they have and which elements should be considered together, as the list of the elements in papers varies. It is thus not clear how and with which other procurement strategy elements a CS needs to be coordinated, if any.

In terms of overall strategy selection approach, it is important to investigate how decisions are made in real life. This will clarify how the CS is made and how contract strategies are related to more complex project procurement strategies (routes). Empirical research is needed, especially in-depth case studies and process studies, to identify what actually happens in practice and the problems that arise, as the selection process 'on paper' may not be a true reflection of real-life practices (Lædre et al., 2006).

Also, we noticed that all the articles reviewed present strategy selection as a rational process and choose the organization as the unit of analysis. In reality, decisions are taken by different functional teams and various managers. Their roles, experiences, and personal preferences for a contract type may affect the strategy choice. Changing the unit of analysis and examining what happens at the team or individual level could reveal more about the complexity of CS selection and help us better understand the real challenges that organizations face in this process.

Overall, the CS research appears to be heavily under-theorized. Even when theories are mentioned in the articles (primarily in studies about incentive contracts), they are rarely consistently pursued through the papers. The absence of a theoretical lens and the fragmented application of certain theoretical constructs

limits the scientific value of the research and its contribution to the advancement of management science. Despite multiple publications and more than three decades of focus on CS topics, many studies are still exploratory. Furthermore, very few papers attempt to build or test theory despite applying appropriate research strategies and richness of collected data. Applied theories, such as TCE, agency, utility, and game are naturally used in the literature that studies contracts, but there is ample room for more their consistent application and elaboration. Future studies could apply property rights theory (Selviaridis and Wynstra, 2015) or real options theory when studying target cost contracts.

2.5.2. Conclusions about the contribution of ESM, PM and PSM literature

Although the number of articles in ECM journals and their contribution to many topics is substantial, we see very few attempts to apply theories and systematically advance research. Taking a more rigorous perspective could change and enrich these studies. We also notice that most studies use data from the public sector, which may be explained by its easier availability, diversifying research into other private and public subsectors could enrich and improve generalizability of the findings.

We believe that PM research is not sufficiently differentiated from ECM literature, as they both examine the same topics, using similar approaches and methods. For instance, both literatures study the role of incentives, and the design of particular incentive contracts. PM researchers could differentiate themselves by publishing scientifically rigorous studies and focusing on questions relevant and specific for the project management field. This could provide specific advice on the process of overall procurement strategy or contract strategy selection. Another relevant avenue for PM research could be to look inside project teams and identify

the roles and contributions of various departments in the strategy development process.

The number of articles related to contract strategies published by PSM researchers is unexpectedly low, which may be explained by the traditional interest of this literature in the series manufacturing setting. However, given the increasing trend of projectification in many industries, there is a clear need for more PSM studies in this empirical context. For instance, PSM research could study traditional contracts and find ways to apply them and overcome their inherent weaknesses effectively. Existing research on incentive contracts focuses implicitly or explicitly on bilateral contracts between the client and contractor, whereas the specifics and complexity of multi-party contracts as applied in practice require further investigation. Finally, we found existing scholars to be interested either in the design or the effect of contracts. Since we still do not know how various contract strategies should be managed, PMS researchers should focus on the contract management phase, as effective governance of buyer-supplier relationships with contracts is one of the key topics for this research field. Finally, although PSM research contributes to the discussion of the contract strategy selection through conceptual studies, empirical studies are needed to understand how organizations approach the process of contract strategy selection and what challenges they face in finding the most effective contract for the transaction.

2.5.3. Limitations of the study

First, we could only briefly analyze each topic in the current review due to a broad approach to the studied topic and the many relevant publications. Second, we limited our literature search to three disciplines. Extending it to other research strands such as public policy or general management might have given us additional insights into the issue. Finally, we also confined our literature search to academic

articles in the three chosen disciplines. Including management journals or books in the search might have allowed us to extend the number of topics, questions, or approaches relating to strategy selection. Future studies can address these limitations.

2.6. APPENDICES

Appendix 2A. Contract strategies and project delivery strategies included in the review

Contract strategies mentioned in the literature review

Name	Definition/Explanation
Cost plus incentive fee – CPFI	The parties agree to share the risk associated with the project execution. The two parties negotiate and agree on a target cost and a target profit. Any deviation between the actual target costs will be shared by both of them in an agreed upon ratio. On completion, the contractor receives the target fee plus or minus his share in cost deviation (Al-Harbi, 1998)
Cost reimbursable (Cost plus, prime cost, time and material)	The owner pays the fixed fee or percentage of the cost fee, and additionally reimburses the contractor for all costs associated with the project. Thus, the owner pays for the labour, plant and materials consumed, and these costs are charged at rates that are checked through open book accounting (Chapman and Ward, 1994)
Fixed price (Fixed fee, lump sum)	The owner pays a fixed price to a contractor regardless of what the project actually costs the contractor to complete. The contractor carries all the risk of loss associated with higher-than-expected costs, but benefits if costs turn out to be less than expected (Chapman and Ward, 1994).
Incentive/disincentive – I/D	A specific type of incentive contract that is applied in the road infrastructure projects. The contractor receives the incentive fee for the project early completion compared to the planned schedule. A pre-defined incentive amount is given for each day of the early completion. On the other side, the contractor is penalized for late completion of the project with a fixed daily amount of disincentive (Arditi, Khisty and Yasamis, 1997).
Guaranteed maximum price - GMP	The guaranteed maximum price (GMP) contract, whereby the contractor is paid his actual cost in addition to an agreed upon fee while he guarantees that the total cost to the owner will not exceed a stipulated maximum amount. The contractor bears risks of the cost overrun (Boukendour and Bah, 2010).
Target cost – TC	A target cost is introduced. Any cost under- or over- run against this target is split between the owner and the contractor at pre-agreed, specified proportions. There is motivation for both parties to work together to minimize actual costs: for the employer to minimize the total sum paid out, and for the contractor to maximize his profit above that included in the fee (Broome and Perry, 2002)

Project delivery strategies mentioned in the literature review

Name	Definition/Explanation
Construction management, with two variations: management contracting (agency) and construction manager at risk – CMR or CMAR (CMR can be alternatively called Construction manager/general contractor – CM/GC. In oil and gas industry Engineer Procure Construct Manage (EPCm) can be an equivalent to this strategy)	In management contracting, a contractor performs a management function under a professional services contract with the owner. In such contract, the planning, design and the construction can be viewed as integrated tasks, or a professional construction management company can be hired for the implementation of the construction tasks only (Naoum and Landgord, 1988). If the contractor does not carry any financial risks of the project completion, an agency agreement is signed; if the risks are on the contractor side, then construction management at risk agreement is in place.
Design Bid Build - DBB (Design Build Construct, Traditional method)	A PDS in which the owner usually contracts with a designer and a construction contractor. Typically the designer prepares a complete set of design documents, based on which one contractor is typically selected to build a facility in accordance with the plans and specifications (Konchar and Sanvido, 1998)
Design Build - DB (Design Construct)	The owner signs an agreement with a single contractor to perform both design and construction under a single design-build contract (Konchar and Sanvido, 1988)
Integrated Project Delivery - IPD	Approach that 'integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all project participants to optimize project results, increase value for the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction (American Institute of Architects, 2007)
Project alliance - PA	A PDS in which the owner and one or more contractors work as an integrated team to deliver a specific project under a contractual framework where their commercial interests are aligned with actual project outcomes. All parties assume collective, joint responsibility for the project, i.e. ownership of all risks and opportunities, and share 'pains and gains' based on how the actual project outcomes compare to the target ones. Allocation of risks and opportunities is done through risk/reward contractual arrangements (Ross, 2003)

Appendix 2B. Search protocols

Scopus

TITLE(contract* selection) OR TITLE(project procurement) OR TITLE(procurement system*) OR TITLE(procurement route*) OR TITLE(procurement path*) OR TITLE(contract* strateg*) OR TITLE(contract* payment) OR TITLE(contractor compensation) OR TITLE(construction contract*) OR TITLE(payment mechanism*) OR TITLE(fixed price) OR TITLE(fixed fee) OR TITLE(lump sum) OR TITLE(cost reimbursable) OR TITLE(cost plus) OR TITLE(time and material) OR TITLE(contract* incentiv*) OR TITLE(financial incentiv*) OR TITLE(target cost) OR TITLE(guaranteed maximum price) OR TITLE(gain pain shar*) OR TITLE(cost plus incentiv*)

KEY(contract* selection) OR KEY(project procurement) OR KEY(procurement system*) OR KEY(procurement route*) OR KEY(procurement path*) OR KEY(contract* strateg*) OR KEY(contract* payment) OR KEY(contractor compensation) OR KEY(construction contract*) OR KEY(payment mechanism*) OR KEY(fixed price) OR KEY(fixed fee) OR KEY(lump sum) OR KEY(cost reimbursable) OR KEY(cost plus) OR KEY(time and material) OR KEY(contract* incentiv*) OR KEY(financial incentiv*) OR KEY(target cost) OR KEY(guaranteed maximum price) OR KEY(gain pain shar*) OR KEY(cost plus incentiv*)

Web of Science

TS=(“contract* selection”) OR TI=(“contract* selection”) OR TS=(“project procurement*”) OR TI=(“project procurement*”) OR TS=(“procurement system*”) OR TI=(“procurement system*”) OR TS=(“procurement rout*”) OR TI=(“procurement rout*”) OR TS=(“procurement path*”) OR TI=(“procurement path*”) OR TS=(“contract* strateg*”) OR TI=(“contract* strateg*”) OR TS=(“contractor payment*”) OR TI=(“contractor payment*”) OR TS=(“contractor compensation”) OR TI=(“contractor compensation”) OR TS=(“construction contract*”) OR TI=(“construction contract*”) OR TS=(“payment mechanism”) or TI=(“payment mechanism”) OR TS=(“fixed price”) or TI=(“fixed price”) OR TS=(“fixed fee”) OR TI=(“fixed fee”) OR TS=(“lump sum”) OR TI=(“lump sum”) OR TS=(“cost reimbursable”) OR TI=(“cost reimbursable”) OR TS=(“cost plus”) OR TI=(“cost plus”) OR TS=(“time and material”) OR TI=(“time and material”) OR TS=(“contract* incentiv*”) OR TI=(“contract* incentive*”) OR TS=(“financial incentiv*”) OR TI=(“financial incentive*”) OR TS=(“target cost”) OR TI=(“target cost”) OR TS=(“guaranteed maximum price”) OR TI=(“guaranteed maximum price”) OR TS=(“gain pain shar*”) OR TI=(“gain pain shar*”) OR TS=(“cost plus incentiv*”) OR TI=(“cost plus incentiv*”)

Appendix 2C. List of papers included in the review

DISCIPLINE	CATEGORY	TOPIC
I - ECM journal	A - Contract strategy (CS)	1 – Individual strategies
II - PM journal	B - Procurement route	2 – Comparison of performance
III – PSM (SCM) journal		3 – Contract strategy selection

Abu-Hijleh, S. F., & Ibbs, C. W. (1989). Schedule-based construction incentives. Journal of Construction Engineering and Management, 115(3), 430-443	I	A	1
Al-Harbi, K. M. A. S. (1998). Sharing fractions in cost-plus-incentive-fee contracts. International Journal of Project Management, 16(2), 73-80	II	A	1
Alhazmi, T., & McCaffer, R. (2000). Project procurement system selection model. Journal of Construction Engineering and management, 126(3), 176-184.	I	B	2
Arditi, D., Khisty, C. J., & Yasamis, F. (1997). Incentive/disincentive provisions in highway contracts. Journal of Construction Engineering and Management, 123(3), 302-307	I	A	2
Arditi, D., & Yasamis, F. (1998). Incentive/disincentive contracts: perceptions of owners and contractors. Journal of Construction Engineering and Management, 124(5), 361-373.	I	A	1
Badenfelt, U. (2008). The selection of sharing ratios in target cost contracts. Engineering, Construction and Architectural Management, 15(1), 54-65.	I	A	1
Bayraktar, M. E., & Hastak, M. (2009). A decision support system for selecting the optimal contracting strategy in highway work zone projects. Automation in Construction, 18(6), 834-843	I	A	3
Berends, T. C. (2000). Cost plus incentive fee contracting—experiences and structuring. International Journal of Project Management, 18(3), 165-171.	II	A	1
Berends, T. C. (2006). Cooperative contracting on major engineering and construction projects. The Engineering Economist, 51(1), 35-51.	I	A	1
Boukendour, S. (2007). Preventing post-contractual opportunism by an option to switch from one contract to another. Construction Management and Economics, 25(7), 723-727.	I	A	1
Boukendour, S., & Bah, R. (2001). The guaranteed maximum price contract as call option. Construction Management and Economics, 19(6), 563-567.	I	A	1
Boukendour, S., & Hughes, W. (2014). Collaborative incentive contracts: stimulating competitive behaviour without competition. Construction Management and Economics, 32(3), 279-289.	I	A	1
Bower, D., Ashby, G., Gerald, K., & Smyk, W. (2002). Incentive mechanisms for project success. Journal of Management in Engineering, 18(1), 37-43	I	A	1
Bower, D., & Merna, A. (2002). Finding the optimal contractual arrangement for projects on process job sites. Journal of Management in Engineering, 18(1), 17-20.	I	A	2
Brahm, F., & Tarziján, J. (2015). Does complexity and prior interactions affect project procurement? Evidence from mining mega-projects. International Journal of Project Management, 33(8), 1851-1862.	II	A	3

Bresnen, M., & Marshall, N. (2000). Motivation, commitment and the use of incentives in partnerships and alliances. Construction Management and Economics, 18(5), 587-598	I	A	1
Broome, J., & Perry, J. (2002). How practitioners set share fractions in target cost contracts. International Journal of Project Management, 20(1), 59-66.	II	A	1
Bubshait, A. A. (2003). Incentive/disincentive contracts and its effects on industrial projects. International Journal of Project Management, 21(1), 63-70.	II	A	1
Carmichael, D. G., & Karantonis, J. P. (2015). Construction contracts with conversion capability: a way forward. Journal of Financial Management of Property and Construction, 20(2), 132-146.	I	A	1
Chan, A. P., Chan, D. W., Fan, L. C., Lam, P. T., & Yeung, J. F. (2008). Achieving partnering success through an incentive agreement: lessons learned from an underground railway extension project in Hong Kong. Journal of Management in Engineering, 24(3), 128-137.	I	A	1
Chan, D. W., Chan, A. P., Lam, T. I. P., & Chan, H. L. (2010). Exploring the key risks and risk mitigation measures for guaranteed maximum price and target cost contracts in construction. Construction Law Journal.	I	A	1
Chan, J. H., Chan, D. W., Lam, P. T., & Chan, A. P. (2011). Preferred risk allocation in target cost contracts in construction. Facilities, 29(13/14), 542-562.	I	A	1
Chan, D. W., Chan, A. P., Lam, P. T., & Wong, J. M. (2010). Empirical study of the risks and difficulties in implementing guaranteed maximum price and target cost contracts in construction. Journal of Construction Engineering and Management, 136(5), 495-507.	I	A	1
Chan, D. W., Chan, A. P., Lam, P. T., & Wong, J. M. (2010). Identifying the critical success factors for target cost contracts in the construction industry. Journal of Facilities Management, 8(3), 179-201.	I	A	1
Chan, D. W., Chan, A. P., Lam, P. T., & Wong, J. M. (2011). An empirical survey of the motives and benefits of adopting guaranteed maximum price and target cost contracts in construction. International Journal of Project Management, 29(5), 577-590.	II	A	1
Chan, D. W., Chan, A. P., Lam, P. T., Yeung, J. F., & Chan, J. H. (2011). Risk ranking and analysis in target cost contracts: Empirical evidence from the construction industry. International Journal of Project Management, 29(6), 751-763.	II	A	1
Chan, D. W., Lam, P. T., Chan, A. P., & Wong, J. M. (2011). Guaranteed maximum price (GMP) contracts in practice: A case study of a private office development project in Hong Kong. Engineering, Construction and Architectural Management, 18(2), 188-205	I	A	1
Chan, D. W., Lam, P. T., Chan, J. H., Ma, T., & Perkin, T. (2012). A comparative study of the benefits of applying target cost contracts between South Australia and Hong Kong. Project Management Journal, 43(2), 4-20.	II	A	2
Chapman, C. B., & Ward, S. C. (1994). The efficient allocation of risk in contracts. Omega, 22(6), 537-552.	III	A	3
Chapman, C., & Ward, S. (2008). Developing and implementing a balanced incentive and risk sharing contract. Construction Management and Economics, 26(6), 659-669.	I	A	1,3

Chen, Q., Xia, B., Jin, Z., Wu, P., & Hu, Y. (2015). Choosing appropriate contract methods for design-build projects. Journal of Management in Engineering, 32(1), 04015029.	I	A	3,2
Choi, K., & Kwak, Y. H. (2012). Decision support model for incentives/disincentives time–cost tradeoff. Automation in Construction, 21, 219-228.	I	A	1
Choi, K., Kwak, Y. H., Pyeon, J. H., & Son, K. (2011). Schedule effectiveness of alternative contracting strategies for transportation infrastructure improvement projects. Journal of Construction Engineering and Management, 138(3), 323-330	I	A	2
Chua, D. K., & Loh, P. K. (2006). CB-contract: Case-based reasoning approach to construction contract strategy formulation. Journal of Computing in Civil Engineering, 20(5), 339-350	I	A	3
Cox, A., & Thompson, I. (1997). Fit for purpose. Contractual Relations: Determining a Theoretical Framework for Construction Projects. European Journal of Purchasing & Supply Management, 3, 127-135	III	B	3
Ding, J., Wang, N., & Hu, L. (2018). Framework for designing project delivery and contract strategy in Chinese construction industry based on value-added analysis. Advances in Civil Engineering, 2018.	I	B	2
Eriksson, P. E. (2017). Procurement strategies for enhancing exploration and exploitation in construction projects. Journal of Financial Management of Property and Construction, 22(2), 211-230.	I	B	3,2
Eriksson, P. E., Lingegård, S., Borg, L., & Nyström, J. (2017). Procurement of Railway Infrastructure Projects–A European Benchmarking Study. Civil Engineering Journal, 3(4), 199-213	I	B	2
Eriksson, P. E., Volker, L., Kadefors, A., Lingegård, S., Larsson, J., & Rosander, L. (2019). Collaborative procurement strategies for infrastructure projects: a multiple-case study. Proceedings of the Institution of Civil Engineers-Management, Procurement and Law, 172(5), 197-205.	I	B	2
Gordon, C. M. (1994). Choosing appropriate construction contracting method. Journal of Construction Engineering and Management, 120(1), 196-210.	I	B	3
Griffis, F. H., & Butler, F. M. (1988). Case for cost-plus contracting. Journal of Construction Engineering and Management, 114(1), 83-94.	I	A	1
Griffiths, F. (1989). Project contract strategy for 1992 and beyond. International Journal of Project Management, 7(2), 69-83.	II	A	1,3
Gruneberg, S., Hughes, W., & Ancell, D. (2007). Risk under performance-based contracting in the UK construction sector. Construction Management and Economics, 25(7), 691-699.	I	A	1
Hartman, F., & Snelgrove, P. (1996). Risk allocation in lump-sum contracts—Concept of latent dispute. Journal of Construction Engineering and Management, 122(3), 291-296.	I	A	1
Hartman, F., Snelgrove, P., & Ashrafi, R. (1997). Effective wording to improve risk allocation in lump sum contracts. Journal of Construction Engineering and Management, 123(4), 379-387.	I	A	1
Hasan, A., & Jha, K. N. (2015). Acceptance of the incentive/disincentive contracting strategy in developing construction markets: Empirical study from India. Journal of Construction Engineering and Management, 142(2), 04015064.	I	A	1

Herbsman, Z. J., Tong Chen, W., & Epstein, W. C. (1995). Time is money: innovative contracting methods in highway construction. Journal of Construction Engineering and Management, 121(3), 273-281.	I	A	2
Herbsman, Z. J., & Glagola, C. R. (1998). Lane rental—Innovative way to reduce road construction time. Journal of Construction Engineering and Management, 124(5), 411-417.	I	A	1
Herten, H. J., & Peeters, W. A. R. (1986). Incentive contracting as a project management tool. International Journal of Project Management, 4(1), 34-39.	II	A	1
Hosseinian, S. M., & Carmichael, D. G. (2012). Optimal incentive contract with risk-neutral contractor. Journal of Construction Engineering and Management, 139(8), 899-909.	I	A	1
Hosseinian, S., & G. Carmichael, D. (2014). Optimal sharing arrangement for multiple project outcomes. Journal of Financial Management of Property and Construction, 19(3), 264-280.	I	A	1
Howard, W. E., Bell, L. C., & McCormick, R. E. (1997). Economic principles of contractor compensation. Journal of Management in Engineering, 13(5), 81-89.	I	A	
Hughes, D., Williams, T., & Ren, Z. (2012). Is incentivisation significant in ensuring successful partnered projects?. Engineering, Construction and Architectural Management, 19(3), 306-319.	I	A	1
Ibbs, C. (1991). Innovative contract incentive features for construction. Construction Management and Economics, 9(2), 157-169.	I	A	1
Ive, G., & Chang, C. Y. (2007). The principle of inconsistent trinity in the selection of procurement systems. Construction Management and Economics, 25(7), 677-690.	I	B	3
Jaafari, A. (1996). Twinning time and cost in incentive-based contracts. Journal of Management in Engineering, 12(4), 62-72	I	A	1
Jaraiedi, M., Plummer, R. W., & Aber, M. S. (1995). Incentive/disincentive guidelines for highway construction contracts. Journal of Construction Engineering and management, 121(1), 112-120.	I	A	1
Kaplanogu, S. B., & Arditi, D. (2009). Pre-project peer reviews in GMP/lump sum contracts. Engineering, Construction and Architectural Management, 16(2), 175-185.	I	A	1
Kerkhove, L. P., & Vanhoucke, M. (2016). Incentive contract design for projects: The owner′ s perspective. Omega, 62, 93-114.	III	A	1
Khalafalla, M., & Rueda-Benavides, J. (2018). Unit price or lump sum? A stochastic cost-based decision-making tool for design-bid-build projects. Transportation Research Record, 2672(26), 11-20.	I	A	2
Kumaraswamy, M. M., & Dissanayaka, S. M. (1998). Linking procurement systems to project priorities. Building Research & Information, 26(4), 223-238	I	B	3
Kumaraswamy, M. M., & Dissanayaka, S. M. (2001). Developing a decision support system for building project procurement. Building and Environment, 36(3), 337-349.	I	B	3
Lædre, O., Austceng, K., Haugen, T. I., & Klakegg, O. J. (2006). Procurement routes in public building and construction projects. Journal of construction engineering and management, 132(7), 689-696.	I	B	3

Lahdenperä, P. (2010). Conceptualizing a two-stage target-cost arrangement for competitive cooperation. Construction Management and Economics, 28(7), 783-796.	I	A	1
Lahdenperä, P. (2016a). Preparing a framework for two-stage target-cost arrangement formulation. International Journal of Managing Projects in Business, 9(1), 123-146	II	A	1
Lahdenperä, P. (2016b). Formularising two-stage target-cost arrangements for use in practice. International Journal of Managing Projects in Business, 9(1), 147-170.	II	A	1
Laryea, S. (2016). Risk apportionment in target cost contracts. Proceedings of the Institution of Civil Engineers–Management, Procurement and Law, 169(6), 248-257.	I	A	1
Ling, F. Y. Y., Rahman, M. M., & Ng, T. L. (2006). Incorporating contractual incentives to facilitate relational contracting. Journal of Professional Issues in Engineering Education and Practice, 132(1), 57-66.	I	A	1
Love, P. E., Davis, P. R., Chevis, R., & Edwards, D. J. (2010). Risk/reward compensation model for civil engineering infrastructure alliance projects. Journal of Construction Engineering and Management, 137(2), 127-136.	I	A	1
Ma, J., Ma, Z., & Li, J. (2017). An IPD-based incentive mechanism to eliminate change orders in construction projects in China. KSCE Journal of Civil Engineering, 21(7), 2538-2550	I	A	1
Meng, X., & Gallagher, B. (2012). The impact of incentive mechanisms on project performance. International Journal of Project Management, 30(3), 352-362.	II	A	1
Missbauer, H., & Hauber, W. (2006). Bid calculation for construction projects: Regulations and incentive effects of unit price contracts. European journal of operational research, 171(3), 1005-1019.	III	A	1
Mosley Jr, J. C., & Bubshait, A. A. (2017). Project procurement systems for mechanical, electrical and piping projects in Saudi Arabia: An empirical assessment. Engineering, Construction and Architectural Management, 24(6), 1004-1017	I	B	2
Motawa, I., & Kaka, A. (2009). Modelling payment mechanisms for supply chain in construction. Engineering, Construction and Architectural Management, 16(4), 325-336.	I	A	3,2
Oyegoke, A. S., Dickinson, M., Khalfan, M. M., McDermott, P., & Rowlinson, S. (2009). Construction project procurement routes: an in-depth critique. International Journal of Managing Projects in Business.	II	B	2,3
Paul, A., & Gutierrez, G. (2005). Simple probability models for project contracting. European Journal of Operational Research, 165(2), 329-338.	III	A	2
Perry, J. G., & Barnes, M. (2000). Target cost contracts: an analysis of the interplay between fee, target, share and price. Engineering, Construction and Architectural Management, 7(2), 202-208.	I	A	1
Rose, T., & Manley, K. (2010a). Motivational misalignment on an iconic infrastructure project. Building Research & Information, 38(2), 144-156.	I	A	1
Rose, T. M., & Manley, K. (2010b). Financial incentives and advanced construction procurement systems. Project Management Journal, 41(1), 40-50.	II	A	1

Rose, T., & Manley, K. (2010c). Client recommendations for financial incentives on construction projects. Engineering, Construction and Architectural Management, 17(3), 252-267.	I	A	1
Rosenfeld, Y., & Geltner, D. (1991). Cost-plus and incentive contracting: some false benefits and inherent drawbacks. Construction Management and Economics, 9(5), 481-490.	I	A	1,2
Shr, J. F., & Chen, W. T. (2004). Setting maximum incentive for incentive/disincentive contracts for highway projects. Journal of Construction Engineering and management, 130(1), 84-93	I	A	1
Smith, H. F. (1997). Bucking the Trend: Cost-Plus Services in Lump-Sum Turnkey Market. Journal of Management in Engineering, 13(1), 38-43.	I	A	1,2
Stukhart, G. (1984). Contractual incentives. Journal of Construction Engineering and Management, 110(1), 34-42.	I	A	1
Suprapto, M., Bakker, H. L., Mooi, H. G., & Hertogh, M. J. (2016). How do contract types and incentives matter to project performance?. International Journal of Project Management, 34(6), 1071-1087.	II	A	1,2
Tang, W., Qiang, M., Duffield, C. F., Young, D. M., & Lu, Y. (2008). Incentives in the Chinese construction industry. Journal of Construction Engineering and Management, 134(7), 457-467.	I	A	1
Thompson, I., Cox, A., & Anderson, L. (1998). Contracting strategies for the project environment. European Journal of Purchasing & Supply Management, 4(1), 31-41.	III	B	3
Tran, D. Q., Brihac, A., Nguyen, L. D., & Hoon Kwak, Y. (2018). Project cost implications of competitive guaranteed maximum price contracts. Journal of Management in Engineering, 34(2), 05018001.	I	A	1,2
Turner, J. R. (2004). Farsighted project contract management: incomplete in its entirety. Construction Management and Economics, 22(1), 75-83.	I	B	3
Turner, J. R., & Simister, S. J. (2001). Project contract management and a theory of organization. International Journal of Project Management, 19(8), 457-464.	II	B	3
Veld, J., & Peeters, W. A. (1989). Keeping large projects under control: the importance of contract type selection. International Journal of Project Management, 7(3), 155-162.	II	A	3
Ward, S., & Chapman, C. (1994). Choosing contractor payment terms. International Journal of Project Management, 12(4), 216-221.	II	A	3
Ward, S. C., & Chapman, C. B. (1995). Evaluating fixed price incentive contracts. Omega, 23(1), 49-62.	III	A	1,2
Willoughby, T. J. (1995). Managing design under lump-sum contract. Journal of Management in Engineering, 11(2), 21-25	I	A	1
Witt, E., & Liias, R. (2011). Comparing risk transfers under different procurement arrangements. International Journal of Strategic Property Management, 15(2), 173-188.	I	B	3,2
Wong, K. C., & So, A. T. (1995). A fuzzy expert system for contract decision making. Construction Management and Economics, 13(2), 95-103.	I	A	3
Zhang, L., & Li, F. (2014). Risk/reward compensation model for integrated project delivery. Engineering Economics, 25(5), 558-567.	I	A	1
Zhang, L. Y., & Li, F. (2015). The impact of risk perception on developing incentive systems for relational contracting. KSCE Journal of Civil Engineering, 19(5), 1203-1213.	I	A	1

Appendix 2D. Number of relevant publications per journal

Even if a journal is related to supply chain management field (Omega) or operations management (European journal of operations research), it is mentioned as PSM in the table below), as publications in them within this LR related to PSM research topics

#	Journal	# of articles	Research discipline
1	Journal of Construction Engineering and Management	20	ECM
2	International Journal of Project Management	14	PM
3	Construction Management and Economics	12	ECM
4	Journal of Management in Engineering	9	ECM
5	Engineering, Construction and Architectural Management	8	ECM
6	International Journal of Managing Projects In Business	3	PM
7	Omega	3	PSM
8	Advances in Civil Engineering	2	ECM
9	Automation in Construction	2	ECM
10	Building Research and Information	2	ECM
11	European Journal of Operational Research	2	PSM
12	European Journal of Purchasing and Supply Management	2	PSM
13	Journal of Financial Management of Property and Construction	2	ECM
14	KCSE Journal of Civil Engineering	2	ECM
15	Proceeding of Institution of Civil Engineers – Management, Procurement and Law	2	ECM
16	Project Management Journal	2	PM
17	Building and Environment	1	ECM
18	Civil Engineering Journal	1	ECM
19	Construction Law Journal	1	ECM
20	Engineering Economics	1	ECM
21	Facilities	1	ECM
22	International Journal of Strategic Property Management	1	ECM
23	Journal of Computing in Civil Engineering	1	ECM
24	Journal of Facilities Management	1	ECM
25	Journal of Professional Issues in Engineering Education and Practice	1	ECM
26	The Engineering Economist	1	ECM
27	Transportation Research Record: the Journal of Transportation Research Board	1	ECM

3. DESIGN OF MULTI-PARTY PERFORMANCE-BASED CONTRACTS: UNDERSTANDING THE ROLE OF SUPPLY CHAIN INTERDEPENDENCE AND SUPPLIER MOTIVATION [5]

3.1. INTRODUCTION

Performance-based contracts (PBCs) are a popular type of a supply chain agreement but are complex to design and execute (Selviaridis and Wynstra, 2015). Manufacturing servitization, the complexity of value creation processes, and the quest for supplier innovativeness are some of the reasons why buyers prefer to pay their suppliers for results rather than for inputs (Hypko et al., 2010; Sumo et al., 2016). Suppliers, however, are often less willing to engage in PBCs: linking part of the reward to the outcome that is not known ex ante substantially increases their financial risk (Gruneberg et al., 2007; Steinbach et al., 2018). Buyers can, in some situations, impose a PBC on suppliers using asymmetry in bargaining power (Cox, 2001). However, if suppliers are not satisfied with the contract, they are likely to engage in self-oriented behaviour and disputes over contract interpretation, rather than invest effort in the successful execution of the transaction (Howard et al., 2014).

According to Agency theory, in which PBC research is often grounded, certain task characteristics make a performance (outcome-based) contract a suboptimal choice for suppliers, e.g. high uncertainty in the process of outcome creation, low

[5]An earlier version of this chapter was presented in: Nikulina, A. and Wynstra, F. Factors that affect supplier motivations to engage in multi-party performance-based contracts. *Proceedings of 30th Annual Meeting of International Purchasing and Supply Education and Research Association* (2021).

The updated version of the chapter is currently under revision in *Journal of Purchasing and Supply Management*.

measurability of performance, or lack of prior relationships between the parties (Sihag and Rijsdijk, 2019). Existing research has found that a PBC under such conditions can lead to suppliers' providing low level efforts into the transaction and to opportunistic behaviours (Steinbach et al., 2018; Nullmeier, 2019). Thus, in incentivizing suppliers to accept higher levels of risk inherent in PBCs, several factors play a role. First, the uncertainty of the performance outcomes needs to be limited. In other words, suppliers need to perceive a sufficiently high outcome attributability and feel they can influence the outcomes to a large degree (Nullmeier et al., 2016). Other factors that positively affect suppliers' willingness to work under a PBC include a previous history of collaborative relationships with the buyer, and the financial rewards involved (Selviaridis and Norrman, 2014). The offered reward is a strong motivator that influences supplier behaviour and the relationship between the contract parties (Howard et al., 2014; Selviaridis and Van der Valk, 2019).

Several studies have focused on the problem of reward design, investigating how suppliers should be compensated for increased risk (Kim et al., 2007; Ng et al., 2009). The problem of low outcome attributability (high outcome uncertainty) has also been examined. Initially, environmental uncertainty was seen as the only obstacle to PBC adoption (Eisenhardt, 1989; Zu and Kaynak, 2012). However, researchers have also emphasised the uncertainty that originates from behaviours of buyers and other supply chain parties (Nullmeier at al., 2016; You et al., 2018). Behaviours of subsuppliers in particular are a potential source of uncertainty if the supplier is dependent on them in the process of outcome creation. Interdependence in product/service creation is a common feature, especially when complexity of the product and of the process through which it is created is high (Caldwell et al., 2009; Howard et al., 2014). For instance, in project-based industries, such as aerospace, shipbuilding, or construction, multiple interdependent parties participate in the

outcome creation (Anvuur and Kumaraswamy, 2007; Martinsuo and Ahola, 2010). Motivating subsuppliers to work under performance-based contracts in such contexts is problematic. At the same time, PBCs could be particularly beneficial in such settings, as it is important to align diverging goals and agendas (Brown et al., 2001; Artto et al., 2016).

The interdependence between suppliers and subsuppliers in the PBC context has received limited attention. Selviaridis and Norrman (2014) suggest a solution to the dependency problem by involving subsuppliers in the PBC and transferring part of the risk to them. However, it has also been found that suppliers rarely cascade their performance-based contracts to their own supply base: subsuppliers perceive PBCs as too risky because they lack sufficient information about the process of outcome creation and cannot influence the behaviours and actions of the buyer and the first-tier supplier (Kleemann and Essig, 2013). Therefore, we intend to contribute to the literature on PBC by empirically investigating the following question:

Which factors affect subsupplier motivation to engage in a multi-party performance-based contract in case of supply chain interdependence?

To answer our research question, we engage in a comparative case study of multi-party PBCs in the construction sector. We define a multi-party PBC as a contract in which two or more suppliers (or subsuppliers) are offered a shared reward linked to the same performance target. Although each party contributes to the outcome, none of them fully controls the process of its creation.

We focus on identifying factors that can affect subsuppliers' willingness to accept a highly uncertain reward in the context of dependency on other project participants. The construction industry is an example of a complex project setting

in which multi-party PBCs between interdependent parties are applied, for instance, in project alliances that can include client, main contractor and subcontractors. Prior studies have focused on relational governance, success factors and outcomes of such contracts (Barlow, 2000; Walker et al., 2002; Caldwell e al., 2009). However, they have paid scant attention to the set of PBC parties, incentive alignment in the supply chain, or the mitigation of low attributability risk (Randall et al., 2010; Selviaridis and Wynstra, 2015).

This study also seeks to advance knowledge about subsuppliers' willingness to engage in a multi-party PBC using Expectancy theory, which allows us explicating the motivational effect of financial reward in terms of its achievability, fairness, and attractiveness (Vroom, 1964; Rose and Manley, 2011). Finally, we advance the knowledge on performance-based contracts in the context of project-based industries.

As the contracting literature related to PBCs has not yet focused on the specifics of multi-party settings, we position our study as theory elaboration (Ketokivi and Choi, 2014). This type of theory advancement is appropriate when a theory is formulated but falls short in explaining certain phenomena (Fisher and Anguinis, 2017). It includes two parts: conceptualization and analysis of empirical data. Therefore, we start with a literature review to identify the factors that affect suppliers' willingness to engage in PBCs. Subsequently, we use case studies to investigate how these factors apply to a multi-party PBC and identify additional variables that influence subsupplier motivation in such contexts.

3.2. LITERATURE REVIEW

3.2.1. Clarification of terms and definitions

A performance-based contract is a type of buyer-supplier agreement where at least part of the supplier reward is linked to the transaction results defined by the buyer (Selviaridis and Wynstra, 2015). However, there is a variety of terms in use. In maintenance, 'output-based' contracts are signed with service providers (Hypko et al., 2010). The construction sector uses the term 'incentive' contract to describe rewards linked to the project outcomes (Rose and Manley, 2010a). All these terms embody a specific empirical context. To draw on different research strands effectively, we use the term 'performance-based contract' or PBC.

While 'buyer' and 'supplier' are general terms for transaction parties, it is common to refer to 'clients' and 'contractors' in the context of construction projects. Contractors and subcontractors are organizations in the first and second tier of the project supply chain (Beach et al., 2005). The main (general, engineer-procure-construct, EPC) contractor is selected and engaged in the project directly by the client. The main contractor develops design and engineering solutions and may be responsible for the overall project, procurement, and construction management. Sub-contractors perform construction works on-site and can be involved in the project by the client or main contractor, depending on the selected project implementation strategy.

3.2.2. PBC adoption and supply chain interdependence

The decision to use a PBC is a step preceding its design (Selviaridis and Norrman, 2015). In a multi-party setting, the buyer also needs to decide which parties will be offered such contract. The supply chain management (SCM) literature considers PBCs as a means of transferring risk from the buyer to the supplier and of encouraging the supplier to focus on the transaction objectives of the buyer (Sumo

et al., 2016; Nullmeier et al., 2020). Similarly, in construction projects PBCs are used to focus project parties on the ultimate project outcome defined by the client (Bower et al., 2002), but also more broadly as tools to promote interorganizational collaboration (Bresnen and Marshall, 2000).

Although some SCM studies suggest cascading PBCs down the supply chain, they do not specify an approach for a multi-party contract formation (Kleemann and Essig, 2013; Selviaridis and Norrman, 2014). Empirical research in project and construction management confirms that subcontractors are included in PBCs (Barlow, 2000; Walker et al., 2002; Caldwell et al., 2009), but is unclear about how a set of parties is defined.

One way of deciding which parties to include in the PBC is by examining supply chain interdependence, which may take three forms: pooled, sequential, and reciprocal (Dubois et al., 2004; Bygballe and Jahre, 2009). In the case of pooled interdependence, subsuppliers may be serving several of their own customers using shared resources; their ability to provide input to the (first tier) supplier also depends on their services to others. Such interdependence can be addressed by standardizing processes, products, and services. Sequential interdependence means that suppliers are contingent in their performance on the input of their subsuppliers. This can be coordinated by careful planning. Reciprocal interdependence is the most complex and, by default, incorporates the other two types. It exists when the output of one party becomes the input for another party, which in turn affects the production processes of the first in terms of timing, quality requirements, or quantities. Such interdependence can only be managed through mutual adjustments (Thompson, 2003).

Standardization, planning, and mutual adjustment as coordination measures differ in the level of required effort and cost. Mutual adjustment requires investment in communication and decision-making and is the most expensive and complex.

Therefore, it should only be pursued if other coordination measures are insufficient. Reciprocally interdependent units should be positioned next to each other in the organizational structure to form a self-sufficient and autonomous unit to minimize the cost of mutual adjustment (Thompson, 2003). Following this logic, a multi-party PBC should not be applied if there is no actual 'technical' reciprocal interdependence between its parties. However, if it exists, organizing interdependent parties under one contract may reduce the cost of coordination, as they would be inclined to invest in communication and collaborative decision-making to succeed. All three types of interdependence are present in the construction industry due to the high complexity of processes and products, and many participants (Bygballe and Jahre, 2009; Bankvall et al., 2010). However, reciprocal interdependence plays a dominant role (Walker and Lloyd-Walker, 2015).

3.2.3. Issue of low outcome attributability

External environment uncertainty. Eisenhardt (1989) posits that when external uncertainty is high, it becomes too expensive for the buyer to transfer risks to suppliers under an outcome-based contract. Zu and Kaynak (2012) and Nullmeier et al. (2016) find that high uncertainty originating from the external environment negatively affects the suppliers' level of effort and inputs and increases the risk of shirking. Construction projects are subject to many types of uncertainty originating in their dynamic environment, ranging from political instability to severe weather conditions (Fang et al., 2004; Laan et al., 2011). None of the parties can be responsible for managing such risks or bearing their financial consequences. Thus, they are not likely to accept a PBC if environmental uncertainty is high (Nullmeier et al., 2016).

Buyer-induced uncertainty. Another potential source of low outcome attributability for suppliers is buyer engagement in outcome creation (Steinbach et al., 2018). Nullmeier et al. (2016) find that the buyer's role in the contract (e.g. the type of inputs it provides or approach to control) affects the supplier's level of efforts under a PBC. The buyer can increase uncertainty for the supplier by behaving in an untransparent and untrustworthy manner. Demonstrating a lack of trust, a hierarchical attitude and micro-management of suppliers, and breaching the spirit of the contract are all forms of non-collaborative buyer behaviour (Steinbach et al., 2018). Akkermans et al. (2019) propose a solution to this problem: collaborative KPIs in which the performance of both the supplier and the buyer is measured and rewarded.

Supply chain-induced uncertainty. When the supplier is dependent on its subsuppliers in the outcome creation, it will perceive a PBC as unattractive and risky, even if the offered reward is substantial (Selviaridis and Norrman, 2014). This risk can be transferred by cascading the PBC to subsuppliers: a multi-party contract is a potential solution, especially when reciprocal interdependency exists in the supply chain and cooperation is needed (Dubois et al., 2004; Bygballe et al., 2010). Research also suggests that a high level of outcome uncertainty (low outcome attributability) will encourage the supplier to develop collaborative relationships with the buyer and its own supply base (Selviaridis and Norrman, 2014), as trustful relationships reduce the perception of the outcome risk (Rousseau et al., 1998).

3.2.4. Collaborative relationships

A collaborative relationship between the buyer and supplier is likely, ceteris paribus, to motivate the supplier to establish similar links with subsuppliers (Selviaridis and Norrman, 2014; Steinbach, 2018). When the buyer's behaviour is hierarchical and price-driven, such a relationship is also likely to be replicated up the supply chain.

Formal, arm's length transactions between clients and main contractors are typical for the construction sector (Cox, 2001). They translate into adversarial relationships with subcontractors, in which abuse of bargaining power and focus on price are common features (Caldwell et al., 2009; Martinsuo and Ahola, 2010). The reasons lie in the fragmented nature of the industry where the set of parties is likely to vary from project to project, and the subsequent absence of long-term intense exchanges between organizations, which are required to build trust (Kadefors, 2004; Gadde and Dubois, 2010).

3.2.5. Performance-based reward design, amount and distribution

The reward under a PBC needs to be attractive and compensate for the increased financial risk (Steinbach et al., 2018). Literature from multiple research fields (e.g. general management, operations and supply chain management, marketing management) has studied performance-based payment design (Kim et al., 2007; Oflaç et al., 2012). Reward framing should be clear and focused on gains to avoid the risk of non-collaborative behaviours and demotivation (Selviaridis and Van der Valk, 2019). The best way is to let contractors " […] share in the client's success from the project." (Rose and Manley, 2010c, p.253). Construction and project management research has identified a set of principles for successful incentive design. For example, the targets need to be achievable and flexible to accommodate for uncertainties in the project execution. The sharing ratio for rewards and penalties should be attractive and fair for the contractor, and performance measurement mechanisms should be clear and transparent (Bower et al., 2002; Broome and Perry, 2002).

If a 'pure' PBC, in which all reward is tied to the outcome, is perceived as too risky by the supplier or too complex to design and manage by the buyer, a 'hybrid' contract can be considered. It combines elements of the less risky, input-based

reward with a more uncertain performance-based compensation. Performance-based incentives can be added to any input-based contract; for instance, schedule incentives in cost-reimbursable agreements.

An important question for multi-party PBCs in particular is the reward distribution between the parties. The simplest method is sharing the reward in equal portions; however, as the parties' contribution to the outcome may vary, this method may be perceived as unfair. Alternatively, the principles of distributive justice can be applied, and the reward can be shared proportionally to the invested efforts (Kadefors, 2005). There is no clear answer to which method is better. For instance, Kadefors and Badenfelt (2009) find that practitioners' opinions differ about the sharing ratio of project cost savings. Some believe that the contractor should get a bigger share (up to 70%), some suggest equal sharing, and others advocate leaving a large portion of savings to the client (up to 70%).

3.2.6. Supplier motivation to accept an uncertain reward

Financial reward is a key extrinsic motivator to collaborate (Kadefors, 2004), as private businesses are strongly "[…] driven by financial value creation." (Caldwell et al., 2009, p.180). However, it does not mean that the offered reward will automatically have the desired motivational effect, because the relationship between financial incentives, commitment, trust, and motivation is complex (Bresnen and Marshall, 2000). Expectancy theory (Vroom, 1964; Porter and Lawler, 1968; Parijat and Bagga, 2014) explains the motivational effect of financial incentives. It originally addresses employee motivation but has also been applied at the organizational level to explain the supplier motivation to perform in a transaction (Rose and Manley, 2010c; 2011). Expectancy theory establishes relationships (motivation antecedents) between four variables: employee effort, performance, objectives, and financial reward. Three types of relationships exist

between these variables: Expectancy, Instrumentality, and Valence. Expectancy is a subjective perception of the probability that a personal effort will lead to the required performance level. Instrumentality means the perception of the probability that performance will result in the financial reward. Valence reflects the value of the financial reward as perceived by the employee considering her objectives. According to Expectancy theory, the overall level of motivation is the result of multiplying the three motivation antecedents. If any of these is zero, the motivational effect will not exist.

Looking at the supplier's motivation problem, Expectancy is a relationship between organizational effort and desired performance. It is related to the concept of outcome attributability: whether the supplier believes that it can control the outcome creation process and that its effort will lead to the desired performance. In the context of multi-party PBC, Expectancy also relates to the perception of other parties' capabilities and motivation to perform (Hollenbeck and Klein, 1987). Instrumentality is the belief that organizational performance will be fairly measured and credited. It can be affected by collaborative relationships among the transaction parties, particularly openness and transparency, and the perception of fair treatment by the buyer. Finally, Valence is the relationship between the offered reward and supplier organization's objectives and may be influenced by the reward amount and perception of achievability of targets. Figure 3.1. presents the theoretical model of supplier motivation.

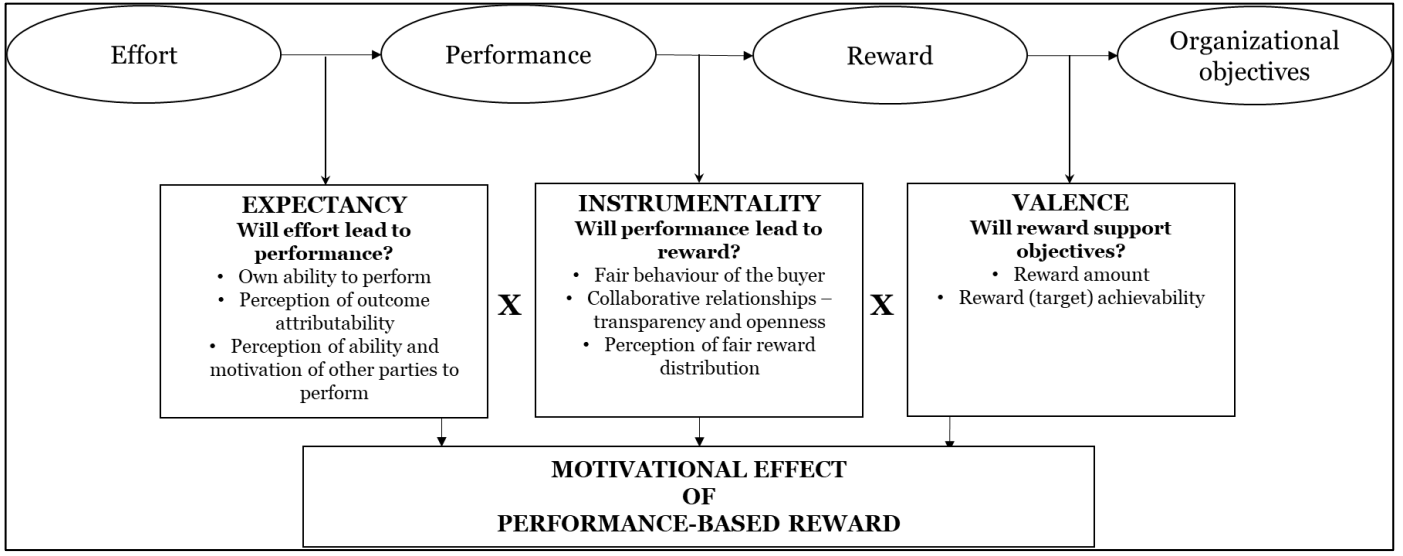


Figure 3.1. Theoretical model of supplier motivation by the offered reward

3.3. RESEARCH METHOD

We apply a comparative case study method to elaborate the literature on PBCs. Case studies can be used for all types of theory advancement (Voss et al., 2002; Dubois and Salmi, 2016). In theory elaboration, it is important to select suitable, contextual, but generalizable cases (Ketokivi and Choi, 2014). Studying multiple cases, as opposed to a single case, increases the clarity of constructs and relationships between them (Ridder, 2017). Our object of study is the multi-party performance-based contract.

We started our data collection from a large main contractor organization (Contractor). We performed purposeful sampling (Dubois and Arajuo, 2007) of cases based on the application of multi-party performance-based contracts. We selected three projects that showed variability in the set of PBC parties (Flybjerg, 2006). Our selected projects also share similarities: comparable type (an upgrade/rebuild of a hydrocarbon processing facility), project budget, and geographical location. All projects pursued collaborative strategies and adopted PBCs to support collaboration between the parties. See Table 3.1. for details.

Table 3.1. Description of projects

	Project "Alpha"	Project "Beta"	Project "Gamma"
Location	Europe		
Budget (€M)	500-750		
Scope	Refurbishment and upgrade of a hydrocarbon processing plant	Refurbishment and upgrade of a hydrocarbon processing plant	Refurbishment and upgrade of a hydrocarbon processing plant
Key objectives	Schedule	Schedule and cost	Cost
Results	Not known; project terminated (no funds)	Schedule met, cost - no	Savings from the target cost, schedule met
Reason to introduce PBC	To promote collaboration between parties and to transfer risk from a fixed-price contract	To promote collaboration between parties and to reach challenging cost and schedule objectives	To promote collaboration between parties and to reach challenging cost objective
Parties who share reward (risk)	Five subcontractors	Two main contractors and three subcontractors	Client, main contractor, and three subcontractors
PBC type	Cost-plus incentive fee	Cost & schedule incentive added to traditional contract	Target cost
Performance targets	Project schedule and (administrative budget)	Project schedule and target cost combined	Project target cost
% of profit at risk	100%	PBC is a 'bonus' on top of input-based contracts	100%
Risk side in the reward system	Risk of delay and of overspending the administrative budget	No risk side, incentive is a bonus	Risk of exceeding target cost

For each case, the first author conducted interviews with the project teams, collecting opinions of all PBC parties (client, main contractor, subcontractors), which allowed for triangulation of perspectives (Diefenbach, 2009). We conducted 43 interviews across 12 organizations, talking to managers from different project functions (construction, procurement/contract management, engineering, project controls), as well as to the project directors and executives directly involved in the design and negotiation of the PBCs (see Appendix 3A for details). Interviews with the Contractor were face-to-face, and interviews with other organizations primarily took place via phone or online conferencing. Not all respondents agreed to have the conversations recorded. For such cases, interview notes were completed directly after the discussion, and sent to the interviewee for verification. We also analysed project and contractual documents (e.g. incentive contracts, partnership declarations) to triangulate the interview data.

Our approach to data collection and analysis was systematic and abductive (Dubois and Gadde, 2002). We jointly started data coding and analysis while continuing data collection. By conducting these activities in parallel (Voss et al., 2002), we used the analyses of the first interviews to improve our discussions with additional respondents, and follow-ups with the managers interviewed earlier. We used parts of the documentation to discuss the PBC design details and related risks with the interviewees.

Our initial list of themes was informed by the literature review: aspects of PBC design and factors that influence contractor motivation represented our deductively developed themes. However, we also found emerging themes that were not covered by our initial ideas and questions. Such pieces of data were coded inductively using open coding, aggregated into themes, and combined with original codes through the axial coding process. Finally, they were analytically linked to the antecedents of financial motivation (Expectancy, Instrumentality, Valence). Our codes were

influenced and improved by moving between the literature and the empirical data (Miles and Huberman, 1994; Voss et al., 2002). Appendix 3B provides details on our approach to data analysis.

Finally, we carefully considered the reliability and validity of our research (Gibbert et al., 2008; Yin, 2011). Table 3.2. summarizes our measures to ensure the methodological quality of the study.

Table 3.2. Actions taken to ensure research methodological quality

Internal validity *Quality of logical reasoning*	• Various streams of research literature used • Two theoretical perspectives to frame and analyse cases
Construct validity *Quality of operationalization of theoretical constructs*	• Triangulation of interview data with documents: discussion with interviewees • Interviews with all parties engaged in the PBC to collect all points of view and with different levels of employees (project team and executives)
External validity *Analytical generalizability of empirical findings to theory*	• Fine-grained analysis of each case and cross-case • Linking findings to the literature for analytical generalization and elaboration
Reliability *Transparency of explanation, ability to replicate research*	• Interview guide adjusted for respondents (client, contractor, subcontractor) • List of all interviewees • Documented data analysis approach

3.4. EMPIRICAL FINDINGS – WITHIN-CASE ANALYSIS

3.4.1. Reciprocal dependence

Reciprocal interdependence exists between the project parties in all the selected cases. While reciprocal interdependence is easily observed in a dyad, it is more complex to identify in a multi-party setting, as it is not always symmetrical (Das and Teng, 2001). Our study focuses on the contract design phase, but interdependency primarily reveals itself during execution. For this reason, we provide examples of anticipated interdependences in Table 3.3.

Table 3.3. Examples of reciprocal interdependence between project parties

Client – (Sub)contractors typical interdependence		
Client provides scope description, specifications, quality and safety requirements, and work permits. If these are not known, Contractor cannot deliver engineering documentation. Subcontractors cannot start working without permits. Client depends on the performance of each party in the overall project performance.		
Contractor – Subcontractors typical interdependence		
Contractor develops works schedules that affect Subcontractors' resource planning (which equipment and crews are needed and when). Work delays or rework by one of the subcontractors leads to rescheduling work of others in the area, and readjustments in resource planning. If resources are no longer available, new schedules may be needed for all parties.		
Project "Alpha" - *example*	**Project "Beta" - *example***	**Project "Gamma" - *example***
Contractor engages subcontractors in the project execution if the client awards him the contract. Client requires a competitive price. The Contractor's offered price depends on the prices offered by each subcontractor. So, subcontractors' prospects of work depend on the competitiveness of each party.	Steel modules are fabricated off-site based on Contractor's drawings. Timeliness and quality of such drawings impacts production, delivery and assembly schedule of the modules, and on-site preparation. Late or poor quality of drawings can lead to delayed production and the need for Contactor to reschedule all activities related to the modules.	The project is split into 26 subprojects (the operational site layout is complex) and requires complex and coordinated scheduling of multiple subcontractors' works in each area. Contractor performs overall work scheduling. Non-adherence to the schedule by one of the parties leads to complex re-scheduling and readjustments of the work of others in multiple areas.

In this section we first offer a detailed analysis of project "Alpha", after which we highlight the most important empirical findings for the projects "Beta" and "Gamma". Table 3.4. provides detailed information on all three projects.

3.4.2. Within-case analysis – project "Alpha"

This project concerns the upgrade of a hydrocarbon processing plant and the addition of a new unit. The client adopted a 'hands-off' approach to project management, having signed a fixed price agreement with Contractor. Contractor engaged in a multi-party PBC with five subcontractors to transfer part of the financial risk for the project outcome to the subcontractors.

Ensuring perception of outcome attributability. Contractor took several steps to reduce outcome uncertainty for the subcontractors. First, the subcontractors were involved in preparing the project execution plans (under the signed Teaming Agreement). They were thus part of the process of outcome creation planning. "*Early involvement makes the construction plans more accurate, as you have better information about scope, client needs, site, technicalities, etc. So, you will be able to make a very accurate and detailed cost estimate and plans… and this means you will have fewer exceptions later*" (Executive, subcontractor D). This improved perception of the achievability of the targets, and of control over the process of outcome creation. It also improved "*feelings about working together*" (Construction manager, subcontractor E). Second, in accordance with the signed contract, all subcontractors were part of the project governing bodies: a Governance Board consisting of parties' executives and an Execution Leadership Team of construction managers. "*The Execution Leadership Team shall meet daily…. and have the authority to make decisions through unanimous votes and the chairman will have the deciding vote in situations where the votes are not unanimous […].*" (Article 6, Incentive agreement).

Some parties had concerns about their dependence on others in earning the reward. For instance, subcontractor A raised the point that they all were dependent on the quality and timeliness of engineering documentation provided by Contractor, who did not bear any risk under the PBC. Contractor stressed that there was no possible misalignment in this aspect, as *"[…] it's in our best interest to issue engineering timely and without rework, as we have the final and the biggest risk in this project, way more than any of the sub[contractor]s*" (Engineering manager, Contractor). However, despite these concerns, all parties signed the PBC. Subcontractors were generally positive about the proposed project execution model, although they understood it was risky. "*We fully support this model. We already*

did this before in an alliance with another customer." (Executive, subcontractor C). "*I think this is the only reasonable and fair model, if everybody who signed up for it, truly believes in it, behaves in that way, and pushes for its implementation*" (Executive, subcontractor D). An executive from subcontractor G also agreed that the set targets were "*quite 'sporty', but not unrealistic*".

The interviewees mentioned that it was important for them to see that the intention of working together was not just talked about but a contractual obligation. "*I don't know these companies, but the fact that they've signed the contract and that they want to appoint their best people to this project, matters. I know projects where the client said he wanted to collaborate, but then it was nothing more than 'lip service'... When I see that everybody says, 'I am ready to do it together with you', I think yes, this is serious*." (Executive, subcontractor B). Thus, the codification of intentions to work on the project jointly positively affected the parties' intentions to achieve the set targets.

Collaborative relationships. It was not possible to ensure existence of a prior collaborative experience among all parties in this project. Contractor had previously worked with all the engaged subcontractors, but never at the same time. Subcontractor B was new to all other subcontractors. The others shared a certain degree of familiarity, albeit not in collaborative projects. However, subcontractors mentioned that lack of prior collaborative relationships was not an issue for them, and instead stressed the importance of trust into managerial capabilities of the Contractor, and other parties' reputation. *"I think here you need to trust him [Contractor] to choose the parties, as if he chose us, I assume he is choosing the same level of companies for other parts of the scope. If suddenly I see a very small company at the table [...] which has never done such a project, then I will have a problem, and of course, I will not trust them and will not believe we can collaborate. But the risk of that is really low*." (Executive, subcontractor D). "*When*

I hear the names of the companies that I'm going to work with – I know what to expect from them, as this is a relatively small world, and you can't hide your reputation." (Executive, subcontractor C).

All subcontractors agreed that Contractor made a genuine effort to behave openly and fairly during the project negotiations and avoided traditional, hierarchical discussions: "*They probably got tired of fighting with subcontractors and understood that things need to change*" (Project manager, subcontractor C). To ensure a collaborative spirit, the Partners Declaration codified four relational principles: partnership ("*We function as one team with one brain*"), collaboration ("*We are respectful and are known for generous acts of collaboration*"), ownership ("*Being responsible matters and is in everybody's interest*"), and transparency ("*Information flows freely and openly from everyone involved*"). The parties' executives signed this declaration to demonstrate their personal and organizational commitment to working jointly in the project. Parties also waived their rights to engage in disputes with each other for underperformance. "*Each party hereby waives its rights or entitlement to make any claims for costs, damages or losses of whatever nature for any and all matters related to this agreement from another party in case any of the targets or incentive are not met by any of the parties hereto for any reason*." (Article 8, Incentive Agreement). Thus, the emphasis was on teamwork, respect, 'no-blame' culture, and transparency.

Reward design and distribution. Bilateral unit rate contracts were signed to compensate subcontractors for the incurred costs and accommodate for their specific rates and scope (for description of contract types see Appendix 3C). No profit margin was incorporated in the rates; all profit was put at risk under the PBC. Thus, this was a 'pure' PBC form, regardless of the bilateral contracts. This approach was taken to eliminate subcontractors' focus on individual goals. "*The idea is very simple; you want a commercial model that only supports behaviours*

that are needed for the project, and the only way you can behave is to collaborate with such a commercial model. It's not rocket science!" (Project director, Contractor). At the same time, it was clear that the parties would need a higher than usual reward to accept such risk. The project director, and the engineering, construction and project control managers of the Contractor organization agreed to set a target of about 200% of typical expected profit margin. All parties agreed that the reward was high enough to show interest in this project. "*These numbers – if we can make them […] would make it one of the best, maybe even the best project for us in the last few years*" (Executive, Subcontractor A). Subcontractors also found that risk side was not unfair, as *"[…] yes, if you cause trouble, you pay for it, that's fair enough*" (Construction manager, subcontractor E).

Only one subcontractor was in doubt about the approach to the reward distribution, whereas others had no concerns. "*You may discuss that some of us have more risk than others… we, for example, have less work to do on site than let's say the piping contractor… but at the end we all can get pretty good money and if we give our best resources and time to that project, then the approach is ok*" (Executive, subcontractor D). The parties also said that it was important for them to believe that Contractor has their best interests in mind, based on his reputation: "*If there is good prior experience with the [Contractor], then sub[contractor]s will work the best they can, when they are sure that [ ] Contractor has their best interests in mind*." (Construction manager, subcontractor E).

Table 3.4. PBC adoption, measures to improve outcome attributability, collaborative relationships, and reward design

	Project "Alpha"	Project "Beta"	Project "Gamma"
PBC adoption *(see Appendix 3D for details about set of parties)*	• Collaborative approach and PBC introduced early in the engineering phase • The client is a financial holding - not involved in the PBC or project management • The main contractor adopts, designs the PBC to foster collaboration and transfer risk under fixed-price contract • Parties who share reward/risk: 5 subcontractors	• Collaborative approach and PBC introduced early in the EPC phase • The client designs PBC and negotiates it with the main contractors and subcontractors • PBC shapes cooperation and coordination so that each party "drives performance in the best interest of the project" Parties who share reward/risk: 2 contractors (Contractor and Contractor II), 3 subcontractors	• Alliance and PBC considered by the client from the very beginning • The client designs the PBC and negotiates it with the main contractor and subcontractors Parties who share reward/risk: the client, contractor & 3subcontractors
Measures to improve perception of outcome attributability	• Early involvement of subcontractors to verify project plans/cost • Collaborative project governance: governance board, construction leadership team • Decisions are taken unanimously. If not, the main contractor decides • Reliance on the client's management capabilities and choice of parties • Parties rely on the technical and managerial reputation of each other in the absence of established collaborative relationships • Intention to collaborate codified in the binding Incentive contract	• Collaborative project governance through alliance board and integrated management team • Highly integrated project management team – all parties take project-related decisions • Decisions by majority vote. The client has the deciding vote • 'Shadow of the past' in collaborative projects for most parties • Intention to collaborate codified in the binding Alliance Agreement	• Early involvement of subcontractors to verify project plans/cost • Collaborative project governance: Alliance board, Project management, execution teams • All project-related decisions are made unanimously • Reliance on the client's management capabilities and choice of parties • Parties rely on technical and managerial reputation of each other in the absence of established collaborative relationships • Intention to collaborate codified in the binding Alliance contract

	Project "Alpha"	Project "Beta"	Project "Gamma"
Collaborative relationships	• No prior collaborative experience in the same circle of participants • The main contractor has prior work experience with each party • Partners Declaration signed by all parties (principles of trust, transparency, openness) • Disputes about partners' performance are contractually prohibited • Non-hierarchical behaviour of the main contractor in contract negotiation • Subcontractors can raise and discuss their concerns during contract negotiations	• Subcontractors brought to the project based on previous collaborative experience • All parties have prior experience of working together (in different projects) • Collaborative development of the project governance / management system • Parties can openly raise and discuss their concerns about collaborative framework • Highly integrated project management team - all parties take project-related decisions	• No prior collaborative experience in the same circle of participants • The client has prior experience of working together with all parties • One alliance contract, open-book accounting, no bilateral contracts – full transparency • Non-hierarchical and aligned behaviour of the client and main contractor in negotiations • Subcontractors can openly raise and discuss their concerns during alliance negotiations • No-blame principles developed and signed by all parties
PBC design, reward amount and distribution *Not all numbers are reported, sharing ratios are slightly altered compared to real contracts for confidentiality*	• Reward is linked to the target date and target administrative budget • Sharing ratios: 15%-20%-35%-20%-10%, based on estimated individual contribution • 100% profit at risk for each party; no other possibilities to make profit • Bilateral unit rate contracts only cover costs • Reward flexibility: target date may be changed, if client agrees • Target measurement: all project info is shared with all parties daily	• Reward is linked both to the target completion date and target cost • Sharing ratios: each party gets 20% • No risk side in the incentive contract • Bilateral contracts: cost-reimbursable for main contractors; unit rate for subcontractors • PBC is a bonus, as profit margin is included in bilateral contracts • Reward flexibility: no adjustments mechanisms Target measurement: all project info is shared with all parties daily	• Reward is linked to the target cost • Savings from the target cost: client 35%, main contractor 30%, subcontractors 9%-16%-10% • Risks of exceeding target costs: client – not capped; main contractor –10%; subcontractors – 5% of the revenue • 100% of profit at risk for each party; no other possibilities to make profit • Reward flexibility: target cost can be adjusted by the Alliance Board • Target measurement: all project info is shared with all parties daily

3.4.3. Projects "Beta" and "Gamma"

Ensuring perception of outcome attributability. In project "Beta", all parties collaboratively discussed the set-up of the project management approach, frequency of meetings and decision-making rights, creating a perception of fairness and openness. The alliance agreement, signed by the parties' executives, codified these arrangements. The project team was highly integrated: employees from all parties were selected for key positions based on their merit and were empowered to take decisions on behalf of the project. Thus, there was a perception of collaboration, control, and involvement in the process of outcome creation when the PBCs were negotiated.

"Beta" applied a 'hybrid' contract, in which the shared performance-based reward was added to bilateral input-based contracts. During the interviews, two subcontractors raised concerns that the bilateral contracts were conflicting: cost-reimbursable for the main contractors and unit rate for subcontractors. As profit is earned in different ways in such contracts (maximizing hours in the former, maximizing efficiency in the latter), the approach to problem-solving in the project would also be different, hindering alignment and collaboration. Interviewees from the client organization admitted that it took a lot of effort to reach an agreement because of this reward conflict "[…] *we had to convince them [main contractors] because they didn't trust the subcontractors and the subcontractors didn't trust the [main'] contractors*." (Construction manager, client). In project "Gamma", the governance system was designed by the client and then discussed with all parties together. One of the subcontractors described the discussion as "*fierce but good*" (Executive, subcontractor A). In this project, all decisions were taken unanimously at all levels of management, which gave parties a perception of both fairness and control.

Collaborative relationships. In Project "Beta", all parties, except Contractor II, had prior experience of working together in collaborative projects (although not in the same one). The subcontractors who participated in the PBC were engaged in the project based on this prior positive experience. Subcontractors and Contractors admitted that the client made a genuine effort to behave collaboratively during negotiations of the collaborative setup and attributed this to the personalities in the team: "*We also know that this client can look and talk very differently*." (Executive, subcontractor B). However, they also mentioned that the client was not flexible in the negotiations about the PBC commercial terms.

In "Gamma", discussions about the PBC were open and the parties showed a desire to collaborate. Subcontractors mentioned that it was important to see that the client and main contractor could work well together: "*If they do not have good relationships, we often receive controversial instructions, and it does not lead to anything good. So seeing them agreeing with each other helped*." (Executive, subcontractor A).

Reward design, amount and distribution. In "Beta" and "Gamma", the client organization initiated the PBC, designed it, and negotiated with other parties. In project "Gamma", the client even became a party to the PBC, explicitly sharing risks and rewards with the main contractor and subcontractors. The clients in the two projects were large oil and gas companies experienced in project management. This could explain their high involvement in the PBC design process.

Project "Beta" represents the 'hybrid' PBC model. Five parties shared the risk-based reward while also making a profit under the traditional input-based bilateral contracts. Project "Gamma" is a 'pure' PBC form, where all the profit depends on the savings from the target cost. In "Beta", while the offered incentive was a substantial bonus, none of the PBC parties believed that the reward would be paid due to non-achievable targets. "*We knew from the beginning that there was no money on the*

table." (Project manager, Contractor II). All parties raised this concern with the client, but the latter was not willing to make changes. The client project director explained that additional funds to incentivize the contractors had not been granted, and possible incentives had to be 'carved out' from the project budget. The client contract manager, reflecting on the reward design, also mentioned that it may have been confusing, as *"[…] asking contractors to achieve both cost and target objectives makes it not clear what exactly we want them to do*." Parties mentioned that they had agreed to sign the PBC, despite not believing in the achievability of reward, as "*We already started the project when we heard the incentive part. If I translate it to other words - we could not walk away from it already, the project was already going. If it was a new client and we were still in the tender process and we would maybe not sign… but in this specific situation we knew the client and he is also very important for us, you understand*." (Executive, subcontractor D).

In project "Gamma", all PBC parties were engaged in the project early and together participated in the verification of engineering documentation, analysis of constructability, and project planning. This approach created the perception that the plans were reliable and would lead to the desired outcome and achievable performance targets.

In "Gamma", the reward sharing ratio was based on the value of individual contributions. In case "Beta", the reward was shared in equal 20% portions among the five parties. One of the executives (Subcontractor A) did not believe this was fair and tried to discuss it with the client. Others mentioned that they would have paid more attention to that aspect had the reward been perceived as genuinely achievable. The client contract manager explained the reason for equal reward sharing in the following way: "*[…] for us the impact of the parties on the result was equal, and also it is simpler. If you try to tie it to the contribution / value of the*

contract – what if then later you transfer part of the scope, how do you recalculate the incentive? It becomes too complex then".

3.4.4. Conclusion

Various tactics to the design of performance-based reward were used in the three projects. At the same time, there were many similarities in the approach to increase the perception of outcome attributability and create collaborative relationships. Results in terms of financial motivation also differed per case. In project "Alpha", subcontractors were satisfied with the offered contract. They felt motivated to work together, although some were concerned about the dependence on the Contractor's input. In "Beta", financial reward did not have the motivational effect for collaboration as the parties considered the reward target unachievable. In project "Gamma", the PBC motivated subcontractors to work jointly towards the set target cost, as a lot of effort was put into creating perception of its achievability, designing collaborative management system and ensuring transparency and fairness through one alliance contract.

3.5. CROSS-CASE ANALYSIS AND DISCUSSION

As our objective is to understand motivation of sub-suppliers to engage in a multi-party PBC, this section will be structured around three antecedents of financial motivation: Expectancy, Instrumentality, and Valence. All offered propositions relate to the context of reciprocal dependency in particular.

3.5.1. Factors that contribute to Expectancy

Including multiple supply chain parties in one PBC makes the reward very risky and uncertain, as each party depends on the performance of every other participant (Nullmeier et al., 2020). We identify several factors that contribute to the perception of positive Expectancy in such context. The literature-informed assumption was that

Expectancy is linked to the subsupplier's perception of outcome attributability and expectations of other parties' performance towards the set targets. Our empirical data confirms this and shows that Expectancy may be also affected by the reward design (as shown in project "Beta"). As projects "Alpha" and "Gamma" demonstrate, early subcontractor involvement contributes to the perception of control over the process of outcome creation through enhanced quality of project planning and constructability (Briscoe and Dainty, 2005; Rose and Manley, 2010c). When subcontractors worked together on documentation for the client ("Alpha") or identification and approval of improvement and savings opportunities ("Gamma"), this also contributed to positive expectations about the performance of other PBC parties.

The risk of low outcome attributability can be reduced by engaging parties in shared control (Wood and Gray, 1991; Thomson et al., 2009). In all three projects, this risk was mitigated by giving each party an equal opportunity to participate in the management and control of outcome creation, regardless of the actual work scope and contribution. Collaborative project governance and management framework included decision-making rights, roles and responsibilities, and conflict resolution procedures. Such approach creates an increased perception of influence on the outcome, positive expectations about other parties' taking similar steps towards the set target, and overall alignment (Rose and Manley, 2011). In sum, this approach positively affects Expectancy, which in the case of multi-party contracts includes not only the perception of own ability to reach the targets, but also the evaluation of the intentions and capabilities of other PBC parties.

Interviewees from all projects also mentioned that putting their signatures under intentions to collaborate made a difference. This signaled a true commitment to work jointly towards the set targets. Some authors find that relational governance is not very significant at the beginning of the transaction, as trust is not yet

established and the parties rely on contracts (Benítez-Ávila et al., 2018). Others find that a formal incentive contract can signal trust (Dewulf and Kadefors, 2012). Our findings support the recent discussion related to the formal side of relational governance: codifying relational norms in the early phase of parties' relationship affects positive expectations of parties (Keller et al., 2020).

Thus, early involvement, participation in the management of the outcome creation process, and codification of intentions to collaborate positively affect Expectancy. We propose the following:

Proposition 1. Joint collaborative involvement in the planning of the outcome creation process is positively related to subsuppliers' Expectancy.

Proposition 2. Commitment to joint collaborative management and control of outcome creation is positively related to subsuppliers' Expectancy.

Proposition 3. Codification in contracts of intentions to collaborate in the process of outcome creation is positively related to subsuppliers' Expectancy.

Previous literature finds that collaborative relationships in supply chains are important for the supplier's willingness to engage in PBC (Selviaridis and Norrman, 2014). Collaboration also enhances trust, which is necessary to take risks in interorganizational relationships (Rousseau et al., 1998). In the context of our study, this means the risk of accepting a contract with an uncertain reward that depends on the performance of multiple parties. However, due to the fragmented nature of the industry, traditional arm's length relationships, and a lack of desire to engage in mutual adjustments (Gadde and Dubois, 2010), it is hard to expect a collaborative 'shadow of the past' (Poppo et al., 2008) among all parties in a construction project.

Thus, when a multi-party PBC is designed and negotiated early in the project, parties will have not yet developed trustful relationships.

Only in project "Beta" parties had prior experience of working together in collaborative projects. However, due to the issues with the design of PBC (perceived non-achievability of targets), a collaborative 'shadow of the past' was not enough to ensure the motivational effect of the offered incentive. In the other two projects, parties had varying degrees of familiarity and prior work experience with each other. Still, in all projects, the client (the main contractor in "Alpha") had a prior positive experience with the selected organizations. Thus, previous cooperation and ties affect the client's selection of the parties, especially in projects where collaboration is considered (Crespin-Mazet et al., 2015). Subcontractors rely on the client's (or main contractor's) choice of parties.

Our data shows that parties were not concerned about the lack of previous collaborative experience when engaging in the PBC. In terms of their technical capabilities, reputation was sufficient to believe they would perform, as well as reliance on the managerial abilities of the Contractor and the client. Prior empirical findings (Faems et al., 2008) and process theory of trust development (Schilke and Cook, 2013) state that reputation replaces trust in the early phase of relationships if prior interaction is absent. Another explanation lies in the multi-dimensional nature of trust. Relational or goodwill trust requires prior successful interaction or time to develop. This type of trust does not yet exist among the parties during the PBC negotiation phase (Rousseau et al., 1998; Das and Teng, 2001; Ruijter et al., 2020). However, calculative trust, which is based on the rational perception of transaction characteristics and assessment of counterparts' ability of delivering on promises, may already be there. From that perspective, emerging collaborative relationships are associated with each party's perception about other parties' capabilities to perform and reach the set targets. Thus, we propose the following:

Proposition 4. The technical and managerial reputation of other PBC parties and the buyer positively affects subsuppliers' Expectancy.

Our last observation regarding Expectancy relates to project "Beta", which used a 'hybrid' PBC form. This approach is less risky for PBC parties, as not all profit is uncertain (Berends, 2000). However, there could be a specific problem in the multi-party setting if the nature of the bilateral input-based contracts of PBC parties differs and parties have conflicting individual financial goals. The conflict between individual contracts applied in parallel with a shared PBC creates doubts about whether all PBC parties will align their efforts in working towards the set targets and whether they would look for the same type of solutions to project issues. In sum, this conflict negatively affects Expectancy because of a perception of parties' diverging interests. Thus, we offer the following proposition:

Proposition 5. Conflicting financial goals between individual input-based rewards of PBC parties are negatively related to subsuppliers' Expectancy.

3.5.2. Factors that contribute to Instrumentality

Instrumentality is related to the perception of the buyer's openness and transparency in measuring performance and fairness of reward distribution. Thus, it relates to the collaboration among parties and performance-based reward design. Our findings show that the behavioural reputation of the buyer, in particular, is important for subsuppliers: does the buyer have a history of disputes and litigations, or is he perceived as fair in dealing with payments and claims? The reputation of the counterparts in terms of fair treatment of others provides positive expectations about the transaction outcome (Möllering et al., 2005).

Another important factor is the buyer's negotiation behaviour that signals future behaviour to suppliers. Prior research confirms the importance of buyer behaviour towards suppliers in bilateral PBCs (Steinbach et al., 2018). Traditionally, these parties with more bargaining power and perception of low importance of subsuppliers' objectives in the project tend to have aggressive, cost-focused negotiating behaviours (Ness and Haugland, 2005). However, as buyers aim to align all the parties' interests towards one performance target, they need to change their approach to procurement processes, demonstrate a lack of hierarchical position, focus on project problem-solving, and treat other parties with respect (Eriksson, 2015). Subcontractors confirmed that in all projects the client and main contractor tried to behave in an equal, simple, and open manner, rather than in a traditional aggressive and hierarchical way, and the intention to collaborate was perceived as genuine. The buyer's reputation and negotiation behaviour in the contract design phase affects Instrumentality and creates the perception that each party will be treated fairly, and that the buyer will recognize everybody's contribution.

Codifying collaborative intentions in contracts, or the formal side of relational governance (Keller et al., 2020), also plays a role in the positive perception of Instrumentality. In particular, such aspects as a declaration of no-blame culture (project "Gamma"), commitment to open information sharing and early warning of potential problems (all projects), the contractual obligation not to have disputes (all projects), full transparency under one alliance contract ("Gamma") demonstrate the willingness of all parties to work in an open, fair and transparent manner towards the performance targets. We propose the following:

Proposition 6. The codification of intentions to collaborate in the process of outcome creation is positively related to subsuppliers' Instrumentality.

Another factor that affects Instrumentality is the reward distribution. This factor affects the party's perception that its share is not too small, and the reward of every other party is not unfairly big. Thus, it creates a perception of fairness. We found two approaches to defining the sharing ratio (Kadefors, 2005). The first offers each party an equal share (project "Beta"), the second considers the value of individual work in relation to the overall construction value ("Alpha" and "Gamma"). While the first approach is simpler to design and manage, it is not necessarily perceived as fair, as each party's level of risk and involvement is different. Suppliers seem to prefer the approach that links reward share to the estimated value of each contribution. However, this may create issues in the management phase, for example, if parties need to invest disproportionally bigger effort in the project or if the scope of work needs to be reassigned. Yet, at the phase of reward design, such an approach is viewed as appropriate as it follows the principle of distributive justice (Rose and Manley, 2011). We propose the following:

Proposition 7. Reward sharing ratio proportional to the value of the individual contribution is positively associated with subsuppliers' Instrumentality.

3.5.3. Factors that contribute to positive Valence

Financial reward is one of the motivators to collaborate (Bresnen and Marshall, 2000). We have identified several aspects of reward design that connect to Valence. As they appear similar to those applicable for bilateral PBCs, we do not develop any propositions about Valence. In all three cases, PBC parties perceived the offered reward amount as attractive. As there is a good understanding of profit margins and open book accounting is often used in projects, it easy for the organization that designs the PBC to ensure that the offered amount exceeds profit

levels in traditional non-incentivized projects. The importance of the achievability of reward is similar as in the case of bilateral contracts: when rewards are viewed as non-achievable, incentives have no motivational effect, and the supplier will not respond to them by changing his actions or level of effort (Howard et al., 1997; Bower et al., 2002). Thus, positive Valence will not be ensured. Project "Beta" demonstrates that reward can be perceived as attractive but non-achievable, as it is linked both to performance challenges and savings targets, whereas in principle, these should be set as trade-offs (Meng and Gallagher, 2012; Rose and Manley, 2010c).

Early involvement that allows subcontractors participate in development of project plans (Briscoe and Dainty, 2005) improves the perception of quality and achievability of set targets (Broome and Perry, 2002). Thus, early involvement is positively associated with Valence. Although it is important to word financial reward as an incentive and not a penalty (Bower et al., 2002), the existence of risk does not necessarily decrease parties' positive expectations (Selviaridis and Van der Valk, 2019). We have not identified any issues with the design of the risk side of the incentives in the studied cases – potentially because the literature and the industry have accumulated substantial understanding that excessive penalties do not work (Meng and Gallagher, 2012). Finally, we also find no difference between multi-party and bilateral contracts in this aspect.

3.5.4. Proposed conceptual model

Our empirical study shows that relationships between outcome attributability, collaborative relationships between the parties, reward design, and financial motivation to work under multi-party PBC are much more fine-grained and complex than we initially assumed.

Expectancy is affected by the multi-party setting the most, as it relates both to own ability to perform and perception of control over the outcome (outcome attributability), and to positive expectations about other parties' capabilities and motivation to work towards the set target. In sum, Expectancy is enhanced by early involvement, engagement in shared control, codified commitment to collaborate, and parties' technical and managerial reputation.

In quite some aspects, motivation seems to operate similarly in bilateral and multi-party settings, in particular in Valence and some factors related to Instrumentality. Instrumentality depends on 'fair' behaviours of the buyer and its behavioural reputation and on the reward design–sharing ratio that leads to the perception of reward fairness. Codification of intentions to collaborate also plays a role. It signals parties' intention to behave transparently and fairly towards each other and to share information about progress towards the set targets and their transparent measurement.

Valence is ensured not only by the offered reward amount and perception of its achievability but also by early parties' involvement in the outcome creation planning process. Thus, it is not fully related to reward design and incentive intensity but also to the transaction execution approach taken by the buyer.

While many factors may affect the transaction progress, and each party's behaviours may change during the execution of the performance-based contract, effective and clear contract design is one of the key factors for a successful transaction start-up (Caldwell et al., 2009), and a predictor of transaction success. Figure 3.2. presents the final conceptual model.

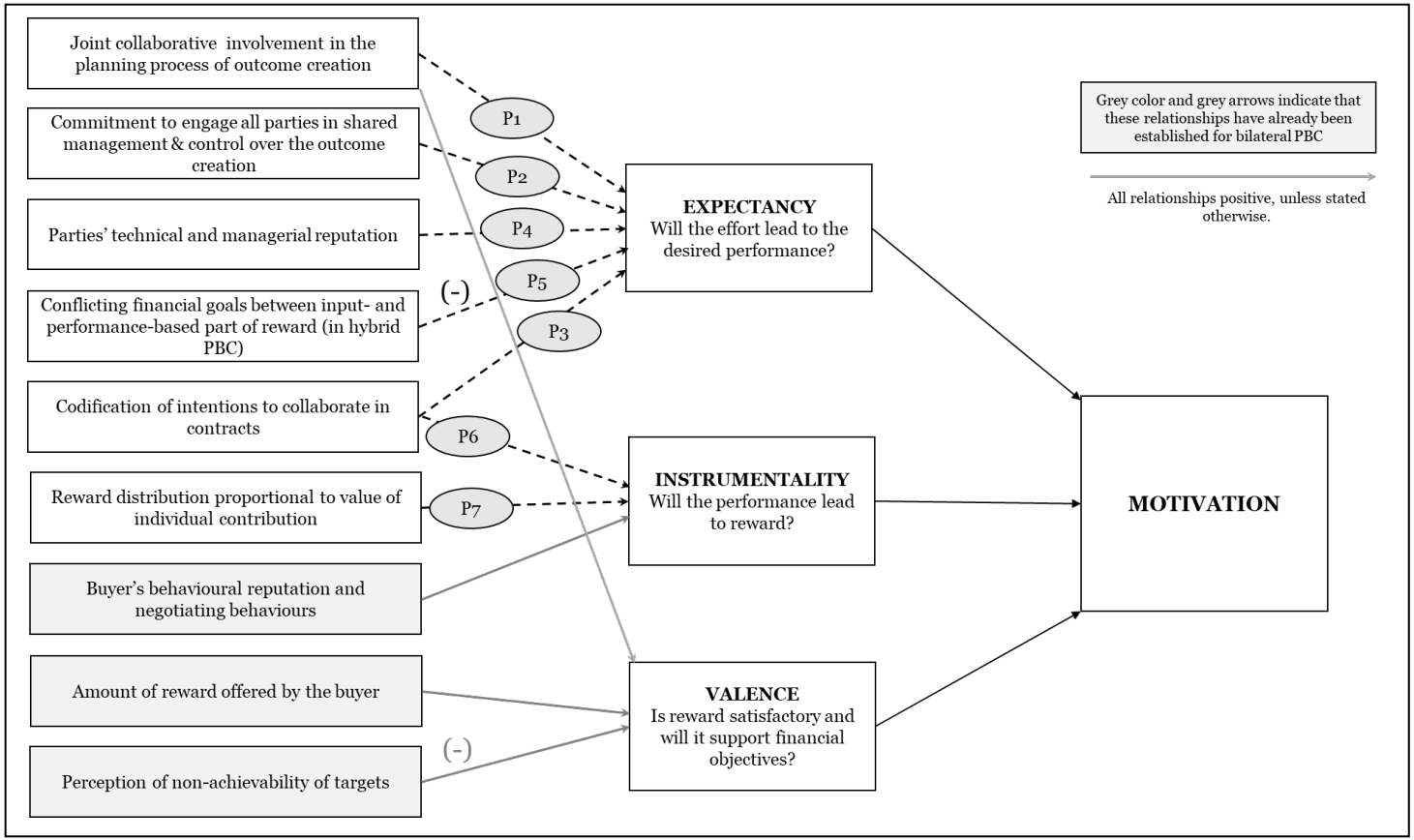


Figure 3.2. Proposed conceptual model

3.6. CONCLUSION

3.6.1. Theoretical contributions

Low outcome attributability that originates from dependency on subsuppliers negatively affects the supplier's willingness to engage in a PBC (Selviaridis and Norrman, 2014; Nullmeier et al., 2016; You et al., 2018). Existing research proposes to engage subsuppliers in the PBC to mitigate this risk. However, it does not establish how to ensure subsuppliers' motivation to accept an uncertain reward. We empirically demonstrate how a multi-party PBC can become an acceptable option in case of supply chain parties' interdependence.

We extend the PBC literature by discussing types of interdependence in the supply chain. We find that a performance-based contract is a suitable choice in case of reciprocal interdependence. To better understand subsuppliers' willingness to work under a multi-party PBC, we apply Expectancy theory that relates financial motivation to the perception of the capability to perform and control the outcome, fairness of reward distribution, and to attractiveness and achievability of the offered reward. Finally, we advance knowledge about a multi-party PBC in the context of complex projects.

We establish that a shared performance-based reward should be offered to all parties whose role is key to the outcome creation if reciprocal interdependence exists between them. In the contract design phase, low outcome attributability that originates from the supply chain is mitigated by several management actions. These include: 1) involving PBC parties in the planning of the outcome creation process; 2) offering parties an opportunity to participate in shared control over outcome creation; 3) codifying intensions to collaborate that signals both alignment and fair behaviours towards each other. Finally, the lack of a collaborative 'shadow of the

past' is substituted by the technical and managerial reputation of the PBC parties that creates positive expectations about their performance.

3.6.2. Managerial contributions

Incentive contracts often are not well received by contractors in the construction industry, as they depend on the ability of multiple parties to deliver the constructed facility on time and within budget. A multi-party contract is a solution to this issue, but it is complex to design and manage. For this reason, we believe that our study provides valuable advice for practitioners.

A multi-party PBC can be considered if parties depend on each other in the ability to perform their work. A performance-based incentive can be shared between them proportionally to the monetary value of individual input, as this approach creates a perception of fairness. Generally, a bigger reward than in traditional contracts needs to be considered to compensate for the increased risk. When 'hybrid' PBCs are applied (a combination of input and performance-based payment), it is important to ensure that individual input-based contracts do not have conflicting financial goals, as these will hamper the alignment effort and motivational effect of the shared reward.

We recommend that PBC parties engage in joint control over the transaction execution process and are involved early in the joint planning effort. This gives subsuppliers a perception of control over the process that leads to the desired performance. It is desirable to document roles and responsibilities in the joint control process and commit to the principles of openness, fairness, and no blame. The written and signed agreement about intended control procedures and behavioural rules creates a perception of alignment of all participants' interests on the shared target.

The buyer should also behave collaboratively in the contract negotiations to demonstrate the commitment to work together. Finally, a lack of prior experience of working together should not be seen as an obstacle to setting up a multi-party PBC. However, the buyer should select trustworthy and high-performing parties: counterparts' reputation is viewed a proxy of their ability to perform.

3.6.3. Limitations and future research directions

Our comparative case study in the construction sector allowed us to identify two potential contextual differences between PBCs in manufacturing and in projects setting. While the context represents a limitation to generalizability, at the same time, it helps to bring "[…] truth of the real world and […] allows us to explicate the challenge and the solution in greater detail." (Welch et al., 2011, p. 743).

One specific feature may be the type of interdependence in the supply chain. A multi-party PBC creates a business model of reciprocal dependence, as the profit is linked to the performance of all parties. Such a contract replicates the 'technical' interdependence between the project parties and is a reason to apply a multi-party PBC. In the absence of such complex interdependency, subsuppliers may not be willing to accept such a risky contract. Further research is needed in different empirical settings to investigate whether a multi-party PBC would be acceptable in the situation where reciprocal interdependence among parties.

The second potential context-specific feature is the role of the client (buyer) in adopting and designing a multi-party PBC. While the supply chain management literature decouples PBCs between client and supplier and supplier and his supply base and assumes that the supplier takes the task of cascading PBC down the supply chain, the client's role is more prominent in construction projects. Traditionally, the client is highly involved in the overall process of contractual governance in projects.

Consequently, the role of the buyer in different empirical settings in the design (and management) of a multi-party PBC requires additional investigation.

The second limitation of our study relates to the fact that we focused on the motivation of subsuppliers. However, as Wu et al. (2010) demonstrate, there may be situations where the buyer involves multiple tier-one suppliers in a PBC. Such contracts may have differences in the motivational actions required to align the interests of potential competitors outside this transaction and thus require a separate investigation.

Finally, we focused our empirical analysis on the contract design phase only. While contract design is one of the predictors of transaction success, it is reasonable to expect that financial motivation during the contract implementation phase is affected by performance challenges or potential non-collaborative behaviours of the PBC parties. How motivation to work under a PBC is affected by changes and challenges in the implementation process requires further research.

3.7. APPENDICES

Appendix 3A. List of the Interviewees

	Organization	Interviewee role	Interview type	Duration
ALPHA	Contractor	Project executive Project director Construction manager (key informant) Engineering manager (key informant) Project controls manager Procurement manager	Face to face Face to face Face to face; face to face Face to face; face to face Phone call Face to face; face to face	50 m 1hr 30 m 1 hr 30 m; 1 hr 1 hr; 1 hr 20 m 1 hr 7 m 45 m; 1 hr 10 m
	Subcontractor A	Project executive	Phone call	58 m
	Subcontractor B	Project executive	Phone call	1 hr
	Subcontractor C	Project executive Project manager	WebEx call WebEx call	1 hr 5 m 1 hr
	Subcontractor D	Project executive	Phone call	57 m
	Subcontractor E	Project executive Construction manager	Phone call; follow-up email Phone call	1 hr 15 m 54 m
BETA	Client	Project executive/director Construction manager Procurement manager Contract manager Continuous improvement manager	Skype call Skype call Face to face, follow up phone Skype call Face to face, face to face	1 hr 1 hr 1 hr 40 m; 35 m 1 hr 12 m 1 hr 20 m; 1 hr
	Contractor	Project executive Construction manager (key informant) Engineering manager Engineering manager (later phase)	Face to face Face to face; face to face Face to face; follow up via phone Face to face	45 m 2 hr; 1 hr 35 m 50 m; 25 m 1 hr 5 m
	Contractor II	Project manager	Phone call	1 hr 10 m
	Subcontractor F	Project executive Construction manager	Phone call Phone call	50 m 1 hr 5 m
	Subcontractor D	Project executive Construction manager	Phone call Phone call	1 hr 10 m
	Subcontractor G	Project executive	Phone call	1 hr 7 m

GAMMA	Client	Project executive	Phone call	57 min
	Contractor	Project director (key informant)	Face to face; follow up via phone	1 hr; 25 min
	Subcontractor F	Project executive Construction manager	Phone call Phone call	58 min 1 hr 5 min
	Subcontractor D	Project executive Construction manager	Phone call Phone call	55 min 1 hr 18 min

Note: Subcontractors D and F were part of more than one project (D – all three projects, F – "Beta" and "Gamma")

Appendix 3B. Data analysis

Step 1. Data classification into central research themes derived from the literature: interdependency; PBC design (reward sharing, risk sharing); low outcome attributability/high uncertainty; collaborative relationships; financial motivation broken down into three aspects – expectancy (achievability of reward); instrumentality (fair attribution and payment of reward); valence (attractiveness of reward).

Additional themes added after the first interviews that allowed us to identify which management actions lead to reduced outcome uncertainty and increased supplier motivation, and another round of document analysis based on interview results

Initial themes in interviews	**Initial themes in project documentation**
- Approach to PBC formation (set of parties) - PBC design, risk and reward sharing - Risk of dependence on other parties (outcome uncertainty and attributability) - Measures to reduce outcome uncertainty - Parties' behaviours and relationships - Motivating effect of PBC	- PBC design (contractual clauses – design, targets, ways of calculation, distribution ratios) - Measures to reduce outcome uncertainty
Additional themes from interviews	**Additional themes from project documentation**
- Parties' reputation - Documented commitment to share information and collaborate - Early involvement in project	- Documented commitment to share information and collaborate

Step 2. Within case analysis and abduction, elaboration of themes (adding more lower-level codes). As not all data could be coded using pre-defined themes, we used inductive coding of additionally identified themes.

Project "Alpha"	Project "Beta"	Project "Gamma"
Interviews: Approach to set of PBC parties, role, reciprocal interdependency Incentive - targets, clarity, measurement, distribution ratio, fairness, achievability, attractiveness Risk-sharing ratio, risk size, fairness Dependency risk, ways to be in control, helping others, problem awareness, joint problem-solving, joint decisions, collaborative management, collaborative board Dependency on main contractor, main contractor behaviour, subcontractor behaviour, New party, trust, collaborative experience, prior working together, incentive experience, collaborative behaviours, technical reputation, managerial reputation, behaviour reputation, shadow of the past Early contractor involvement, saving opportunities	**Interviews:** Approach to set of PBC parties, role, reciprocal interdependency Incentive - targets, clarity, measurement, distribution ratio, fairness, achievability, attractiveness Risk-sharing ratio, risk size, fairness Dependency risk, ways to be in control, helping others, problem awareness, joint problem-solving, joint decisions, collaborative management, collaborative board, integrated team, goal conflict, contract conflict Dependency on client, dependency on main contractor, client behaviour, main contractor behaviour, subcontractor behaviour, New party, trust, collaborative experience, prior working together, incentive experience, collaborative behaviours, technical reputation, managerial reputation, behaviour reputation, shadow of the past	**Interviews:** Approach to set of PBC parties, role, reciprocal interdependency Incentive - targets, clarity, measurement, sharing ratio, fairness, achievability, attractiveness Risk-sharing ratio, risk size, fairness Dependency risk, ways to be in control, helping others, problem awareness, joint problem-solving, joint decisions, collaborative management, collaborative board, Dependency on client, dependency on main contractor, client behaviour, main contractor behaviour, subcontractor behaviour, New party, trust, collaborative experience, prior working together, incentive experience, collaborative behaviours, technical reputation, managerial reputation, behaviour reputation, shadow of the past Early contractor involvement, participation in project planning, improvement opportunities

Documents: Incentive sharing ratio, calculation Incentive risk, team budget, scaffolding budget, calculation, fairness Bilateral contract, liabilities, penalty size Collaborative project management, governance board, execution leadership team, information sharing, no-blame culture, commitment to collaborate, partners declaration, teaming agreement	**Documents:** Incentive sharing ratio, calculation Bilateral contract, individual reward, liabilities, penalty size Collaborative project management, alliance board, integrated team, meeting protocols, information sharing, commitment to collaborate, alliance declaration	**Documents:** Incentive sharing ratio, calculation Incentive risk-sharing ratio, calculation, risk size Improvement opportunities from early contractor involvement Collaborative project management, alliance board, management team, information sharing, no-blame culture, commitment to collaborate, alliance contract, alliance charter

Step 3. Refinement of themes using axial coding; focus on identifying factors that affect subsupplier willingness to accept PBC in multi-party setting

PBC design	Ways to reduce outcome uncertainty		Collaborative relationships and intentions	
	Participation in project management	Early involvement	To reduce outcome uncertainty	To ensure fair treatment and trust
Sharing ratio based on individual input Conflict between input- & performance-based contract Reward achievability Reward & risk amount	Collaborative board Collaborative project management Integrated team Intention to collectively control outcome creation Intention to collaborate	Participation in planning Savings and improvement opportunities	(No) shadow of the past Technical and managerial reputation as a proxy of trust	Collaborative negotiating behaviours of 'buyer' Behavioural reputation of buyer Codification of intentions to collaborate information – fairness and openness

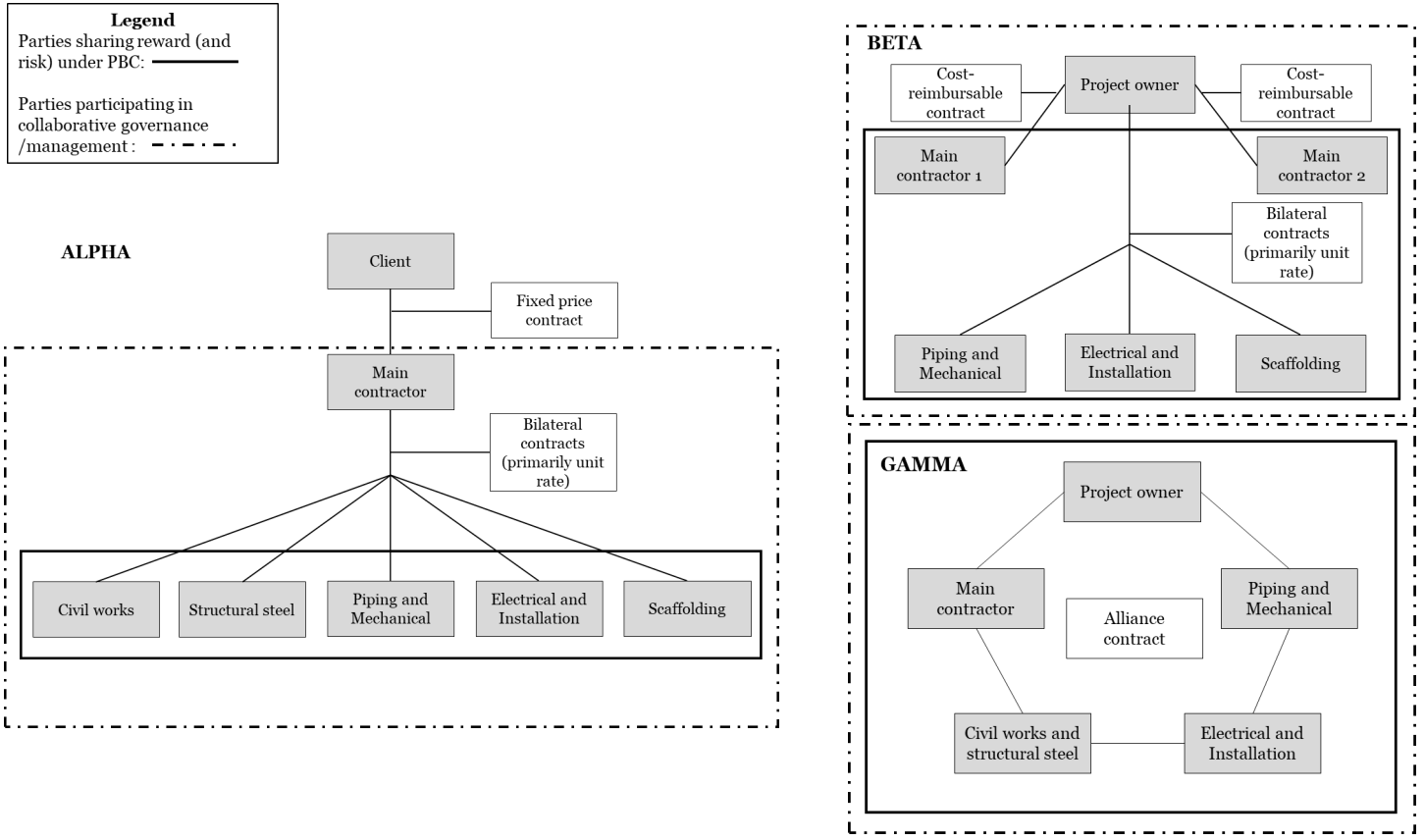
Step 4. Cross-case analysis and Discussion - Link of factors to the three aspects of the supplier motivation according to Expectancy theory

	Expectancy	Instrumentality	Valence
PBC design	Potential conflict between bilateral and performance-based contracts (-)	Fair reward sharing ratio (+) based on the value of individual input	Reward amount (+) Non-achievability of reward (-)
Commitment to participate in collaborative control	Perception of control over the outcome creation process (+)	Codified commitment to collaborate (+) as proxy of trust	
Early involvement	Perception of control over the outcome creation process (+)		Achievability of targets (+) Belief in reward attractiveness - (savings) for target cost contracts (+)
Codified commitment to collaborate	Perception of parties' future non-opportunistic behaviour and alignment of interests (+)	Perception of future fair and transparent behaviours to each other (+)	
Reputation	Perception of parties' capabilities to perform (+) Trust in managerial capabilities of main contractor/client (+)	Perception of fairness of buyer based on prior behaviours (+)	

Appendix 3C. Contract types used in construction projects (based on the allocation of risk for reaching the outcome)

Cost reimbursable (Cost plus, prime cost, time, and material)	The owner pays the fixed fee or percentage of the cost fee and reimburses the contractor for all costs associated with the project. Thus, the owner pays for labour, plant, and materials consumed, and these costs are charged at rates that can be checked through open book accounting (Ward and Chapman, 1994)
Unit rate (Schedule of rates, menu contract)	Typically used when detailed work activities can be determined precisely but the quantities of these work activities are unknown. The contractor can accurately determine the resources required and realistic productivity rates for the detailed work activities. The contractor bids unit rates for these work activities, and the owner pays the contractor for the actual quantity of work based on the unit rates. The owner takes on the quantity risks while the contractor takes on the productivity risks (Oyetunji and Anderson, 2001).
Fixed price (Fixed fee, lump sum)	The owner pays a fixed price to a contractor regardless of the actual project costs. The contractor carries all the risk of loss associated with higher-than-expected costs but benefits if costs turn out to be less than expected (Ward and Chapman, 1994, 1995).
Target cost – TC (gain/pain share, alliance)	A target cost is introduced. Any cost under- or over-run against this target is split between the owner and the contractor at pre-agreed, specified proportions. Both parties are motivated to work together to minimize actual costs: for the employer to minimize the total sum paid out and for the contractor to maximize profit above those included in the fee (Broome and Perry, 2002)
Cost plus incentive fee – CPFI	The parties agree to share the risk associated with the project execution. The two parties negotiate and agree on a target cost and target profit. Both share any deviation between the actual target costs at an agreed-upon ratio. On completion, the contractor receives the target fee plus or minus his share in cost deviation (Al-Harbi, 1998)

Appendix 3D. Contractual and governance set-up of the studied projects



4. LEARNING TO CONTRACT – EXPLORING INTRA-CONTRACT LEARNING[6]

4.1. INTRODUCTION

Contracts serve as governance mechanisms in interorganizational relationships (IORs) and exchanges of goods and services and form the foundation of every business transaction (Wacker et al., 2016). The goal of an interorganizational contract is to improve the predictability of the behaviours of contract parties and the outcomes of the transaction (Mellewigt et al., 2007), align the interests of the client and contractor[7] (Turner and Müller, 2003), and focus supply chain partners on the performance levels which the buyer wants to achieve (Selviaridis and Spring, 2018; Van der Valk et al., 2020).

However, contracts do not always bring the intended results. Depending on how they are written, interpreted, and applied, contracts "[...] can drive a relationship into escalating formality and distance [...], or into reciprocity, cooperativeness and flexibility." (Abdi and Aulakh, 2017, p. 772). Practice shows that creating suboptimal, ineffective contracts is a common problem. Disagreements over contracts are one of the main reasons for interorganizational litigations in all industries. In some sectors such as infrastructure, mining, and energy, they can account for 50% to 70% of all legal disputes (Norton Rose Fulbright, 2016; 2018; 2020).

Contracts play a critical role in project-based sectors with complex products, services, and transformation processes (Hobday, 1998; Howard et al., 2014), such

[6] The chapter is prepared for submission to a journal in the Operations management field

[7] In this paper terms 'buyer' and 'client' and 'supplier' and 'contractor' will be used interchangeably. 'Client' and 'contractor' will be referred to, when drawing from the literature that uses these terms, or discussing empirical context

as aerospace, shipbuilding, and construction. In such a highly representative example of a project-based industry as construction, dependence on contractual governance mechanisms is also explained by the sector's fragmented and competitive nature, which makes the application of relational governance challenging (Dubois and Gadde, 2002). Yet, construction is one of the notoriously 'litigious' industries, with the average cost of claims reaching $33 million. The leading reasons for disagreements are diverging interpretations of contracts and contract incompleteness (Arcadis, 2019). Heavy reliance on contracts, combined with a high number of disputes, signals ineffective contractual governance. Thus, project owner organizations need to learn how to draft and negotiate successful contracts and, if necessary, revise them during the project so that the contracts continue serving as effective governance mechanisms.

There is evidence that organizations can improve and adapt their contracts over time. Learning to contract (LtC) is the process of developing the ability to analyse 'lessons learned' and incorporate them into the contract development process or into new contract clauses (Mayer and Argyres, 2004). However, LtC is complicated and time-consuming and is not a simple one-off activity but rather "[…] an evolving process […]" (Argyres et al., 2007, p.4).

Given the prominent role of the contracts in the interorganizational exchange, LtC has attracted substantial attention from management and organizational scholars (Ryall and Sampson, 2009; Vanneste and Puranam, 2010; Lumineau et al., 2011; Ariño et al., 2014), and more recently also from the operations management and industrial marketing disciplines (Selviaridis and Spring, 2018; Zhang et al., 2018). However, there are still gaps in the theoretical framework of LtC and the empirical knowledge about this phenomenon. To demonstrate the existing knowledge gaps, the literature can be analysed along three dimensions in which theories develop (Bacharach, 1989): when LtC takes place, why it takes place, and

how it happens. These dimensions are the moment, objects, and mechanisms of learning.

Looking at the moment of learning, studies have primarily focused on changes to existing texts or the development of new provisions from one transaction to another; in other words, on *inter-contract* learning (Mayer and Argyres, 2004; Ryall and Sampson, 2009). Such approach may to a certain extent be explained by the fact that management and organizational scholars study contracts at strategic level and are not concerned with the operational, or contract implementation phase (Nullmeier, 2019). Operations management scholars have confirmed the presence of learning within transactions (Selviaridis and Spring, 2018). However, they focus on the role of such learning rather than on understanding the LtC process. As a result, it is not clear how LtC happens during the contract implementation phase, despite its high importance. When organizations struggle with an existing contract, they cannot always wait until the next transaction to make contract improvements, especially when the exchange is lengthy.

Only a few articles have examined the objects of learning to identify what parties learn that leads to amended provisions (why learning happens). For instance, Vanneste and Puranam (2010) note that changes to contracts are made as parties discover new information about each other and each other's working practices. Argyres et al. (2007) conclude that learning about different types of clauses is part of learning about transaction features. Lumineau et al. (2011) also find that contracts are changed as parties learn about the effectiveness of the text, the structure of the contract, and the overall contracting process. Thus, three objects of LtC have been identified but not studied in depth; most researchers simply mention their existence without examining their role.

Research on the mechanisms of learning (how learning happens) is mainly limited to the experience of the involved parties: so-called *experiential* learning

(Kolb and Kolb, 2009) and its influence on the introduction, deletion, or changes to contract provisions. Other learning mechanisms, such as *vicarious* learning (Bandura, 1965) or *inferential* learning (Michalski, 1993) have not been explored (except by Dekker and Van den Abbeele, 2010 and Lumineau et al., 2011).

Research has paid little attention to the possible relationships between the moments, objects, and mechanisms of learning, despite relationships between constructs being key for theory (Bacharach, 1989; Suddaby, 2010). Empirical studies have focused on the link between experiential learning and changes in contracts from one transaction to the next, such as the level of detail, the effect of inclusion of provisions, or the pace of learning (Reuer and Ariño, 2007; Mayer and Bercovitz, 2008; Ryall and Sampson, 2009; Vanneste and Puranam, 2010). Other possible relationships between the constructs, such as the roles of the learning mechanisms or the interactions between different objects of learning and learning mechanisms, remain unclear.

In this paper, we problematize two aspects of learning to contract: the lack of a complete theoretical framework, and the predominant research focus on the inter-contract learning. We do not regard addressing this second aspect merely as 'gap-filling' (Alvesson and Sandberg, 2011), but we wish to provide a missing part of the knowledge base that prevents us from developing a more complete theory, and also as an opportunity to gain insight into an important and persistent empirical problem. Thus, in this paper we aim to answer the following research question:

How do organizations learn to contract within an ongoing project?

To answer this question, we synthesize the existing literature to create a more complete theoretical framework for LtC. Next, we conduct a longitudinal single case

study and investigate a lengthy construction project to analyse how intra-project or intra-contract learning evolves during the transaction. Thus, we take a dynamic view on contracting (Van der Valk et al., 2020), studying how (and why) contracts change during the transaction implementation.

4.2. THEORETICAL BACKGROUND

This section examines LtC in relation to the organizational learning literature and provides an overview of extant LtC research about the key constructs and their relationships.

4.2.1. Learning to contract as organizational learning

Organizational learning emerged in the 1960s and has been extensively investigated since the 1980s at varying levels of analysis (group, organization, dyad, or network), applying different theories and in various research domains. As a result, multiple definitions and frameworks of organizational learning are in place (Crossan et al., 1999; Knight, 2002). Two definitions are particularly relevant for our study. In the first, Argyris (1977) and Argyris and Schön (1978; 1997) define learning as "detecting and correcting error" (Argyris, 1977, p. 116) within an existing system, process, or set of established rules. This view is adopted by LtC research. Mayer and Argyres (2004) mention that learning is triggered by disputes, thus, problems during the transaction. Contract clauses are changed in the following contracts as parties realize that their previous versions did not effectively govern the exchange, i.e., they were incomplete, too vague, or drove wrong behaviours. In the second definition, Huber (1991) states that "[…] an entity learns if, through its processing of information [acquiring, distributing, interpreting] the range of its potential behaviours is changed" (p.89). Thus, LtC involves identifying issues in existing

contract clauses and correcting them so that parties' behaviours, which contracts describe in various clauses, can change in the future.

As learning to contract is a process, it is important to draw from the knowledge about other, potentially similar organizational learning processes. Doz (1996) identifies three steps in the learning to collaborate process in R&D alliances. First, organizations develop awareness (cognitive knowledge) that initial conditions (assumptions about the task, environment, parties' goals and skills) are not true to life. Next, they re-evaluate these conditions. If this re-evaluation is positive, the alliance course can be corrected, parties can adapt to the necessary changes, then cognitive learning translates into behavioural learning, and the alliance is realigned. If the re-evaluation is negative, for instance, parties do not believe in the possibility of positive changes, readjustment does not happen and the alliance fails. Although this research is silent about the role of contracts, it looks at the learning process within a lengthy interorganizational exchange, thus providing valuable insights into the intra-contract learning process.

One important question for LtC is "who is learning?" LtC literature (often implicitly) operates at various levels of analysis. Some studies focus on the functional group level (Argyres and Mayer, 2007; Tyler and Bercovitz, 2014) when studying how various groups contribute to the contract design or what the differences are in their contracting capabilities. As LtC is mostly viewed as the change of contract texts over time, it is then natural that buyer organizations who develop contract templates, negotiate contracts, and then monitor their implementation, are the ones who learn (Dekker and Van den Abbeele, 2010). At the same time, there are at least two parties in the transaction. If behaviours and practices of both organizations change, then learning takes place in the dyad or network (in case of more than two organizations) (Knight, 2002), although

"learning processes and learning cycles of parties [do] not necessarily coincide" (Doz, 1996, p.59).

Another relevant aspect is measurement of learning. How learning manifests itself is one of the long-lasting debates in the research. Some authors argue that learning should change organizational behaviours and lead to performance improvement (Argyris and Schön, 1978). If learning is only cognitive and does not become behavioural, parties will not be able to make adjustments to overcome identified issues. The transition of learning from a cognitive to a behavioural level is a key step in the learning process (Doz, 1996). Others state that learning is a cognitive change that leads to new insights or improved awareness. Although it may change a potential range of behaviours, it does not necessarily lead to visible, actual behavioural change (Fiol and Lyles, 1985; Huber, 1991). Performance improvement is also not a 'must', as organizations can learn incorrectly, or learn about incorrect things. This approach makes operationalization and measurement of learning a challenging task. Learning to contract is mainly measured as changes to contract clauses (Ryall and Sampson, 2009; Vanneste and Puranam, 2010), thus, its actual manifestation is important.

Finally, it is necessary to distinguish learning from other ways through which organizations adapt to the environment (Fiol and Lyles, 1985). For LtC, it means the ability to discriminate between contract adaptations and contract changes that result from learning. Learning is "[…] development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions […]", whereas adaptation is "[…] the ability to make incremental adjustments as a result of environmental changes, goal structure changes, or other changes […]" (Fiol and Lyles, 1985, p. 811). Thus, the differentiating factor is the cognitive learning, or awareness step: incremental behaviour changes that are a result of adaptation do not involve a change in cognition (Doz, 1996).

Looking into organizational learning processes informs our research about how intra-contract learning to contract may unfold and be measured, and gives insights about level of analysis and differentiation between contract changes based on learning versus adaptation. Next, we discuss the contract lifecycle, and review the existing LtC research related to the key constructs (the moment, objects and mechanisms of learnings), as well as relationships between them.

4.2.2. Contract lifecycle

Roehrich et al. (2020b) identify three phases in the contract lifecycle: design, negotiation, and management. The first two phases relate to contract-making (Lumineau et al., 2011), in which the initial contract template changes during the contract negotiations. In the third, management (implementation) phase, behaviours, relationships and transactions are governed by the contracts, complemented by other governance mechanisms. Contract updates and revisions may occur, which means further renegotiation and changes of the initial template (Roehrich et al., 2020b). After the transaction is completed, 'lessons learned' from the transaction will inform and improve the contract templates used for future transactions (Elsey, 2007). Thus, inter-contract learning occurs after the contract management, or a completed transaction and affects the development of new contract templates, whereas intra-contract learning is expected to happen between the three identified phases. The contract lifecycle is represented in Figure 4.1.

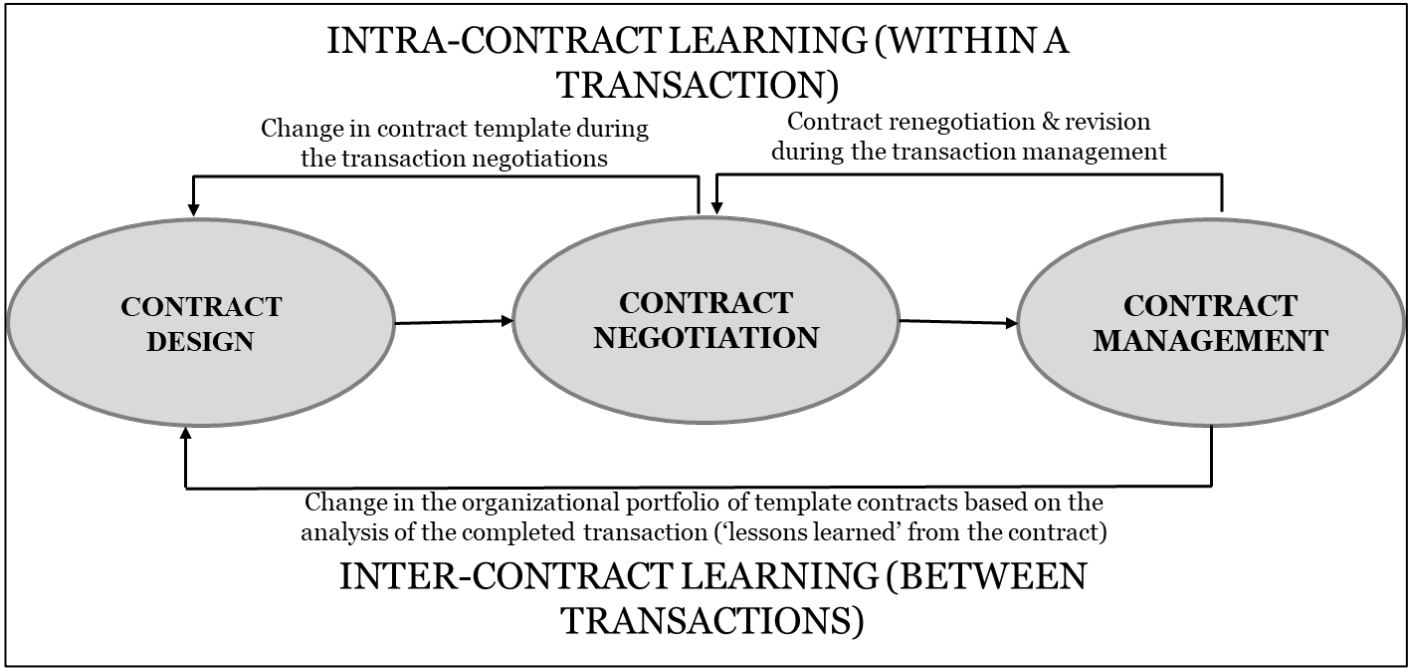


Figure 4.1. Contract lifecycle (adopted from Roehrich et al., 2020b)

4.2.3. Key constructs of learning to contract

Moment of learning. Existing LtC research primarily focuses on inter-contract learning, i.e., how contracts are changed and improved in between transactions. Scholars primarily study contract design and changes to clauses over time, from one transaction to another, or in the contract negotiation process (Lumineau et al., 2011). Dynamic changes that may happen to the contracts due to their revisions and renegotiations in the implementation phase (Van der Valk et al., 2020) largely remain outside the research focus. We have identified two recent studies that implicitly study intra-contract learning. Zhang et al. (2018) investigate how contract amendments can help restore the relationships between the parties in case of exchange disruptions. Selviaridis and Spring (2018) identify how contracting and LtC help to align the interests and incentives of supply chain parties over time. Thus, both studies focus on the role and effect of LtC during the transaction and not on the process of learning itself.

Objects of learning. Objects of learning refer to what organizations can learn about or which mistakes trigger contract changes (Argyris and Schön, 1997). Doz (1996) states that learning objects or dimensions include the environment, the process of working together, the task around which the alliance is centred, the parties' skills, and their goals. At the beginning of a transaction, parties have initial expectations about these dimensions. However, as the transaction progresses, parties may realize they are not valid (Doz, 1996), which marks the beginning of the learning process.

Lumineau et al. (2011) aggregate these into three objects of learning: the transaction, the parties, and the contracting process/contract. Learning about the transaction means acquiring knowledge about its specific features, scope and objective, and the activities needed for successful completion (Argyres et al., 2007;

Vanneste and Puranam, 2010). Learning about the parties means understanding expectations and intentions, capabilities, operational and administrative processes, and problem-solving approaches (Faems et al., 2008). Finally, learning about the contract and its process involves learning about the document's structure and the role of certain provisions, how to negotiate, and where to acquire the necessary knowledge about the contract. If the negotiation process is problematic (e.g., reaching agreement on a certain provision is time consuming) or if certain parts of the contract text are unfair or ineffective, this will again lead to amendments in the contract (Lumineau et al., 2011). Thus, all three objects of learning contribute to the development of contractual governance and can trigger changes. Selviaridis and Spring (2018) also find that all three objects are essential in improving alignment within the supply chains. They develop gradually as parties acquire experience in contracting.

Mechanisms of learning. Mechanisms of learning are the processes through which knowledge is acquired (Huber, 1991). Huber identifies five mechanisms: congenital (knowledge that exits at the organization's birth), experiential, vicarious, grafting (bringing external expert knowledge within the organization boundaries), and searching. Dekker and Van Abbeele (2010) mention experiential and deliberate learning (search for information). For this research, we follow the classification offered by Lumineau et al. (2011), who identify three learning mechanisms in the contract negotiation process: experiential, vicarious, and inferential.

Argote and Miron-Spektor (2011) state that learning occurs in the organization as it acquires experience. Kolb and Kolb (2009) define experiential knowledge as the process in which knowledge is created through the transformation of experience: a combination of grasping and transforming it. In LtC, learning starts from the organization's contracting experience and is based on analysing these

experiences (Seel, 2011). Experiential learning is the most commonly examined mechanism in existing LtC studies.

Vicarious learning (Bandura, 1965) is 'second hand' experience of other organizations and individuals. This learning takes place by hearing, reading about, watching something, or observing something or somebody. More generically, it can be defined as learning through the experiences of others (Bandura, 1965; Lee, 2009). Vicarious learning allows organizations to analyse the contracting experience of others, to help them make fewer mistakes, avoid redundant learning and 'reinventing the wheel' (Bresman et al., 1999; Myers, 2015). In the empirical case they investigate, Mayer and Argyres (2004) observe a lack of vicarious knowledge (no knowledge spillover between projects).

Inferential learning occurs when the existing contract is used as a basis for developing hypotheses about the future of the transaction, and/or the parties. The concept of inferential learning was first proposed by Michalski (1993) who defined it as "[…] a goal-oriented process of modifying the learner's knowledge by exploring the learner's experience." (p. 111). Inferential learning allows people to construct new knowledge through reasoning and reflective thinking. It does not have to be directly connected to specific experiences, though it is grounded in them (Seel, 2011). In the context of LtC it means making decisions about the contract clauses based on inferences about the transaction future, other party's motives, or the effectiveness of certain provisions, without necessarily basing them on what one has directly experienced or learned from others about the contracts. While Lumineau et al. (2011) find this learning mechanism in the contract negotiations process, Mayer and Argyres (2004) mention that contract revisions that they study are not linked to any predictions of future transaction characteristics and needs.

4.2.4. Relationships between LtC constructs

The relationship investigated most often is between the organization's contracting experience and the contract design: how the experience affects the level of detail in specific provisions, or whether certain clauses are included or excluded. Researchers agree that the contracting experience is positively associated with the level of detail in contracts, although this effect is not the same for all types of provisions (Reuer and Ariño, 2007; Ariño et al., 2014). Mayer and Argyres (2004) find that clauses related to communication, coordination and overall governance tend to be longer. Ryall and Sampson (2009) observe the same effect for rights, obligations, and penalties. However, the learning effect is stronger for technical, transaction- or product-specific detail than for more generic, legal provisions (Vanneste and Puranam, 2010). Some researchers (e.g., Argyres et al., 2007) identify learning spillovers between different provisions, i.e., between task description and contingency planning.

The learning to contract is moderated by the time between repeated transactions. If contracts are signed straight after one another, organizational inertia (the tendency to rely on existing routines) prevents changes from being introduced and slows down the learning process (Mayer and Bercovitz, 2008). The more time has elapsed between contracts, the more they tend to change. This may be due to changes in the environment as parties may perceive the previous contract to be outdated and thus have to make changes (Dekker and Van Abbeele, 2010). The pace of learning is also a factor. Mayer and Argyres (2004) view LtC as a slow, incremental, and reactive process in which changes to contracts are triggered by disputes among the parties, without trying to anticipate future issues and find a better solution in the next contract. The pace of learning, according to the authors, is moderated by the perceived success of the transactions, lack of time to learn due

to many work duties, and insufficient staffing levels during periods of fast organizational growth.

Research has identified certain relationships between the objects and mechanisms of learning and has investigated the dynamics of learning mechanisms and how they change over time. For example, Lumineau et al. (2011) find that learning about the other party is well supported by experiential and inferential learning mechanisms, whereas learning about the contracting process is facilitated by vicarious learning. They also find that the role of the learning mechanisms changes during the contract-making process. Vicarious learning is important at the start of the contracting process, as it compensates for the lack of contracting experience. Over time, as an organization acquires contracting experience, inferential and experiential learning become more important. Dekker and Van Den Abbeele (2010) conclude that deliberate and experiential learning are substitutes. The more contracting experience an organization has, the less it is likely to search for information about potential counterparts. In other words, experience substitutes for new information.

Our literature review reveals that LtC is a process that entails different objects and mechanisms that can happen both between transactions and within a single transaction. The following sections examine intra-contract learning to understand what occurs within an ongoing transaction and the relationships between its key constructs.

4.3. RESEARCH METHOD

We intend to build theory about how an organization can learn to contract within a project (transaction). For that reason, we conduct a longitudinal study and adopt a process approach to data analysis (Langley, 1999; 2009; Jehman et al., 2018): we

study learning to contract as a process that unfolds in the project over time. Case studies are particularly suitable for theory development, as they allow the collection of rich data from multiple sources and application of various analysis methods (Voss et al., 2002). Advancing theory using cases is " [...] likely to produce theory that is accurate, interesting, and testable." (Eisenhardt and Graebner, 2007, p. 26).

In this study, we investigate a single case. While potentially leading to compromises in generalizability, a single case allows drawing deep insights into the studied phenomenon (Voss et al., 2002). It is particularly applicable in studies concerned with how organizations learn (Berends et al., 2003) as the learning process unfolds over time and follows a sequence of steps (Huber, 1991). A process approach is needed to answer 'how' questions in the research (Langley, 1999). "Process research is preoccupied with appreciating and theorizing about [...] temporal patterning, rather than focusing on co-variation between independent and dependent variables [...]" (Bizze and Langley, 2012, p. 224).

4.3.1. Case selection

To study the LtC process, we need a long-lasting project. In short transactions, it is not reasonable to expect renegotiations of existing contracts. The construction sector is project-based and these projects are typically lengthy and involve multiple parties. Contract revisions in construction projects are common due to the complexity of the process and product, uncertainty in the environment, and inherent incompleteness of the contracts (Hobday, 1998; 2000).

For data collection purposes, we approached a large multinational contractor (referred to as Contractor) engaged in complex engineering & construction projects. Such projects typically last several years and involve multiple participants and contracts. They thus provide a suitable example of a lengthy exchange, in which contractual governance plays a dominant role. We used purposeful sampling to

identify a case that would give us rich empirical information to maximize our insights into the intra-contract learning and develop theory (Devers and Frankel, 2000). The case also had to meet other criteria such as recent completion, project documentation availability, and project parties' willingness to participate in the interviews.

The project we selected ("Epsilon") involves the extension and upgrade of an existing petrochemical plant in Northern Europe, with a budget of approximately EUR 700 million. The engineering phase started early in 2014 under a bilateral contract between the client and the Contractor. This contract extended into the execution (or Engineer, Procure, Construct – EPC) phase, in which Contractor was responsible for the detailed engineering and the overall project and construction management. A cost-reimbursable type contract was used. In these kinds of contracts, the scope and specifications may not be fully defined in the beginning; thus, contract amendments and adaptations can be expected (Van der Puil and Van Weele, 2014). To execute the construction works and install equipment, Contractor engaged multiple suppliers and subcontractors based on bilateral contracts signed early in the EPC phase, which began mid-2015 and ended in the fall of 2018. Our study focuses on the EPC phase in particular, as multiple parties joined the project during this phase, and contractual governance became complex and dynamic.

4.3.2. Data collection

The first author collected data from March to August 2019. We conducted semi-structured interviews with five project parties (client, Contractor, three subcontractors) and interviewed representatives of executive teams, project directors, as well as construction, quality, engineering, procurement, and contract managers. Interviewing a wide range of participants and a multi-informant design ensures triangulation of perspectives (Shahzad et al., 2018), and allows for acquiring

complementary information. In addition, we interviewed three collaborative consultants engaged in the project. In total, we conducted 31 interviews with 26 interviewees. We asked all interviewees to verify the interview notes for accuracy and completeness. Appendix 4A lists the interviewees and interview details.

To identify the contract revisions that took place and reconstruct the project storyline, we studied 39 project reports: the close-out report and 38 monthly progress reports (MPRs) over the project EPC phase. MPRs, the contracts, and documents related to the development and execution of incentive plans allowed us to collect rich factual data about the project. Such archival data is particularly useful when reconstructing the chronology of events in the past transactions (Langley et al., 2003). Analysis of this documentation also helped us developing interview questions around key events, and triangulate information received during the interviews.

Our study is longitudinal, but retrospective in nature. Compared to real-time observations, retrospective studies are less time-consuming and allow avoiding data overload that happens when data is collected real-time (Miles and Huberman, 1994; Faems et al., 2008). However, this approach has certain limitations (Berends et al., 2011). For instance, interviewees may fail to remember important events in detail, or may interpret events in a particular way due to their attitude to certain phenomena (Voss et al., 2002). We chose a recently completed project to mitigate the recollection bias risk (six months had passed between the project completion and the beginning of data collection). We collected data about each contract revision from multiple informants and triangulated the interview data with the MPRs. Appendix 4B summarizes our efforts to ensure methodological quality of the study.

4.3.3. Operationalization of learning to contract

Not every contract revision during the transaction involves learning. It may simply be an adaptation following, for instance, the verification of project scope. Contract adaptations may also result from experiencing limitations of parties' capabilities to perform (Knoppen et al., 2010) or from reassigning part of the scope to another party. Adaptation is a change in a contract made without necessarily understanding and analysing the root causes and reasons that lead to the change (Fiol and Lyles, 1985). All identified contract revisions in the EPC phase can be divided into potential learnings and adaptations (see Table 4.1. below). We include in our analysis only contract amendments that indicate the LtC took place (type B). We exclude from our analysis contract revisions classified as adaptations (types A & C).

Table 4.1. Types of contracts amendments in the project

Type of contract amendment *+ present in the project* *- absent in the project*	**Supply contracts for the provision of equipment, materials *(with suppliers)***	**Services and work contracts *(with subcontractors)***
Contract amendments (revisions) type A: Made to scope of work, delivery date, specifications clauses of the contracts, etc., following changes to project scope or schedule, or issuance of complete engineering documentation.	+	+
	NOT included in the study. These changes merely reflect the changes in the project to fairly compensate suppliers/contractors. These changes are common and expected for cost-reimbursable projects and do not demonstrate a learning effect. We classify these amendments as contract adaptations.	
Contract amendments (revisions) type B: Made to payment clauses in response to delays in construction works caused by transaction conditions, parties' behaviours, and existing contract payment clauses.	-	+ Included in the study as they demonstrate the learning effect (learning interventions).
Contract amendments (revisions) type C: Made to the scope of work clauses following conclusions about parties' lack of capabilities to perform to the required level.	-	+ Not included in the study. We classify these revisions as adaptations

4.3.4. Data analysis

We study the contract changes between Contractor and subcontractors, in which Contractor acts as a buyer. We do not include the cost-reimbursable contract between Contractor and client in our analysis. While revisions to this contract were made, they relate to the increase of scope (number of hours) in the engineering and project management services. We consider them contract adaptations (similar to type A in Table 4.1. above).

We focus on learning of Contractor, as this organization initiated, designed, and negotiated the contracts with the subcontractors and suppliers. Although other parties such as subcontractors can also learn from the contracts, we expect their potential learning to be more limited than that of Contractor because it is related only to their own contract or work scope.

We analysed the data in several steps (see Appendix 4C for data coding details). First, we recreated the storyline of the project EPC phase based on the study of MPRs and open interviews with the Contractor project director and contract manager. Next, we identified the contract revisions in the project and classified them as adaptations or learning interventions (see Table 4.1. above). We identified three events of contract modifications with a potential presence of a learning effect in them. These contract interventions represent three temporal observations and divide the project EPC phase storyline into three repeated units of analysis (Langley, 1999, Langley et al., 2013). Looking at three consecutive contract interventions ultimately allows us to identify patterns in the Contractor organization's process steps (Bizzy and Langley, 2012).

In the next step, we created a storyline (or narrative) of each contract intervention – from the moment the problem was identified until the contract revision was executed. In this step, we analysed whether learning indeed took place.

To confirm this, we examined the actions taken by Contractor and compared them to the description of organizational learning processes in the literature (Huber, 1991; Doz, 1996).

Next, we identified the presence of various objects and mechanisms of learning and studied their roles and the associations between them. We used quotes from the interviews and relevant parts of MPRs. We then created visual maps for each intervention, showing the steps of the learning process and the presence of mechanisms and objects of learning. Finally, we generalized our findings to the theory level and created the process map of the intra-project (intra-contract) LtC (see Section 4.5. below). Graphical representations to process studies are very suitable, as they allow the representation of large amounts of data, and " [...] can easily be used to show precedence, parallel processes, and the passage of time". (Langley, 1999, p. 1998).

4.4. FINDINGS

The client's main objective was to complete construction by a specific date while adhering to strict safety and quality standards. Initially, the construction works were planned to be sequential, with all major activities executed by specialist subcontractors one after another. Projects on operational sites prefer such schedules as they reduce the number of contract interfaces, create less congestion for the workforce, and cause fewer productivity and safety risks.

Unexpected problems with the site conditions and late mobilization of the team delayed the construction start. More performance-related issues followed, and as a result, the sequential schedule could not be implemented, and various construction activities had to be carried out in parallel. Concurrent execution of works in the restricted space led to congestion, i.e., situations where subcontractors

could not work in certain areas if other workers were present. This caused stand-by time, losses in productivity, risks of claims, and further delays. Contractor developed recovery plans to reduce delays and complete the project on time and negotiated several contract revisions with subcontractors during the EPC phase to support these plans. These contract revisions are the focal point of our analysis.

4.4.1. The first contract intervention: individual schedule incentives

Issues with the site conditions and late team mobilization resulted in a delayed construction start. Certain subcontractors demobilized their equipment for use in other projects. Some workers were not available during the summer holidays. Additional problems were caused by the low productivity of the engineering team and the late preparation of engineering documentation. Due to these issues experienced during the first months of the EPC phase, initial work plans and schedules were not implementable. The management team became aware of the risk of not completing the project on time: "*Desired MC date is under pressure. Meeting an MC date will require overall construction progress numbers, which are 9-10% progress per month. This is beyond the numbers that have been proven on this type of projects.*" (MPR, month 9). To put construction 'back on track', the Contractor team analysed the reasons for the delays and undertook several steps. Project directors held meetings with subcontractor executives to build relationships, gain commitment, and improve the quality of project management. Scheduling effort and control of the project progress was enhanced. Recovery plans were proposed in six project areas, their effectiveness was evaluated, and schedule forecasts indicated that the new plans would allow recovering three to four months of delays. Contractor received approval for these plans from the client (due to the cost-reimbursable contract and close involvement in the project control, the client's agreement was necessary for such measures). Next, workshops with the subcontractors took place,

in which new 'aggressive' detailed work schedules were developed for each recovery area. These plans required extra management attention and resources (e.g., extended shifts, more equipment) and higher productivity from the subcontractors. The Contractor team evaluated the capability and motivation of the subcontractors and realized that the existing contracts would not motivate them to make the required extra effort. To support the necessary change of behaviours, schedule incentives were developed and bilaterally negotiated with seven subcontractors. *"We got out of sequence early, and to get back to sequence we had to pay the bonus."* (Project director, Contractor).

Most project parties had had previous experience with schedule incentives. Specific targets (schedule milestones) were identified together with the subcontractors. The amount of each party's proposed incentive was based on the calculations of the extra cost of delays: " […] *price we would have to pay for extra months of work in case of delay"* (Procurement manager, Client), and on Contractor's assumptions about the amount that would motivate subcontractors to increase their efforts. Knowledge about performance issues and incentives from a different project was used to develop individual incentive plans. After the negotiations of the reward amounts, incentive plans for each subcontractor were drawn up as confidential contract amendments to the bilateral contracts, and work began under the approved recovery plans.

Progress monitoring soon showed that the results of the recovery and incentive plans were controversial. Some subcontractors improved their performance. For others, the incentive did not bring the expected behavioural change and did not result in schedule recovery. According to the Contractor team, the incentives failed because of the quality of resources and processes in certain subcontractor organizations, insufficient management capabilities, and a lack of interest in the incentives. *"We tried individual incentives, but they did not work […]*

Piling contractors in particular are very poorly managed, in fact we end up managing their personnel, not the contractor". "[…] for civil works it did not really work. They are not willing to earn more money at high risk, they just want to cover their cost" (Contract Manager, Contractor).

Another unexpected and undesirable outcome was the subcontractors' complaints about financial losses caused by the recovery plans. The plans assumed concurrency of works and increase of personnel and equipment in certain areas. The subcontractors were concerned that they would not be able to work as planned and their productivity would decrease because of the restricted work space and waiting times. Under a unit rate contract, where profit margins depend on productivity, the recovery plans signaled a risk of losing time and thus money under regular contracts. Some subcontractors were not able to align their work schedules with others. Schedule incentives remained uncertain, being dependent on the actual ability to perform. As a result, the Contractor realized that the incentive plans were not effective and cancelled them after several months. Figure 4.2. shows the process of the first contractual intervention.

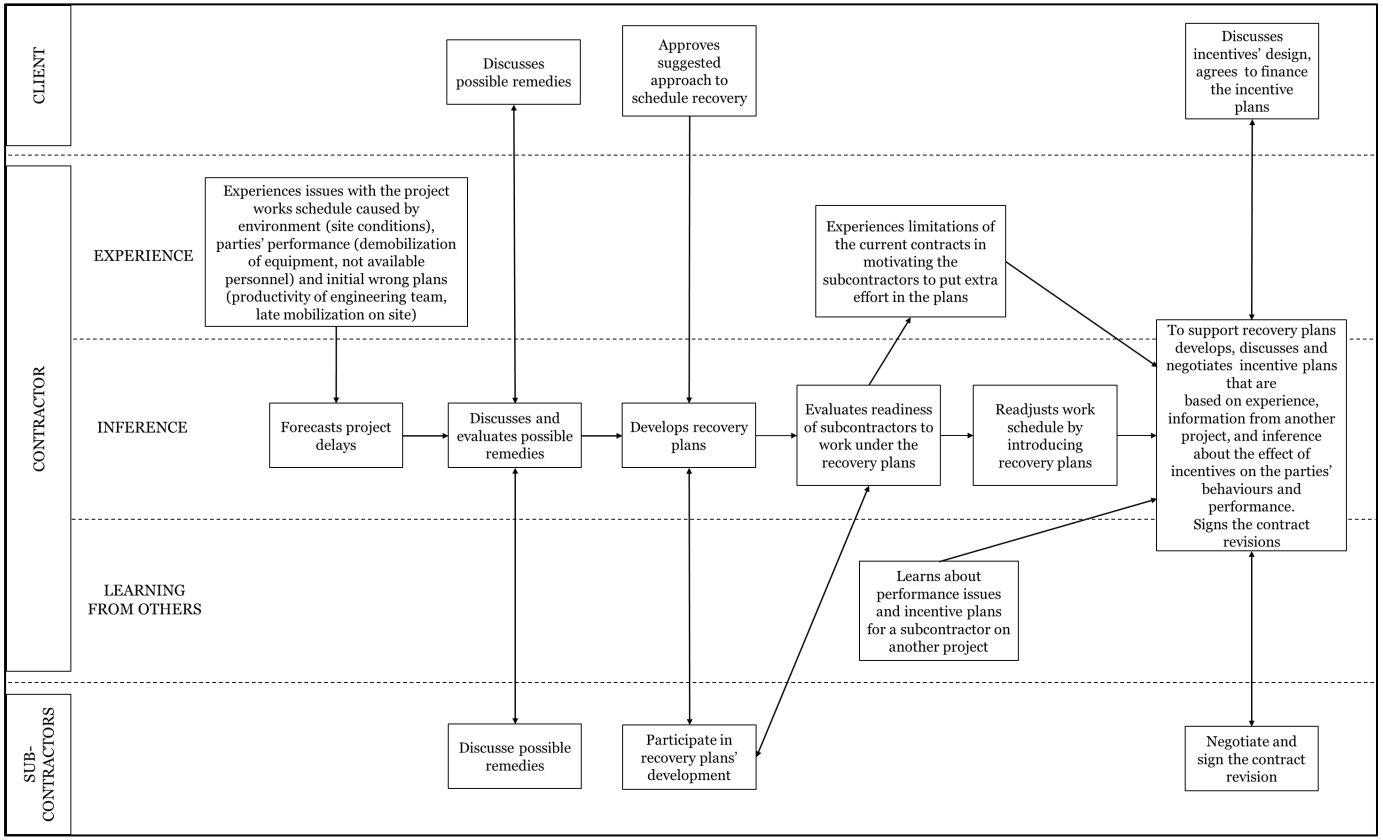


Figure 4.2. Process of the first contract intervention

4.4.2. The second contract intervention: provision to compensate for loss of productivity ('de-risking tool')

In addition to the increasing schedule delays, Contractor now faced complaints from the demotivated subcontractors, as they were unwilling to work together with others in the same areas. "*If you produce and get paid for it, it is ok, but if you do not produce than you just burning man hours and not getting money. And then you start to get worried about your own profit and situation, and stop focusing on your job.*" (Executive, subcontractor I). However, an evaluation of all possible plans and project development scenarios showed that the concurrency of works was inevitable and even had to be increased. The project management team still positively evaluated the subcontractors' capability to cope with this increased complexity. Contractor offered assistance to the underperforming subcontractors by reinforcing their teams with own personnel, or rearranging the work scope and giving part of it to more capable organizations (e.g. part of civil works was reassigned to the tank installation subcontractor). The Contractor team understood that the unit rate contracts presented a clear motivational conflict with the idea of work concurrency. It developed a new contract provision, offering compensation for loss of productivity, caused by the interference of other parties into the scheduled work. Subcontractor work concurrency was analysed per work area, and new contract amendments were negotiated with each subcontractor individually. Such de-risking provision was new to all the team members. It was developed by the Contractor field engineering team based on brainstorming and assumptions of its effect. The idea was supported by the client, who agreed to finance the incentive. *"What we tried to do is to make people bring more staff, more machines, we were intended to pay for the acceleration, and it was quite innovative, good thinking by [Contractor], and well introduced by [Contractor] The idea was to let [subcontractors] recover the unit rates and bring the additional resources."* (Procurement manager, client)

Once again, the progress monitoring showed that incentives brought mixed results. Although it helped to speed up some parts of the work, it did not reverse the project delay. Assumptions about the change it would bring to the subcontractors' ways of working were not fully correct. Responses from those subcontractors who were able to perform and earn this incentive were very positive: " *[…] before, there had been great concern over losing money […] when we got this, we knew it was safe to help each other, even if someone asks you to move or wait"* (Site manager, subcontractor H*)*. Other subcontractors struggled, regardless of the offered help and due to a lack of managerial capabilities to manage increased complexity, or the difficulty to find extra resources required by Contractor. Appendix 4D shows the process map of the second contract intervention.

As the project management team realized that the second contract intervention was insufficient to meet the project completion date, another change in working ways and contracts was initiated.

4.4.3. The third contract intervention: new ways of managing the project, and a shared schedule incentive

In the summer of 2017, the project management team again evaluated all possible project development scenarios. It was decided to radically change the ways of executing the project from traditional to a partnering scheme. "*We are in a process of influencing the project's future by releasing the team's full potential. Our goal is collaboration amongst […] The members of this [Partnership] will collaboratively establish what really matters most, commit to each other's success, identify what is missing (and what to do about it) and what actions to take."* (MPR, month 23). Four subcontractors were invited to join the partnership. This time not only the project development scenarios, the reasons of failures of previous plans, and the

capabilities of the subcontractors were evaluated, but also the criticality of their role for the remaining work and their collaborative attitudes.

Negotiations about the partnership started in parallel with another update of the project plans and schedules. Contractor and four subcontractors together developed new plans of concurrent works to maximize the use of all available resources. The new plans indicated that a delay was inevitable, but that it could be controlled and minimized with a joint working effort. The partners together agreed on the new project target completion date, that was approved by the client.

During a series of meetings and team-building sessions, executives and managers from all participants negotiated the partnership roles and responsibilities and the ways of working. Contractor asked the subcontractors to bring more resources, work faster, change their behaviours, and focus on helping others instead of looking after their own interests and scope of work. Because a radical behavioural change was required, a bottom-up approach was taken to create the partnership. Subcontractors could openly raise their concerns and discuss aspirations about the partnership. The negotiations were difficult and slow: *"Not everybody in the room was excited about the [partnership]."* (Executive, subcontractor J).

For that reason, collaborations consultants were engaged to advise on the individual and team behaviours and their potential effects on the performance. To support this radical change in the ways of working, a new incentive scheme was designed and negotiated jointly with all the parties.Contractor realized that the previous contract revisions did not encourage the process of proactive mutual adjustments and putting the project's needs before individual organizations' interests. This time Contractor, with the support of the client organization, who again provided financial resources for the incentive, developed a shared schedule incentive, based on a "we all win, or we all lose" principle. The incentive was tied to the new jointly agreed work plans and target completion date. Conditional on the

completion date, each partner would receive a substantial amount of money, regardless of the individual performance. At the same time, the failure of any of the parties would put the project's success at risk. The incentive amount was calculated based on the assumptions and discussions of the project management team about the cost of the delay, and the amount of money that would motivate subcontractors to make the radical behavioural change. According to the interviewees, this incentive really stimulated the new ways of working *"[…] we helped each other. For example, when there was a free crane in the area, everybody could use it. Or we did some work for [subcontractor name], and never charged them for that, as we understood we were doing it for the ultimate goal, so doing this extra work paid off."* (Executive, subcontractor J)

The third intervention allowed the project to be completed close to the revised target date and overall, the client evaluated this project as successful. Although some parties experienced performance issues, others were willing to help by providing equipment, personnel, or advice. The last contract intervention was again triggered by the project experiences, learning about the parties' capabilities and attitudes, and awareness about the limitations of the previous incentive schemes. It was based on the positive evaluation of the possibility of schedule recovery, and assumptions about what would be an effective way of changing the parties' behaviours, and making faster progress with the project. Prior experiences with the collaborative project of the Contractor project director were also instrumental to this change. Consultants were involved in the partnership development and discussions about parties' motivation. Appendix 4E shows the process map of the third contract intervention.

Continuously learning from the three contract interventions, the Contractor team ultimately guided the project parties to the desired outcome. The next section

connects our empirical findings to the existing literature and presents the LtC process map.

4.5. DISCUSSION

4.5.1. The presence of intra-project learning

The literature on series manufacturing (Selviaridis and Spring, 2018; Zhang et al., 2018) already established the existence of LtC within transactions. Our study confirms its presence in the lengthy exchanges in project settings.

While many contract revisions took place during the project, most were adaptations - incremental behavioural changes following specific experiences or acquiring new information (Fiol and Lyles, 1985). For instance, some revisions resulted from the verification of scope (new information) or included changes in the scope of work following the poor performance of certain parties (negative experiences). However, the three studied contract interventions clearly demonstrated learning in them – by identifying and analysing the root causes of issues and making corrective plans. This information processing led to a change in the cognition or awareness of the Contractor organization, which signals learning (Fiol and Lyles, 1985; Huber, 1991).

4.5.2. The objects and mechanisms of learning in the intra-project learning

In the three contract interventions we identified the presence of all three learning objects and mechanisms of learning, although their role and importance varied. Table 4.2. summarizes our findings on the presence and associations of the different objects and mechanisms of learning.

Table 4.2. The presence of objects and mechanisms of learning in the contract revisions
('X' indicates presence)

	Experiential learning	**Vicarious learning**	**Inferential learning**
Intervention 1: Individual schedule incentives	*Learning about the transaction (project)*		
	X		X
	Learning about the parties:		
	X	X	X
	Learning about the contracting process/contract		
	X	X	X
Intervention 2: Provision to compensate for loss of productivity ('de-risking tool')	**Experiential learning**	**Vicarious learning**	**Inferential learning**
	Learning about the transaction (project):		
	X		X
	Learning about the parties:		
	X		X
	Learning about the contracting process/contract		
	X		X
Intervention 3: New ways of managing the project (partnering approach), and shared schedule incentive	**Experiential learning**	**Vicarious learning**	**Inferential learning**
	Learning about the transaction (project)		
	X		X
	Learning about the parties		
	X	X	X
	Learning about the contracting process/contract		
	X		X

Objects of learning. The existing literature recognizes that learning to contract is intertwined with learning about each other (parties) and the transaction specifics (Mayer and Argyres, 2004; Vanneste and Puranam, 2010). Our findings confirm the presence of all three objects of learning in the contract revisions. They also show that learning about the three objects comes in a certain order, as discussed below.

Problems rather than successes, and the need to correct the identified problem, trigger the learning, according to the findings of previous research (Argyris, 1977; Ariño and de la Torre, 1998; Mayer and Argyres, 2004; Selviaridis and Spring, 2018). We confirm this, and we find that the issues with the transaction in particular trigger the learning process. Within the ongoing transaction Contractor focused on monitoring the progress towards the desired outcomes. When he became aware of deviations from the initial plan, he analysed the causes of the problems and evaluated whether he should take corrective action to change the transaction course. During this step, the Contractor organization learned about the performance and motivation issues of the subcontractors (and of own organization), which could have caused the problems with the transaction and the implementation of the corrective plans. Finally, Contractor analysed the existing contracts to check whether they motivated subcontractors to change their behaviours and whether the contracts were aligned with the new course of the transaction. If this were not the case, a contract revision would be required so that the contracts could continue to serve as an effective governance and alignment mechanisms.

Learning mechanisms and their associations with the objects of learning. Previous findings show that in the inter-contract setting experiential learning is the main learning mechanism. It can be substituted by vicarious learning if the experience is absent (Lumineau et al., 2011) or search for information (Dekker and Van Den Abbeele, 2010). Experiential learning is naturally present in the intra-

project setting as well. In our case, we found experiential learning in all three contract interventions, and we can conclude that its role and effectiveness increased, which is in line with the prior literature (Kolb and Kolb, 2009; Lumineau et al., 2011). Experiential learning is clearly associated with the transaction: the more the parties learned about the details of the project execution, the better they understood the root causes of the problem. It is also associated with the contract parties: as the project progressed, the Contractor learned about the capabilities and motivation of the subcontractors. Finally, from one contract revision to another, the Contractor experienced and learned about the limitations of the payment provisions, as he was attempting to change them. Experiences become cognitive knowledge through the process of articulation and discussion, in other words, the processing of information (Huber et al., 1991; Zollo and Winter, 2002). Experiential learning played a key role in creating awareness, or cognitive knowledge (Huber et al., 1991; Doz, 1996).

However, experience is not always sufficient to evaluate possible remedy options or design the effective contract changes. Previous solutions may not be suitable for the issues in the new project, or relevant experience may simply be missing. As vicarious knowledge was not actively pursued (see below), the Contractor management team used inference instead. This learning mechanisms is also associated with all the three objects of learning. The contractor had to infer future project development scenarios. Inference was also clearly needed to design the contract text changes. For example, assumptions had to be made about what subcontractors would perceive to be an effective incentive in each situation, or how the change would affect the project schedule.

We noticed that inferential learning became increasingly important. This is consistent with the findings of Lumineau et al. (2011) on the dynamics of inferential learning in the contract-making process. In our case, the increased presence of inferential learning may be explained by the fact that each time the project team and

the Contractor tried to introduce a more radical change in order to remedy the persistent problems with the project. While the first contract intervention can be treated as incremental learning (Crossan et al., 1999), as schedule incentives were a familiar tool for many participating organizations, the following instances of learnings were more novel (de-risking incentive had not been used before) and even radical (change from traditional project management to a partnership, supported by the shared schedule incentive). Thus, every time the learnings departed further and further from the existing experiences of the team. Overall, the possibility of radical learning may be a differentiating feature of the intra-contract learning from the inter-contract, found to be an incremental process (Mayer and Argyres, 2004). While experience helps in understanding the issue and is needed to initiate the process for contract amendments, inference is necessary to resolve the issue and to design an effective change to the contract text. In other words, it plays a key role in transforming cognitive learning into behavioural learning (Doz, 1996).

Evidence of vicarious learning in the three contract interventions was limited as the project team did not consistently search for external knowledge. This learning mechanism was only present in the first and the third intervention. In the first, it was associated with knowledge about the parties' performance and contracts. In the third, it was associated with knowledge about the parties' expected behaviour and performance. The lack of strong presence of vicarious learning is not a surprising finding. It can be explained by the specifics of the empirical setting. Learning from others in projects is complicated by factors such as the perceived uniqueness of the project, the dissemination of the project teams as carriers of knowledge, and the lengthy timeline of some projects (Bresnen *et al.*, 2004; Scarborough et al., 2004). In addition, time pressure within the ongoing transaction could have prevented the project team from investigating the experience of other organizations or project teams. Mayer and Argyres (2004) stated that being very busy with work duties is

one of the factors limiting learning to contract. The limited presence of vicarious learning prevents us from making firm conclusions about its role and associations with other learning mechanisms and objects of learning.

4.5.3. The pace of intra-project learning

Inter-contract learning is a slow process (Mayer and Argyres, 2004), hindered by the organizational inertia (Ryall and Sampson, 2009), and moderated by the time between transactions (Dekker and Van den Abbeele, 2010). Our findings show that intra-contract learning has different characteristics. Three learning cycles occurred within approximately 38 months of the EPC phase (many more contract revisions took place, but they represented adaptations). There is no reference point to evaluate whether this is a large or a small number. However, the focus on learning, particularly on the actual change of behaviours, was obvious in the project (Argyris, 1977; Doz, 1996). This can be explained by the empirical setting. Projects have a strong perception of finite time, and overall, are driven by action and accomplishment (Lundin and Söderholm, 1995). In other words, the need to correct the course of the transaction before time runs out may explain the pace of learning. It may also be related to the criticality of the experienced problems. Adherence to the planned schedule was the project's key objective, and the risk of not meeting the desired completion date triggered the continuous and deliberate process of learning.

4.5.4. The process of learning to contract within an ongoing transaction

Our empirical analysis allows us to show the flow and sequence of events that led to the three contract revisions in the project. We find that the three studied contract interventions followed along the steps of the learning process.

In each intervention the learning started with the monitoring of the project progress. The acquisition of information (Huber, 1991) and accumulation of experience (Zollo and Winter, 2002) led to the understanding that the initial (later

revised) plans would not lead to the desired project outcome (target completion date). The Contractor investigated the root causes of the experienced delays and became aware of the issues with the parties' motivations and performance. During this step, the information about these issues was discussed and interpreted in the project team (Huber, 1991) i.e., what these delays and their reasons meant for the project's future. It became clear that continuing the current path would lead to project failure (as the target date was the key objective for the client). In other words, the Contractor acquired cognitive experiential knowledge about the transaction and the parties (Doz, 1996).

Next, the re-evaluation step began (Doz, 1996), in which conclusions were made about the possibility of taking action and changing the project's future. Corrective action plans were developed using experience, inference, and in some cases also vicarious knowledge. The required changes in the ways of working were analysed (i.e., extended shifts, night shifts, concurrency of works in certain areas, extra equipment, and personnel on-site). The proposed plans and new ways of working were evaluated and deemed feasible and effective – thus, the re-evaluation was positive (Doz, 1996). After that, existing contracts were examined. As the Contractor concluded that they could not support the proposed changes, contracts were revised. The Contractor continued to acquire knowledge about the transaction, the parties, and the contract through all three learning mechanisms. Thus, the acquisition and distribution of information continued in this phase, but in a more comprehensive manner (multiple mechanisms and objects of learning).

Implementing the corrective plans, renegotiating, and executing the contract amendments signaled that the acquired cognitive knowledge was transformed into behaviour. This was the beginning of the readjustment phase of (Doz, 1996), which aimed at changing actual behaviours in the project. The acquired cognitive knowledge was codified in the new plans and amended contracts (Zollo

and Winter, 2002) and stored for future organizational reference and use (Huber, 1991). Finally, monitoring updated plans and amended contracts marked the beginning of the new learning cycle (Doz, 1996).

By analysing the steps in the contract interventions, identifying the objects and mechanisms of learning, and understanding their roles and associations, we developed a theoretical understanding of the LtC process (see Figure 4.3.).

4.5.5. A new definition of learning to contract

We developed a theoretical framework of the LtC process and empirically investigated the previously omitted process of intra-contract learning. The existing definition of Mayer and Argyres (2004), extensively used in the literature, is silent about learning in the contract management phase. Thus, we propose a refined definition of LtC. We define LtC as *the process of changing existing or developing new contracts by learning during the transaction and between the transactions about the transaction itself, the parties, and the contract by analyzing own experience, using third-party knowledge and inference to influence parties' behaviours and ultimately achieve the desired transaction outcome.*

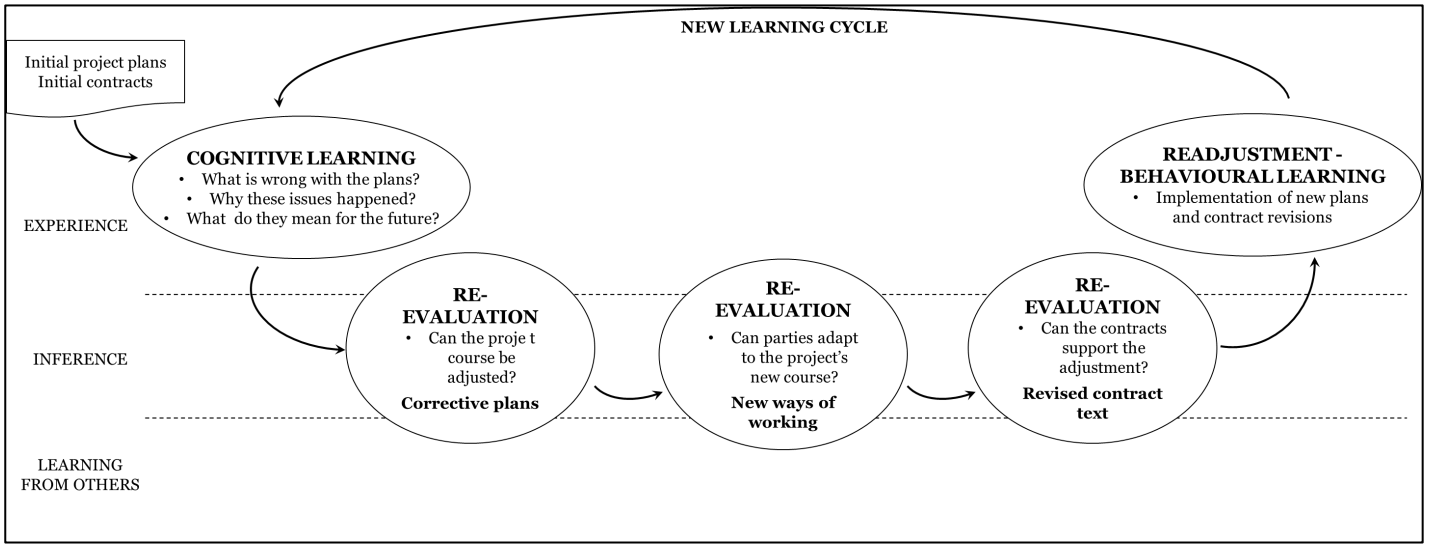


Figure 4.3. Intra-project learning to contract

4.6. CONCLUSION

4.6.1. Theoretical contributions

In this paper, we study how organizations can learn to contract within an ongoing project. We ground the understanding of the LtC process in the organizational learning literature. This allows us to uncover the steps in the LtC process and discriminate between the contract revisions that result from learning and simple contract adaptations. This difference may be particularly important for research that views the learning effect in the mere changes to contract texts. We also review the existing research about the core constructs of LtC theory and their relationships and develop a complete LtC theoretical framework, thereby enriching LtC theory.

We empirically investigate the intra-contract learning process that has been largely omitted by researchers. We identify the characteristics of the objects and mechanisms of learning and develop a learning process map. We find that LtC is likely to be initiated by awareness about the issues with an ongoing transaction. Contracts will be renegotiated only if there is a possibility to introduce effective corrective actions, but the existing contracts cannot support them actions and the required change in the parties' behaviours. We also find that intra-contract learning is supported not only by experiential learning, but also by inference, and, to a lesser extent, learning from others (although the latter finding can be project setting-specific). Intra-contract learning is faster than inter-contract learning: several learning cycles can occur within one project, depending on the changes in the project course that learning brings. Finally, we conclude that the actual change of behaviours is essential for LtC as a particular organizational learning process, which makes us support the opinion that learning manifests itself in the change of actual behaviours (Doz, 1996; Argyres and Schön, 1997).

Our retrospective, longitudinal study of a large engineering and construction project provides a deep understanding of the LtC process in an empirical context not previously studied (Barratt et al., 2011). We believe that the findings from this case are generalizable to other industries that use project-based work, such as film production, aerospace, IT, and pharmaceuticals (Weber et al., 2011), and to lengthy transactions in series manufacturing settings.

4.6.2. Managerial insights

This study may offer insights for organizations designing, negotiating, and managing contracts in projects (i.e., clients or contractors), particularly the functional teams responsible for contract development and management – procurement, legal, and actual users of third-party services.

First, we offer a structured approach to the contract renegotiation process during the project. Multiple contract amendments can occur in a project after acquiring new information or verification of the work scope. Such amendments are typically easy to develop. In situations where corrective action plans are needed as a response to the project issues, revisions of existing contracts also need to be considered. In these situations, one needs to answer three questions: Can feasible corrective plans be developed? Do the parties involved have the interest and capabilities to implement these actions? Does the existing contract support the planned changes? If the answer to the last question is negative, contract amendments need to be made so that the contract can help to govern and guide the desired changes. Keeping an ineffective contract in place may hinder the implementation of corrective actions, as contracts are strong drivers of behaviours.

Second, accumulated experience helps make the necessary contract changes, particularly by analysing the root causes of the problems and the ineffectiveness of the contracts to avoid making the same mistakes. At the same time, relying

exclusively on experience has its limitations, especially if situations present a new, unfamiliar challenge. Inference is needed to design effective contract changes, especially more radical ones. This may involve brainstorming solutions, running development scenarios or simulations, or making assumptions about the parties' motivation or likely changes in performance. Inferential knowledge allows overcoming shortages in experiential knowledge and finding solutions rapidly. If time permits, external sources of information and the experience of others could also be used.

Finally, the effect of corrective actions and contract revisions, or the effect of the learning process, has to be closely monitored. If a change is ineffective, other solutions should be developed, following the same learning cycle, and contracts may have to be renegotiated again.

4.6.3. Limitations and future research directions

First, our specific empirical context may restrict the generalizability of our findings. However, we believe they are likely to be applicable to all project-based industries and in lengthy transactions in series manufacturing. Second, a single case study ensures the richness of data but inevitably limits the opportunity to advance theory due to the restricted number of insights that can be drawn from it. Third, we focused on the learning of the buyer organization and did not examine how and what the supplier learns or how organizations learn together.

Our insights could be refined by conducting replication studies in other industries and settings. For instance, we identified some potentially context-specific features, e.g., fast pace of learning due to a finite perception of time and time pressure in projects. There may be less urgency to learn in series manufacturing, where performance can be corrected over repeated manufacturing cycles, so the relationship between contracts and time could be different. Next, due to the specifics

of the single case and collected empirical data, we could not develop any strong insights about the role of vicarious learning, and this needs clarifying. Finally, we chose to focus on a single organization learning. Looking at how different parties in the network learn can bring more insights into the dynamics and the effects of the LtC process. We hope that our study of intra-contract learning, which we found to be an important and complex phenomenon, will inspire further interest in this topic among other scholars.

4.7. APPENDICES

Appendix 4A. List of interviews (a total of 31 interviews with 26 interviewees)

Role in the project and total number of interviews	**Project director /site manager** 10 interviewees 12 interviews	**Engineering** 3 interviewees 3 interviews	**Construction** 4 interviewees 4 interviews	**Procurement/ contracting** 4 interviewees 7 interviews	**Project controls** 2 interviewees 2 interviews
Client 4 interviewees 5 interviews	1 hr phone – project manager 1 hr 20 m – phone deputy manager		1.5 hrs phone construction/site manager	1 hr phone, 0.5 hr follow up phone procurement & contracts manager	*Manager on long-term leave*
Contractor 13 interviewees 17 interviews	3 interviews x 1 hr with project director 1.5 hrs deputy project director All interviews F2F	2 managers 1.5 hr each interview, F2F 1 supervisor 1 hr F2F	2 hrs F2F – construction manager 1 hr phone – modular yard manager 1 hr phone – construction manager	3 interviews x 1 hr F2F contracts manager 1 interview x 1 hr F2F contract engineer 1.5 hrs F2F project material manager	1 hr F2F senior estimator 1.5 hrs F2F project controls manager
Subcontractor H 2 interviewees 2 interviews	1 hr phone project executive 1 hr phone site manager				
Subcontractor I 2 interviewees 2 interviews	1.5 hrs phone project executive 1 hr phone site manager				
Subcontractor J 2 interviewees 2 interviews	1 hr phone project executive 1.5 hrs face to face site manager				

+ 3 interviews with 3 collaborative consultants (1 hour 15 min phone, 55 min phone, 1 hour 30 min F2F)

Appendix 4B. Actions taken to ensure methodological quality of the study

	Internal validity	Construct validity	External validity	Reliability
Two theoretical perspectives (LtC and organizational learning) used to develop insights, extensive literature review	x			
Triangulation of interview data with project documentation		x		
Interviews with all transaction parties (client, contractor, subcontractor level) and with employees from different functions and management levels		x		
Fine-grained analysis of each of the three identified learning cycles			x	
Process storyline and process maps			x	
Linking findings back to the literature for analytical generalization			x	
Interview guides, list of interviewees				x
Explanation of data analysis approach				x

Appendix 4C. Coding of empirical data

Steps of organizational learning process (based on Doz, 1996; Huber, 1991)

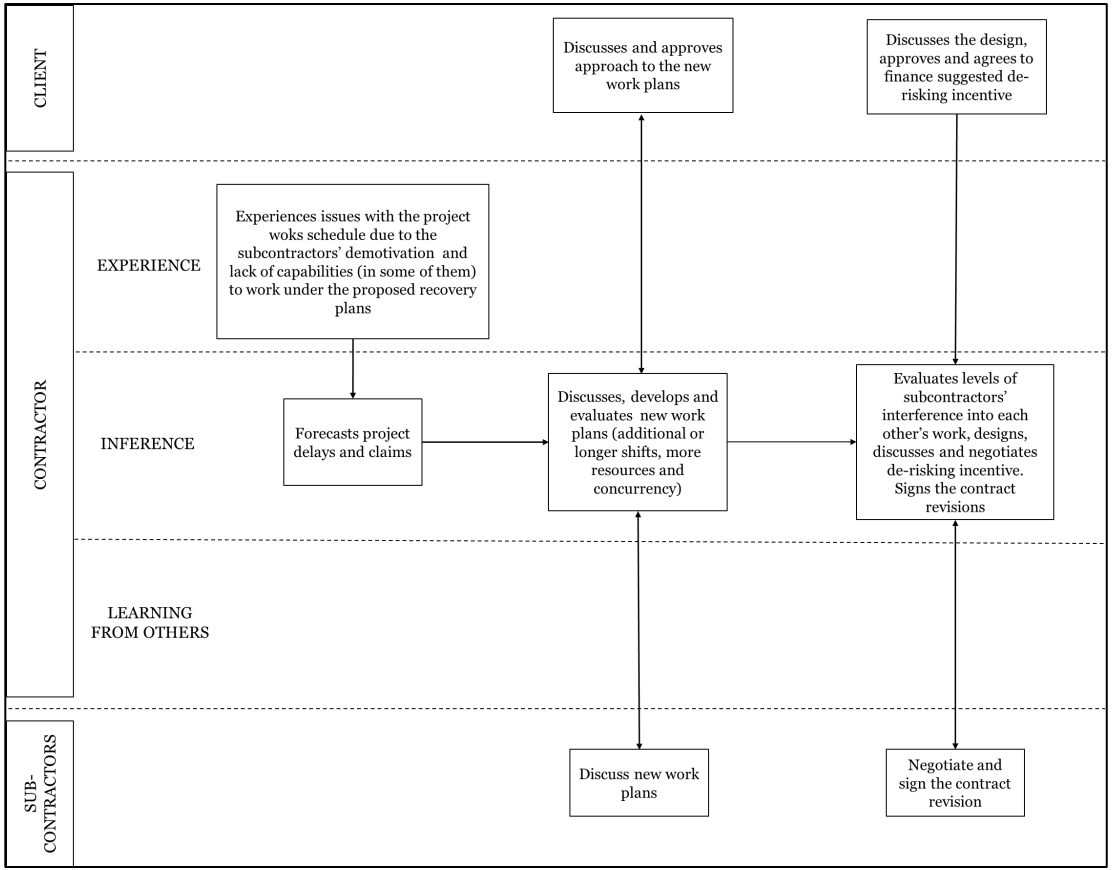
Awareness (cognitive knowledge)	Progress monitoring Reporting issues Project conditions Subcontractor performance Subcontractor attitude (behaviour) Subcontractor resources
(Re)evaluation	Analysis of reasons Forecasting results Cost of delay Development scenarios Schedule simulation Analysis of Subcontractors' attitudes Performance issues Performance potential Subcontractor motivation Existing contract Unit rate Productivity risk Stand-by time Work concurrency
Readjustment (behavioural knowledge)	Development of plans Implementation of plans Development of contract clauses Renegotiation of contracts Execution of contracts Partnership Incentive Work scope

Objects and mechanisms of learning

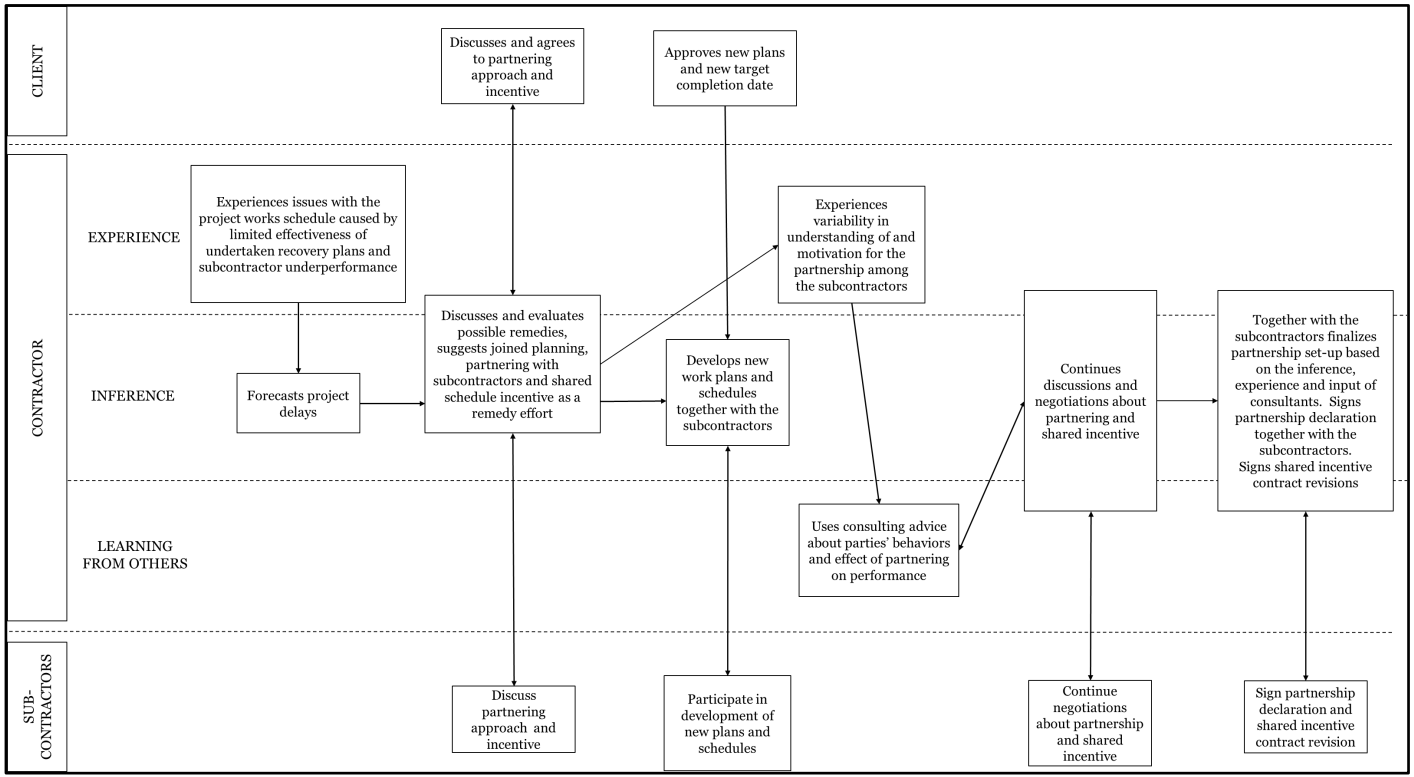
Objects of learning / Learning mechanisms	About the project (transaction)	About the contracting process	About the parties
Experiential learning	Reporting of) experienced problems with the project and project management (scope, schedule, safety, design, engineering, quality, procurement, reporting, information systems, cost, work plans, site conditions, specific work activities, etc.), as well as experiences of Contractor project team members with past projects/transactions. Also experiencing/learning about successes in the project and past projects.	Examples of problems experienced with the contract negotiations or certain parts of the text (e.g., gaps, unclear scope, work processes, roles and responsibilities, unclearly defined or missing milestones, ineffective contractor reimbursement, etc.) in past projects/transactions. Also learning about successful/effective provisions and negotiations.	Examples of problems experienced with the parties' performance, capabilities, motivation, goals, expectations, etc., in past projects/transactions. Also problems with one's own organization or the project team. Also learning about successes in the areas above.
Vicarious learning	Information about other projects (see above for details) obtained from third parties (such as experts, external professional acquaintances, or colleagues) or from various information sources (books, Internet, etc.). Alternatively learning about successful projects and project management techniques from the sources mentioned above.	Information about effective/ineffective negotiation strategies or problems with the contract text (see above for details) or negotiations obtained from third parties (such as experts, external professional acquaintances, or colleagues) or from various information sources. Also learning about successful/ effective contract provisions and negotiations.	Information about problems with project participants (see above for details) obtained from third parties (such as experts, external professional acquaintances, colleagues, etc.) or from various information sources. Also learning about positive aspects of the parties' behaviour, performance and expectations, or about these aspects of one's own organization or project team..

Inferential learning	Contractor project team thinking (forming judgements, forecasting, building plans and scenarios) about issues in the project, and development of mitigation actions not based on own or other's experience to overcome those issues	Contractor project team thinking (forming judgements, forecasting, building plans and scenarios) about approaches to negotiations or changes in contracts that would be effective in closing identified gaps or repairing ineffective provisions (see example above), in changing, maintaining or improving the behaviour or attitude of the parties, or in mitigating issues/ in the project.	Contractor project team thinking (forming judgements, forecasting, building plans and scenarios) about what could change (maintain, improve) the parties' attitude, behaviour, performance, capabilities, motivation, or intentions with regard to the transaction. Same regarding one's own organization and project team.

Appendix 4D. Process map of the second contract intervention



Appendix 4E. Process map of the third contract intervention



5. THE INTERPLAY OF INTEGRATIVE MECHANISMS AND RELATIONAL NORMS IN PROJECT COLLABORATION[8]

5.1. INTRODUCTION

In project environments, collaboration is often viewed as a prescription for success to interorganizational relationships: it helps parties get access to scarce resources and develop new knowledge (Gray, 1985; Hardy et al., 2003; Dietrich et al., 2010), and can positively affect organizations' financial performance through supply chain integration (Halldórsson et al., 2007; Soosay et al., 2008). In complex construction projects especially, collaboration is regarded as a remedy to persistent problems, such as adversarial relationships, low productivity, schedule and budget overruns, and lack of innovation (Brown et al., 2001; Gadde and Dubois, 2010; Hartmann and Bresnen, 2011).

At the same time, collaboration can be costly, complex, and requires substantial effort and change of behaviours from the participants (Cheung et al., 2003; Barrat, 2004; Baiden et al., 2006; Eriksson, 2010). Because of the temporality of projects, there is often a lack of time to develop trust between the parties. As future work prospects are uncertain due to the fragmented nature of the construction industry, organizations may be unwilling to make relationship-specific investments (Heide and Miner, 1992; Gadde and Dubois, 2010). The large number of actors involved in projects and their diverging cultures and goals make the negotiation of mutually acceptable relational norms and rules challenging (Thomson et al., 2009).

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In the past decades, several collaborative project delivery strategies have been developed to address these challenges, for instance, project alliance or integrated project delivery. Such strategies extend the collaboration duration through early involvement of key suppliers and contractors, and strengthen collaborative ties by sharing risks and benefits in commercial models (Eriksson, 2010; Hietajärvi et al., 2017). However, collaboration in projects is not necessarily restricted to a particular set of formal delivery strategies. It can also be based on a set of integrative processes, management practices, and relationships that can be applied in any project (Manley and Hampson, 2000; Hong et al., 2012). A large stream of research has focused on project collaboration from this more generic perspective (Bayliss et al., 2004; Eriksson, 2010), studying so-called 'project partnering' - a management approach aimed at improving the relationship between the contracting parties, creating an environment of teamwork and cooperation (Cheung et al., 2003) that leads to "[...] combined effort of the participants [...] and focus upon project objectives." (Naoum, 2003, p. 71).

Researchers of specific delivery strategies and partnering approaches have extensively studied success factors, implementation barriers, applicability, and benefits of project collaboration (Black et al., 2000; Cheng et al., 2000; Kent and Becerik-Gerber, 2010; Lahdenperä, 2012; Mollaoglu et al., 2015). Studying these topics, scholars have often identified and contrasted opinions of the collaborating organizations instead of looking at the collaborative domain (Wood and Gray, 1991) or focusing on team integrative practices (Baiden et al., 2006). This approach has been criticized for not leading to real understanding of the complex and dynamic collaboration process (Thomson et al., 2009; Hartmann and Bresnen, 2011).

Another stream of literature has addressed the dynamic and contextual processes of project collaboration. This research proposes that project collaboration relies both on 1) behavioural mechanisms, or relational norms (Doloi, 2009) and 2)

formal managerial practices, or integrative mechanisms (Eriksson, 2015). It is understood that the two sides of collaboration are connected, and the interplay between them is dynamic and complex (Bresnen and Marshall, 2002; Dewulf and Kadefors, 2012; Hietajärvi et al., 2017). Their respective roles and the nature of the interplay, however, is not yet clear. Some of these studies treat relational or behavioural elements as key for the collaboration process and its success (Bresnen, 2009; Cheung et al., 2003). Others state that the formal side of collaboration may play a support role (Dewulf and Kadefors, 2012) or find that the interplay between the two sides is likely to be context dependent (Bygballe et al., 2015). This lack of clarity also reflects in the models of project collaboration that combine elements from both sides but do not distinguish between them or their specific roles, as can be seen in the frameworks of Yeung et al. (2012) and Bygballe and Swärd (2019).

Understanding the roles of and interplay between the two sides of collaboration is important for addressing the perceived complexity of project collaboration. It also seems a necessary next step in developing a comprehensive theory of collaboration (Wood and Gray, 1991) in the project management literature. Building on the existing knowledge about the relational norms and integrative mechanisms of collaboration, we intend to develop a project collaboration model that demonstrates their roles and interplay. Hence, we address the following research question:

How do integrative mechanisms and relational norms interplay in project collaboration?

To answer this question, we empirically analyse two collaborative projects, examining the experiences of collaborating teams formed by different parties in large engineering and construction projects. Since such undertakings are

representative of complex project organizing, we aspire that our findings will be generalizable to many project settings.

The rest of the paper is structured as follows: Section 2 offers an overview of the literature on the managerial and relational sides of project collaboration. Our research method is described in Section 3, followed by the analysis of the two collaborative projects in Section 4. In Section 5 we present the discussion and the project collaboration model. Section 6 concludes the article with the theoretical and practical implications, reflections on the study limitations and suggestions for future research.

5.2. LITERATURE REVIEW

5.2.1. Project collaboration and project partnering: clarification of terms

"Collaboration is a process in which autonomous or semi-autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions." (Thomson et al., 2009, p. 25). This definition emphasizes that collaboration incorporates both relational and managerial aspects, which is crucial for this research. However, some clarifications about collaboration in projects are needed.

In projects that bring together a set of parties to pursue a particular goal (von Danwitz, 2018), collaboration is temporally delimited and exists "[...] for the purpose of achieving specific project and business objectives [...] to ensure "[...] effective utilization of each party's specific resources and capabilities." (Suprapto et al., 2015, p. 665). Thus, project collaboration focuses on the project objectives,

whereas a long-term, strategic collaboration spans across several projects (Cheng et al., 2004). Project collaboration often extends beyond the dyad of client and contractor (Bygballe et al., 2010). The collaboration scope (Hardy et al., 2003; Eriksson, 2015) can also include suppliers and subcontractors, who play an important role in the construction works and the overall project outcome due to high levels of specialization and outsourcing in the industry (Matthews et al., 2000; Dainty et al., 2001; Anvuur and Kumaraswamy, 2007; Berends, 2007).

Collaboration in projects is quite often labelled 'partnering'. Both terms are frequently used in project management and construction management research, but their meaning seems inconsistent (Hughes et al., 2012). For instance, Thompson and Sanders (1998) talk about 'a partnering continuum', stating that collaboration is one of its phases. Vice versa, Yeung et al. (2012) view partnering as one of the types of collaborative contracting. Sometimes partnering is treated simply as a synonym to project collaboration (Bygballe et al., 2010) or relational contracting (Rahman and Kumaraswamy, 2004; Yeung et al., 2012).

We take a point of view that partnering is a specific type of project collaboration. It is a non-contractual approach to executing the projects in a collaborative way as opposed to specific formal project delivery strategies such as a project alliance or integrated project delivery (Lahdenperä, 2012; Eriksson, 2010). In this paper we use the terms 'collaboration' and 'partnering' interchangeably. While considering the specifics of partnering when connecting our findings to extant research, we use a more generic 'collaboration' term to discuss the literature more effectively.

5.2.2. Conceptualization of collaboration

To be able to empirically analyse the complex phenomenon of collaboration, researchers often decompose it into processes, dimensions, routines, or elements.

For instance, Thomson and Perry (2006) and Thomson et al. (2009) view collaboration as a set of five processes or dimensions: Governance, Administration (the structural dimensions); Autonomy, Mutuality and Norms (the relational dimensions). Governance is related to the decisions that parties jointly make about collaborating: what collaborative bodies will govern their relationship, which behaviours are expected, or how risks and rewards will be shared. Administration covers the roles, responsibilities, and control procedures within the established collaborative structures. Autonomy is about reconciling individual and collaborative interests. Although each party maintains its identity within the collaboration, it needs to adjust its behaviours and actions to achieve collective interests. Mutuality grows from interdependence. Parties realize that by working together, they can achieve goals that they would not achieve individually. Finally, Norms relate to social capital norms - reciprocity and trust (Thomson and Perry, 2006); Thomson et al., 2009).

Bygballe and Swärd (2019) take a different approach and decompose project partnering into three sets of routines, which together form a cyclical partnering institutionalization process. The first set relates to creating a shared understanding of partnering, a high-level 'philosophical' concept of collaboration. These routines are followed by formal partnering practices that create the collaboration structure. Finally, these are translated in performing and re-enacting partnering practices and routines. The latter inform and improve the understanding of partnering, and a new cycle begins with the improved partnering concept. Behavioural (rules personal relations) and structural aspects (workshops, co-location) are combined in these routines.

According to Bayliss et al. (2004), three processes ensure success of collaboration: instilling, fostering, and maintaining. Instillation refers to the emergence of the idea of collaboration at the management and executive level.

Fostering is the process of explaining collaboration to the team, and maintenance is keeping the adopted collaboration principles alive – as "[…] successful partnering depends on the endurance of the partnering spirit." (p. 255). Thus, collaboration is dynamic and depends on applying specific actions that can contribute to its success, such as partnering workshops, collaboration reviews, newsletters, and incentive contracts.

Hietajärvi et al. (2017) view collaboration as a set of integration mechanisms, and divide them into two groups: formal governance (for instance, goal setting, performance incentives in commercial models, processes for collaborative working, written policies and plans), and organizational and relational arrangements (such as organizational charts and job descriptions, interorganizational meetings and working sessions, social gatherings, etc.).

Finally, Yeung et al. (2012), building on studies by Nystrom (2005) and Yeung et al. (2007), conceptualize collaboration or relational contracting as a set of essential (the most frequently mentioned in the literature) and non-essential elements. However, the authors do not investigate relationships between these elements (which they recognize as a weakness and need for future research) and do not reflect on their nature (behavioural or managerial). Eriksson (2010) also suggests that there are core and optional partnering elements but offers a different list and classification. While the essential elements in Yeung et al. (2012) are exclusively behavioural or relational (see Table 5.2. for their full list), Eriksson (2010) also treats certain formal collaborative techniques, such as partnering workshops or conflict resolution procedures, as core.

The variety of approaches to conceptualization and analysis of collaboration demonstrates the complexity and richness of this construct (Hartmann and Bresnen, 2011). Decomposing collaboration into different processes, dimensions, and elements may at first seem to result in mutually excluding approaches.

However, they allow us to derive theoretical constructs from the literature to guide our empirical investigation and inform data coding and analysis. Based on the literature review, formal integrative mechanisms of collaboration (Erikson, 2015) can be divided into the three categories: 1) Governance and administration, 2) Support (development, maintenance, and improvement of collaboration), and 3) Joint work activities (see Table 5.1.).

Table 5.1. Integrative mechanisms in project collaboration

Integrative mechanisms	**Source and labels**
Governance and administration	Hietajärvi *et al.* (2017) *Governance, organization* Bygballe and Swärd (2019) *Structure and formal practices* Thomson and Perry (2006); Thomson *et al.* (2009) *Governance, Administration*
Support (development, maintenance, and improvement) of collaboration	Bayliss *et al.* (2004) *Instilling, fostering, and maintaining collaboration* Bresnen and Marshall (2002) *Team building activities*
Joint work activities	Bygballe and Swärd (2019) *Parties 'actions and interactions (routines in practice)* Jacobsson and Roth (2014) *Daily project activities*

Next to the integrative mechanisms, scholars often talk about the behavioural (Suprapto et al., 2015) or relational (Thomson et al., 2009) side of collaboration, or collaborative behaviours and attitudes (Anvuur and Kumarswamy, 2007). The term 'relational norms' goes back to McNeil (1980), who defines them as expectations about behaviours shared by the parties (Thomson et al., 2009). The relational atmosphere in the project is dynamic and may change even if the formal contract remains the same (Blois and Ivens, 2006). Actual behaviours of the project team may or may not be in line with the established expectations (norms) about them. For instance, when collaborative behaviours are 'prescribed' to the team members,

people will obey and attempt to behave collaboratively, but their attitude or internal relational norms may remain adversarial. Thus, it is essential to ensure real behavioural change for the successful collaboration (Baiden et al., 2006). Table 5.2. presents five relational norms identified in the literature.

Table 5.2. Relational norms in project collaboration

Relational norms	**Source and explanation**
Win-win philosophy	Thomson and Perry (2006); Thomson *et al.* (2009) *As parties are interdependent, they together can reach a goal that they cannot reach individually* Yeung *et al.* (2012) *Neither party wins if others lose; recognition of mutual benefits*
Shared vision and goals	Thomson and Perry (2006); Thomson *et al.* (2009) *Same as above* Yeung *et al.* (2012) *Existence of common objectives and agreement about ways to achieve them is key for collaboration success*
Commitment	Thomson and Perry (2006); Thomson *et al.* (2009) *Parties need to commit to changing part of their identity to reach mutual goals and put them above individual objectives* Yeung *et al.* (2012) *Agreement to pursuing shared objectives*
Openness and information sharing	Thomson and Perry (2006); Thomson *et al.* (2009) *Each party needs to balance its independence and collaboration, and share information necessary for the success of collaborative exchange (relates to autonomy dimension)* Yeung *et al.* (2012) *Collaboration requires excellence in communication at personal, group, and organizational level*
Trust	Thomson and Perry (2006); Thomson *et al.* (2009) *Relates to social capital dimension* Yeung *et al.* (2012) *Trust is needed for successful collaboration; at the same time, reinforced trust is its outcome*

5.2.3. Interplay between integrative mechanisms and relational norms

Bresnen and Marshall (2002) and Bresnen (2009) stress that the social dynamics between the collaborating parties in partnering projects cannot be forced and is thus 'emergent'. In contrast, formal integrative practices can be designed or 'engineered' by managers. The authors suggest that these two categories potentially interplay but

do not examine their respective roles or how such interplay happens. Thus, project partnering can be considered a result of social interactions in the project team; it is always contextual and cannot be achieved using appropriate parties' selection procedures and contracts. This implies that the role of the managerial, formal integrative mechanism is secondary.

Dewulf and Kadefors (2012) find that formal integrative mechanisms play a supporting role and state that partnering tools (e.g. co-location, team building events) are essential for relationship building. Bygballe et al. (2015, 2016) also conclude that the formal side of collaboration is not sufficient, but it is essential because it supports the informal, relational side and relational exchange. They also find that the interplay of formal (contracts, incentives, communication protocols) and informal (relational) elements depends on the context: the time, budget, nature of the relationship, and collaborative experience of the teams.

Hence, current literature appears to be inconclusive about the nature of the interplay between the integrative mechanisms and relational norms of project collaboration. We intend to advance the discussion on this subject by empirically studying two collaborative projects and proposing a model of the project collaboration that demonstrates interplay between its two sides.

5.3. RESEARCH METHOD

To understand the interplay between integrative mechanisms and relational norms, we studied two collaborative projects of a large contractor organization (Contractor), which performs engineering, procurement, and construction (EPC) services in various sectors. Such organizations are viewed as the main drivers of collaboration in construction (Bygballe et al., 2010), as on one hand, they are connected to the project owner/client organization, and on the other hand linked to

the rest of the complex project supply chain. Looking at collaborative projects of one focal organization allows us to disregard the effects of cultural/managerial differences (Eriksson, 2015) that may lead to differences in the "manifestation of partnering" (Bresnen, 2009, p.927).

We selected two projects for our study (for details see Section 5.4.1.). The first was an ongoing collaborative project (Project "Delta") in which we were engaged in non-participant observations of the collaborating team to uncover their daily collaborative practices and behaviours. As "[…] observation allows the generation of multidimensional data on social interaction in specific contexts as it occurs, rather than relying on people's retrospective accounts" (Mason, 2017, p. 86), the first author spent three days a week in the project team for the period of six months. We also conducted 26 semi-structured interviews with the team members to improve our understanding and interpretation of behaviours and collaborative practices.

To increase data richness, we included a second collaborative project (Project "Epsilon") that by the time of our data collection had been just completed. For this reason, the recollection bias (Voss et al., 2002), which is a common problem for retrospective studies, was low, and interviewees and project documentation were easily accessible. Many of the Contractor team members (managers or leads/supervisors) participated in both projects, and the project director (collaboration champion) was the same person. We conducted separate interviews dedicated to these collaborative projects. In total, we conducted 37 semi-structured interviews to study Project "Epsilon". Appendix 5A lists the interviewees in both projects.

We took several steps to ensure the high methodological quality of our research. We triangulated all the collected data. Our non-participant observations in Project "Delta" were complemented by multiple interviews. For Project "Epsilon", studied retrospectively, we had access to all progress project reports (38 monthly

documents), from which we were able to reconstruct the collaboration 'storyline'. We also asked respondents to clarify particular events that we discovered in these documents, and examined previous research focused on the second collaborate project (master theses) to clarify and verify some events. During all our interviews, we asked similar questions to several respondents (who, when possible, also belonged to different organizations) to compare and verify the information we received from the interviewee. Finally, studying one collaborative project 'live' and one retrospectively allowed us to improve our interview protocols and depth of investigation.

In our research, we chose the collaborating team as the level of analysis, studying integrative mechanisms and relational norms with underlying collaborative behaviours. By looking at the team rather than contrasting collaborating organizations' points of view, we followed the advice of Wood and Gray (1991) and Thomson et al. (2009) to focus on the collaboration domain. Also, construction is essentially a 'team-based industry', in which project teams comprising members of various organizations, drive the project from its inception to completion (Anvuur and Kumaraswamy, 2007).

Various approaches to conceptualizing collaboration informed our data coding, which ensured internal validity of our research (see Section 5.2, Tables 5.1. and 5.2.). Our main constructs, or aggregated dimensions were relational norms (Thomson et al., 2009) and integrative mechanisms (Eriksson, 2015) - see Figure 5.1. for details. The approach to data analysis was abductive (Dubois and Gadde, 2002): the literature informed our theoretical constructs, and thus they appeared from the data deductively. We first identified examples of integrative mechanisms and behaviours underlying the relational norms. One of the relational norms (Respect) emerged from the data and was coded inductively and added to the list of relational norms. In the next step, we examined the relationship between the three

categories of integrative mechanisms. Finally, the interplay between the relational norms and integrative mechanisms was analysed inductively, as these relationships have not been previously established in the literature.

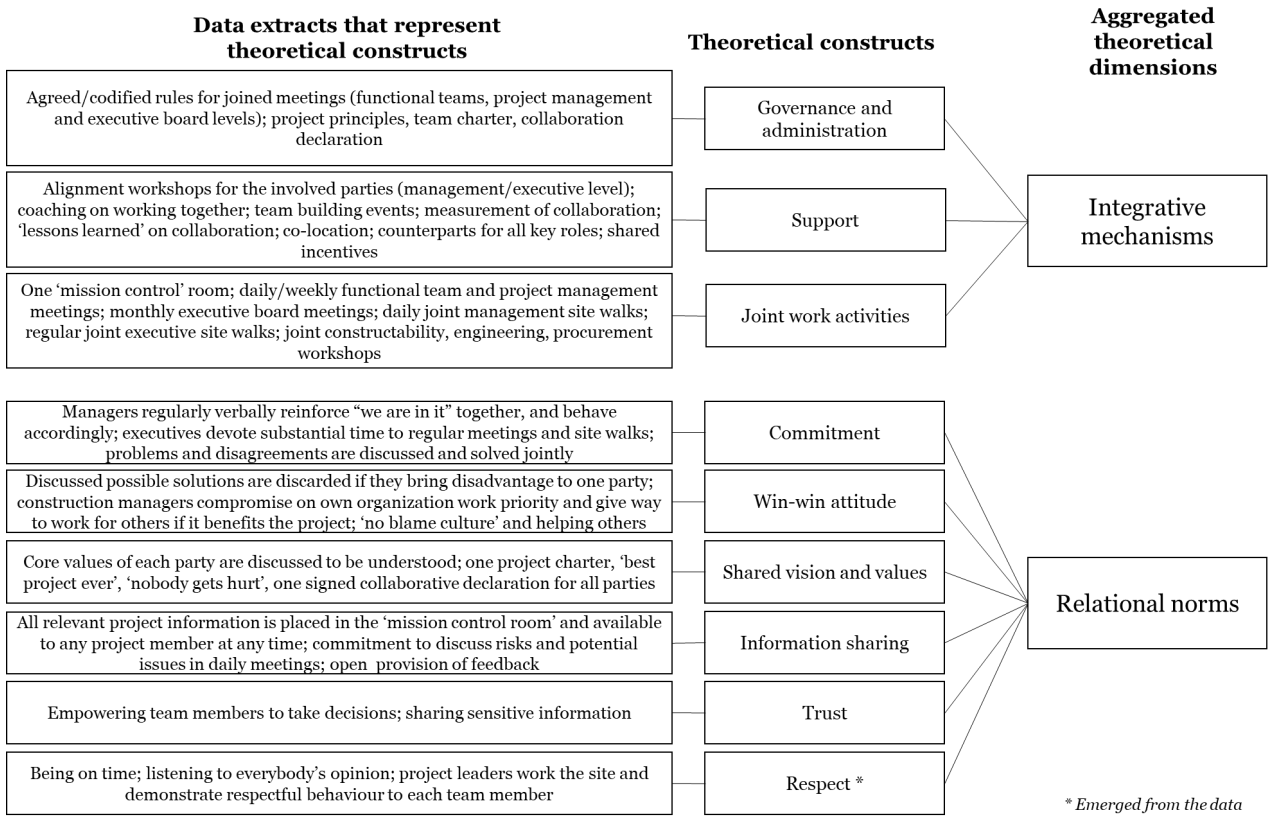

Figure 5.1. Data structure

5.4. FINDINGS

5.4.1. Background of the collaborative projects

Project "Delta". The collaboration started as an effort to align the project team's activities when preparing the project design and the high-level schedule and cost estimate package. The team included representatives from the Client and Contractor organizations. The project started traditionally: the Contractor won the competitive tender, and a cost-reimbursable contract was signed. Initially the team members were based in their respective offices, combining work on this project with several other projects. However, after several months it became clear that there was "no good chemistry" (Design manger, Contractor) in the team, and the Client was not satisfied with the quality and the speed of the work. The project directors were replaced to change the relationships and course of action. The newly appointed director from the Contractor side proposed a collaborative way of working, based on own positive experiences. Several functional managers with collaborative attitudes and experiences were brought on board. A number of collaborative activities were implemented in the team. They were designed based on experience from previous projects but taking into account the specifics of the project phase (early planning), size of the team (about 50 people), and expected deliverables. This collaborative work continued for approximately 6 months, until the Client organization received the project documents, and the project team was dissolved.

Project "Epsilon". This project also started traditionally. The Contractor was selected based on competitive tendering procedures and was engaged in the cost-reimbursable contract for the engineering and the execution phases of the project. A Client executive suggested bringing in collaboration facilitators to improve the organizational effectiveness of the team of approximately 200 people and to coach the team to work together in the best possible manner. Safety as a key

shared value - and also the process that required extra attention - was chosen as the target area. This effort was 'picked up' by the Contractor project director, who played the role of the collaboration champion and expanded the collaborative approach to processes and team members beyond the safety group.

In the execution phase, the project experienced a series of delays and it became clear that collaboration between the Client and Contractor only was not sufficient to mitigate the delay risk. The Contractor project director suggested that a partnership between all the key parties would be the only way to complete the project with minimum delays. This idea was approved by the Client, and the collaboration scope grew from two to six parties, including four subcontractors.

5.4.2. Integrative mechanisms in the two collaborative projects

Based on the analysis of the observations, interviews, and the project documentation of the two projects, we created a full list of identified integrative mechanisms (see Appendix 5B). As integrative mechanisms are context-dependent and vary per collaborative project, we will not describe them all. Below we highlight the key points about how these mechanisms were developed or what role they played in the projects.

Governance and administration. The rules, procedures, and relational norms of collaboration were developed and agreed upon in several ways. There was little effort to document the collaboration rules and norms in Project "Delta". Time was short, the team was small, and some of the Contractor's team members had just completed another collaborative project – Project "Epsilon". Project "Delta" borrowed the project charter elements from "Epsilon" , and the guiding work principles and meeting rules were simply placed on whiteboards in the team meeting ('mission control') room.

When collaboration between the Client and the Contractor started in Project "Epsilon", the project charter was developed during several team sessions. The

charter was then printed on posters and made visible to the team in the office and on site and was repeatedly referred to in the work and team discussions. When the scope of collaboration grew to six parties, a partnership declaration was jointly created by managers of all the parties. It incorporated the values and interests of all participants. A similar approach was taken to disseminate it among the team.

The extended collaborating team also developed new ways of working. It held daily joint manager meetings to discuss the planned work, take the necessary coordination steps, and monitor project progress. The team members also agreed on the principles of open information sharing, striving for unanimous decision-making, helping each other, and focusing on what was best for the project. All partnership parties had an equal voice, regardless of their actual scope of work and contribution to the project.

Support of collaboration. Project "Delta" included only a few formal team integrative events. The introduction of the collaborative approach included only one information and alignment session for the whole team. This was a presentation of new collaborative ways of working followed by an informal social gathering. The Client project director explained that more formal team-building events were not possible due to a lack of budget in a cost-driven project and to a lack of time and interest, given the time pressure. Yet, many team members admitted that another event like this would have been useful for better team alignment.

In "Epsilon", the Client allocated a budget for collaboration and time for team building and developing collaborative team skills (this project was schedule-driven). Collaborative consultants (facilitators) were engaged to analyse and improve team effectiveness. Individual coaching sessions were organized for managers and facilitated alignment sessions for the management team. Certain team building events, although infrequent, were held, orchestrated around collaborative activities

(e.g. building a kite in a team). Weekly team recognition events were highly appreciated by the team and distinguished this project from others.

When the scope of collaboration increased from two to six parties, consultants facilitated partnership creation through alignment sessions with directors and managers of all participants. A substantial 'bottom up' effort to align parties' views and opinions took place. Although this approach was time-consuming, it was necessary as a fundamental behavioural change was required from the subcontractors to create a feeling of involvement in the partnership development. Because the team was big, most 'active' collaboration events were centred around the management level. The whole project team was included in collaboration through a number of team building events, visualization of project and coalition principles on the posters on site, and regular newsletters.

In Project "Epsilon", a shared financial incentive targeted at the project completion date was implemented for all partnership participants. Suggested new ways of working – helping each other instead of benefiting from each other mistakes, meant fundamental behavioural changes at all team levels. The incentive was also offered for the workers at 'boots on the ground level', as changing the principles of behaviour on site was essential. Each month, the working crews received a gift voucher based on the collaborative behaviours demonstrated in their daily work.

Towards the end of project "Delta", several measurements of collaboration were made. The results were discussed during a team workshop and in management meetings. As the construction manager of the Client commented, "we now collaborate to talk about collaboration"; the team appreciated the opportunity to think about collaboration and its purpose in the project. Collaboration and alignment were also measured in Project "Epsilon". In the execution phase, collaboration measurements were also performed at the level of site crews ('boots

on the ground'; for that purpose, the questionnaire was translated into 17 languages to reach all the workers.

In both projects, the project teams were co-located to facilitate personal communication and promote openness and trust. Functional managers and some of the leads had a counterpart in both projects, so they 'worked in couples' to maximize efficiency and alignment. According to the management of Project "Delta", this project setup enabled collaboration, despite the lack of team-building events.

Joint work activities. A variety of regular project management activities provided ample opportunities for application of collaborative behaviours in both projects. Experience with collaboration in Project "Epsilon" allowed for a 'jump start' of multiple integrative activities in "Delta". The way of conducting daily meetings, workshops, progress reviews, etc. changed from the traditional "client-contractor reporting mode" (E&I Lead, Contractor) to joint problem identification and solving efforts.

Our observations of daily management team meetings showed that some team members were skeptical about the new ways of working in the beginning. However, the appreciation for collaboration grew with time. At first, the team required reminders about the behavioural and procedural rules established for such meetings, for example, the flow of the conversation or time control. People often skipped these meetings or turned up late. After some time, more team members attended, the discussions became more open, and constructive conflicts occurred, signaling openness in expressing genuine opinions. The team also talked about the purpose and the output of these meetings, which often led to adjustments.

Functional team meetings included managers, team leads, and certain team members. These meetings were very important, as they were the platform for translating the collaboration message from leadership to team level. The meetings, in particular in the engineering team (the biggest functional group), went through a

series of scope, topic, and time changes, to adjust to the changing focus and phase of work.

When the scope of collaboration expanded in Project "Epsilon" from two to six parties, more effort was needed to encourage collaborative behaviours. A 'boost' of regular project team meetings, manager site walks, executive meetings and site walks, and team co-location played a role in the team integration speed.

5.4.3. Relational norms and corresponding collaborative behaviours in the two collaborative projects

As relational norms and behaviours are not separable from the actions in which they manifest themselves (Baiden et al., 2006), we connect their discussion to the relevant integrative mechanisms. At the beginning of the collaboration, the team needs to agree on relational norms or expected behaviours. In Project "Epsilon", relational norms were developed through joint discussions about the project charter and the partnership declaration. Project "Delta" borrowed the key values and working principles from "Epsilon". In both cases, these discussions took place at the executive/management level. Table 5.3. shows the relational norms and the governance and administrative mechanisms in which we identified the norms (a full list can be found in Appendix 5C).

Table 5.3. Relational norms and corresponding governance and administration mechanisms

Examples of identified relational norms and related collaborative behaviours	Governance and administration mechanisms in which behaviours manifest
• Executives and managers discuss and agree on the processes and procedures through which collaboration happens. • The project director suggests 'borrowing' working principles from another project – they are adopted and displayed in the mission control room. • Meeting rules and routines are visualized on whiteboards in the mission control room • The team regularly discusses the flow and topics of meetings, and rules are adjusted as needed	Agreed (codified) rules of executive, management, and functional team meetings (duration, flow, topics, behavioural rules)
• The project charter and collaboration declaration are developed jointly with open discussions about each party's values ('things that matter') • The project charter, collaboration declaration, guiding work principles are visualized on whiteboards or posters in the office and on site	Key goals and values codified in the project charter or collaboration declaration

In Project "Delta", there was a focus on regular, daily collaborative behaviours in joint work activities by encouraging people to openly share opinions, give respectful feedback, and express concerns or disagreements. The Contractor project director and functional managers - the champions of collaboration, - demonstrated desired behaviours to the team and encouraged team members to behave collaboratively on daily basis. Emphasis on the behavioural side was placed in every team meeting, either at the functional or management level. With time, the team members learned to behave differently: there was more desire to express opinions, more dialogue, more instances when disagreements were openly discussed and constructively resolved.

A particular focus on respect to every team member was key, potentially because traditional projects without a focus on collaboration do not assume that every team member's input and personality is treated equally. Demonstration of respect acknowledged the contribution of the team members. This was also shown

in the behaviour of the project directors. Whenever they needed to speak to team members, they would walk to their desk, rather than calling them to their office, stressing equality and respect. Appendix 5D shows the full list of identified relational norms and corresponding integrative mechanisms.

Many team members reported that collaboration was relatively easy during the early project phase, calling it collaboration 'honeymoon'. Agreeing on deliverables did not meet any obstacles, and making changes was easy and inexpensive, so a win-win approach was natural, and there were no grounds for tension between individual and mutual interests. However, we still observed variability of behaviours in the team. For example, although functional managers were expected to behave collaboratively (e.g. attend daily management meetings and communicate with the rest of the team), some could not truly adopt the collaborative, relational norms, which led to a lack of collaborative activities or a lack of sharing information within their own group. At the same time, the highly collaborative attitudes of other managers led to a higher number of integrative practices within the team, including informal social gatherings outside work hours.

In Project "Epsilon", managers' behaviours and attitudes towards collaboration also varied. For instance, collaboration was very successful and 'tight' in the safety team, where both the Client and Contractor managers shared collaborative attitudes and showed a high level of agreement about the decisions and management of the team. The attitude of the construction manager was "very knowledgeable and professional, but very old school and arrogant" and he was frequently seen to be "shouting at people". This attitude seriously hindered collaboration in the functional group. "We wanted to collaborate, but he put blocks between us" (construction manager, Contractor). The climate in the functional group quickly changed once this manager was replaced.

In the extended partnering team, attitudes and behaviours also varied. However, although "there was quite some shouting in the room" (site manager, subcontractor J), parties were always able to agree on what was best for the project and were open in admitting there were problems and asking for help. According to the interviewees, the shared financial incentive substantially contributed to collaborative behaviours.

Other support activities positively contributed to behaviours and collaboration. For example, the collaboration coach provided feedback about the team's behaviours and coached them to give respectful feedback. Collaborative consultants engaged in Project "Epsilon" helped the team managers to develop leading and empowering behaviours. Appendix 5D reports the collaborative behaviours and integrative mechanisms in which these behaviours were manifested.

In the next section we discuss how our empirical findings on the roles of integrative mechanisms and relational norms advance the existing literature and offer the project collaboration model to demonstrate the interplay between the two sides of collaboration.

5.5. DISCUSSION AND IMPLICATIONS

5.5.1. Relationship between the three categories of integrative mechanisms

The chosen integrative mechanisms are unique in every collaborative project, as they are tied to the purpose and context of partnering (Bresnen and Marshall, 2002; Eriksson, 2010). Our data shows that even if these integrative mechanisms are borrowed from another collaborative project, they will change over time to meet the requirements of a particular team. Moreover, we also confirm that integrative mechanisms are dynamic and evolve with the needs and experience of the

collaborating team (Bygballe et al., 2015; Hietajärvi et al., 2017). This dynamic can relate to the evolution of the ways daily joint work activities are executed (such as the frequency or duration of team meetings), or to the set of collaboration development mechanisms put in place (for instance, engagement of consultants if collaboration needs extra support) .

As demonstrated by our data, the integrative mechanisms can be classified into three categories based on their role in the collaboration process. These categories also seem to be connected in a particular 'hierarchical' way. The first category, governance and administration, forms a framework of processes and procedures of collaboration (Thomson and Perry, 2006). This framework is often developed in the partnering workshops early in the collaborative project (Eriksson, 2010; Bayliss et al., 2004) or in team events during its course. In this way, the second category - mechanisms aimed to support collaboration - provides a platform for creating collaboration 'rules'. Other elements in this category allow the team to practice collaborative behaviours or enable daily collaboration through co-location. Overall, they bridge the translation of the agreed rules and norms into team routines in practice (Bygballe and Swärd, 2019). The third category of daily collaboration practices - joint work activities - creates a feedback loop to the governance and administration level and signals a need for a change in the rules. For instance, over time, collaborative daily management activities can become redundant or need to be redesigned to suit the team's evolving needs. Struggles in the daily joint work activities can also signal that more activities aimed to support collaboration are needed - thus connecting to and influencing activities in the second category of integrative mechanisms.

5.5.2. Governance and administration mechanisms and their link to relational norms

At the beginning of a collaborative project, the team needs to establish rules and procedures, define the roles and responsibilities of parties and various management actions (Thomson et al., 2009). The team also has to negotiate the relational norms to ensure that all team members have a similar understanding of what collaboration means for that particular project (Bresnen and Marshall, 2002; Thomson and Perry, 2006; Eriksson, 2010).

The level of formalization and codification of these rules and norms may be positively associated with the team size and the scope of collaboration. The more parties that participate in the collaboration, the more likely the potentially divergent cultures and processes need to be aligned formally (Matinheikki et al., 2016). Our data confirms prior findings that the level of codification may be negatively correlated to the level of collaborative team experience. The experienced team in Project "Delta", in which some members had a common collaborative experience, required less effort to establish rules and procedures to collaborate (Bygballe et al., 2015). Thompson and Sanders (1998) and Eykelenboom (2018) stress the importance of codifying the relational norms in a project charter or declaration of collaboration. Such a document signed by all participants signals alignment and agreement about the key principles and goals of collaboration and provides the highest 'philosophical' level of agreement (Bygballe and Swärd, 2019).

Furthermore, it is necessary to align the relational norms and established processes and procedures of collaboration. For instance, if one of the relational norms relates to openness and sharing information, channels through which information is discussed need to be available for the team (e.g. project information in the mission control room, regular joint meetings to support openness and the ability to share information). At this level, the team creates the highest level of

understanding of what collaboration means and how it will happen (Bygballe and Swärd, 2019). Negotiated relational norms are part of the larger set of agreed rules, processes, and procedures about the collaboration. The relational and managerial sides need to be established in parallel, as this is vital for their alignment and harmonization. At the beginning of the collaboration, both established processes, procedures, and norms signal intended, future collaborative actions, and expected behaviours (Thomson et al., 2009). Taken together, this is the level of the *rules* of collaboration in the project collaboration model (see Figure 5.2. below).

5.5.3. Mechanisms that support collaboration and their link to and relational norms

Prior research shows that not all projects practice team building activities (Dewulf and Kadefors, 2012), although Bygballe and Swärd (2019) discuss such routines as workshops and co-location as typical partnering practices. There is no agreement in the literature about whether these are core or optional integrative mechanisms. Eriksson (2010) suggests that start-up partnering workshops, follow-up workshops, and team-building events constitute the core collaborative tools. Bayliss et al. (2004) also state that regular collaborative workshops are important for collaboration success. However, Yeung et al. (2012) report that facilitated workshops and continuous collaboration improvement are non-essential.

We find that support mechanisms have a distinct and important role as enabler of collaboration. They may vary in scope, intensity (frequency), complexity, cost, and effect. The choice of these mechanisms seems to relate to several aspects. First, a general perception of their importance and need for them (Dewulf and Kadefors, 2012). Second, big team-level events that are costly and complex to organize may depend on budget and time pressure (Bayliss et al., 2004). Thirdly, the collaboration experience of the team: if the key team members (functional

managers, project directors) share a collaborative past, fewer alignment mechanisms are needed (Bygballe et al., 2015).

Initially, alignment workshops at the executive and management level, especially with external facilitators, can help the team agree on collaboration objectives and rules (Hietajärvi et al., 2017). However, team members need to learn how to collaborate and support mechanisms provide a platform for this purpose. They help to translate negotiated relational norms into real behaviours by exposing team members to collaborative practices, making them reflect on collaboration (in collaboration measurement undertakings), or simply providing opportunities for their joint cooperation and communication through co-location or availability of counterparts.

Co-location is an effective collaboration enabler, as it creates an opportunity and desire for open and more intense communication (Bygballe and Swärd, 2019; Bresnen and Marshall, 2012) and the development of personal relationships. Even if other team building events and techniques are absent, co-location creates a "[…] close social context [that] allowed for personal relationships and joint understanding to emerge without explicit team-building or other partnering measures" (Dewulf and Kadefors, 2012, p. 247). Our findings confirm that co-location facilitates direct communication and develops trustful relationships. It was especially appreciated when the collaboration scope expanded: being close and discussing all the questions and issues results in more effective teamwork. In both projects, the teams had dedicated space for their meetings where key project information and behavioural principles were displayed, encouraging open communication and transparency.

The use of incentives in partnering can be an important way of reinforcing collaboration in the short term and helping to build trust between clients and contractors in the long term. In our study, incentivization was applied when the

scope of the collaboration in Project "Epsilon" expanded, and the behaviours and actions of multiple parties had to be aligned quickly and efficiently. Incentivization was a key driver in the team's effort to change from traditional to collaborative behaviours. Yet, incentivization remains a controversial subject in research and practice. It is not recognized as an essential element of collaboration (Tang et al., 2008; Yeung et al., 2012), but can create common goals (Anvuur and Kumarasmamy, 2007). However, if it is not designed and managed properly, it can drive collaborative relationships in the wrong direction.

In sum, the second category of integrative mechanisms plays an important role in providing an opportunity for the team to focus and reflect on the importance of collaboration and develop collaborative behaviours. In essence, it is the enabler of collaboration (Bresnen and Marshall, 2002) or level of *practice* of collaborative relationships in the project collaboration model (Figure 5.2.).

5.5.4. Joint work activities and their link to relational norms

Collaboration does not replace solid project management, but transforms it (Eykelenboom, 2018). The regular exercise or practical collaborative routines is extremely important (Bygballe and Swärd, 2019). Yet, the intention to execute daily work activities together with a partner (e.g. conducting daily planning meetings together) does not by default make them integrative mechanisms; applying collaborative behaviours within them does.

Our study shows that any project management activity may become an integrative mechanism if collaborative behaviours are present in it. Regular joint work activities create the strongest and the most recurring links: they provide an opportunity to exercise collaborative behaviours (Jacobsson and Roth, 2014) and develop personal relationships for all team members without limitation to the management level. At this level, the role of functional managers as 'translators' of

collaboration from the top level to the team is very important. Our data shows that when managers do not behave collaboratively, their teams cannot collaborate either. In these cases, replacing non-collaborative managers is the right decision (Bresnen and Marshall, 2002; Bygballe and Swärd, 2019).

The role of joint work activities is crucial. If agreed relational norms and corresponding collaborative behaviours are not pursued in regular project management activities, collaboration remains an abstract intention on paper (Ruijter et al., 2020). However, if appropriate behaviours are exercised daily in multiple joint work activities, over time, the agreed relational norms become adopted and 'lived by' norms of the team, leading to a real, fundamental change of behaviours (Baiden et al., 2006). Thus, this is the level of the *implementation* of collaboration in the model of project collaboration (Figure 5.2.).

5.5.5. Collaboration in the project environment - interplay of integrative mechanisms and relational norms

Splitting the integrative mechanisms of project collaboration into three distinct categories allows us to uncover their overall role in more detail and to make a step forward towards understanding the nature of their interplay with the relational side. The three categories of integrative mechanisms – Governance & administration, Support, Joint work activities - provide an arena for relational norms to be agreed, and for collaborative behaviours to be practiced and applied. The relational norms and collaborative behaviours, in their turn, change the way the traditional project work is executed, making joint work activities truly integrative. Thus, we view the two sides of collaboration as complementary. Both need to be considered for project collaboration to be properly understood but, above all, to happen.

The managerial and behavioural sides of collaboration are indeed different. We confirm the existing opinions that it is possible to design and 'engineer' a set of

collaborative practices and tools. However, it is impossible to 'force' collaboration (Bresnen, 2009), as people need to accept it voluntarily and need time to embrace it (Eykelenboom, 2018). Given the complementary nature of both sides, project collaboration understood holistically is neither 'engineered' nor 'emergent'. For a complete understanding of the process of collaboration (Thomson et al., 2009), we need to take into account the complementarity of its sides and understand its unique features and dynamics. Below we present the model of the project collaboration that shows the interplay of integrative mechanisms and relational norms.

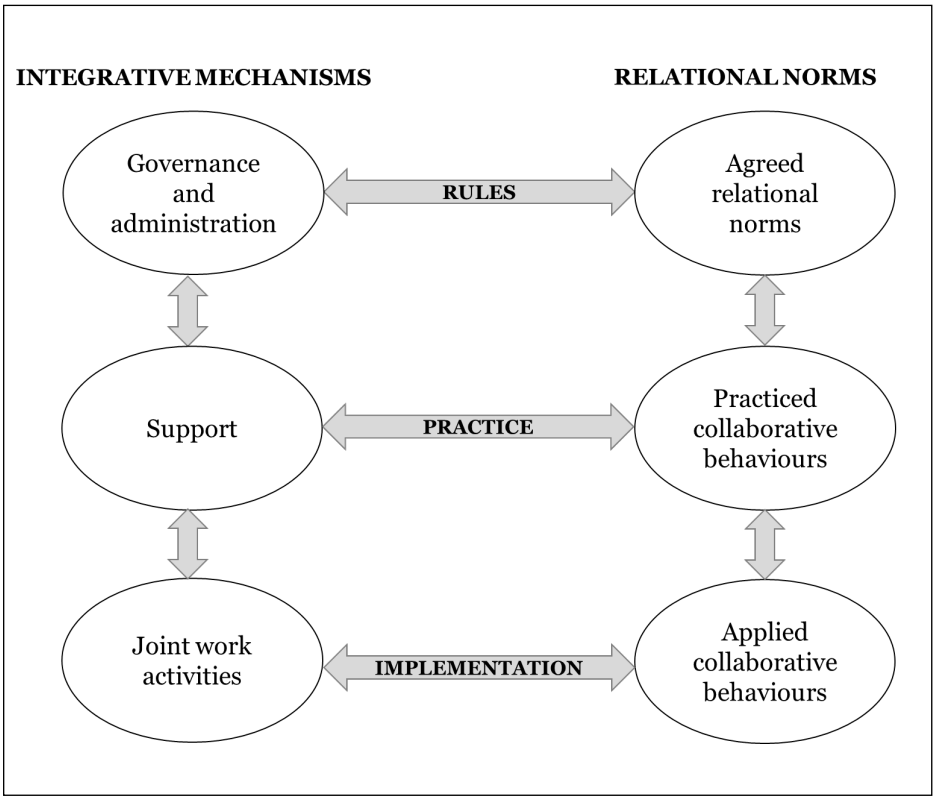

Figure 5.2. Interplay between integrative mechanisms and relational norms in project collaboration

5.6. CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

5.6.1. Theoretical contributions

Our research adds to the body of literature that views project collaboration or project partnering as an approach not limited to a particular project delivery strategy but as a set of relational norms and management activities that lead to team integration and the maximization of its potential (Eriksson, 2010).

So far, scientific studies about the interplay between the two sides of collaboration have been inconclusive. The literature suggests a 'support' role of the managerial, formal side of collaboration to the evolving social exchange through which collaboration truly happens (Bresnen, 2009) and finds that the interplay is context-specific (Bygballe et al., 2015). In this empirical study, we uncover the roles of both categories of collaborative elements and the nature of their relationship. We find that context-specific integrative mechanisms can be classified into three categories according to their role in the collaboration: 1) Governance and administration 2) Support 3) Joint work activities. We also clarify how relational norms and behaviours are related to each of the three categories of integrative mechanisms. In this way we advance collaboration theory by proposing a more complete and at the same time fine-grained view on collaboration in a project environment.

5.6.2. Managerial contributions

This study provides insights for project organizations on how to approach collaboration design and management. We highlight the importance of paying equal attention to the formal (integrative mechanisms) and behavioural (relational) norms of partnering and aligning both sides. The set of integrative mechanisms and the number and wording of relational norms will always be unique for every project

and is likely to change as collaboration evolves. However, understanding that integrative mechanisms play different roles allows investing effort in each of the categories proportional to the team's needs. For collaboration to really happen, it is not sufficient to establish its rules and conduct collaboration development events. Collaboration has to be practiced on a daily basis in all project management activities. Applying collaborative behaviours in these activities is what makes collaboration 'real'.

The role of functional managers is crucial in translating negotiated expected behaviours into truly collaborative behaviours of every team member; collaborative leaders at the top project level cannot do this alone. If key managers do not demonstrate the required collaborative behaviours and acceptance of negotiated norms, they may have to be replaced.

5.6.3. Limitations and future research directions

The data in our study originates from a rather small number of collaborative projects involving the same organization. While the findings may be generalizable to the project settings in different industries, replication studies would be needed in other empirical settings to enrich or challenge our findings.

The collaborative projects that we studied represent an example of ad hoc, non-prepared collaboration. Studying the interplay of integrative mechanisms and relational norms in a context of 'formal', contractual collaborative strategies with parties selected based on their collaborative capabilities, may demonstrate specific features that we have not been able to uncover. Finally, while the project team is a very suitable level of analysis in studies of the project collaboration, changing the level to individual or organizational will likely bring additional insights into our proposed model of the interplay between integrative mechanisms and relational norms in collaborative projects.

5.7. APPENDICES

Appendix 5A. List of interviewees

Project "Delta" (26 interviews in total)

Role in the project and total number of interviews	**Project directors** 2 interviewees 3 interviews	**Quality** 1 interviewee 2 interviews	**Design** 2 interviewees 2 interviews	**Engineering & Safety** 10 interviewees 10 interviews	**Construction** 3 interviewees 3 interviews	**Procurement/ contracting** 2 interviewees 2 interviews	**Project controls** 3 interviewees 3 interviews
Client 9 interviews	Project director 1 hr F2F	No quality representative in the team yet	Design manager 55 m F2F	Engineering manager 1 hr F2F Lead, civil 1 hr 10 m F2F Safety manager 50 m F2F	Construction manager 1 hr F2F Site manager 1 hr 30 m F2F	Procurement manager 45 m F2F	Project controls manager 50 m FTF
Contractor 16 interviews	Project director 2 hrs 1 hr 20 m Both interviews F2F	Quality manager 1 hr 50 m Both interviews F2F	Design manager 1 hr 10 m F2F	Engineering manager 1 hr 30 m F2F Lead, civil 1 hr F2F Lead, mechanical 1 hr F2F Lead, piping 1 hr 15 m F2F Lead, electrical 1 hr 10 m F2F Lead, instrumentation 50 m F2F Lead, safety 1 hr 15 m F2F	Construction manager 2 hrs F2F	Contracts manager 1 hr F2F	Project controls manager 1 hr F2F Lead, scheduling 1 hr F2F

+1 interview 50 mins F2F with the collaboration/lean coach who worked with the team

Project "Epsilon" II (37 interviews in total)

Role in the project and total number of interviews	**Project director /site manager** 7 interviewers 9 interviews	**Quality** 1 interviewee 1 interview	**Safety** 1 interviewee 1 interview	**Engineering** 5 interviewees 5 interviews	**Construction** 4 interviewees 4 interviews	**Procurement/ contracting** 4 interviewees 7 interviews	**Project controls** 2 interviewees 2 interviews
Client 5 interviews	Project manager 1 hr phone Deputy project manager 1 hr phone	*No manager, function was outsourced*	*Manager not available*	*Manager retired*	Construction/site manager 1 hr 40 m phone	Procurement & contracts manager 1 hr phone, 30 m phone	*Manager on long-term leave*
Contractor 21 interviews	Project director 3 interviews x ~1 hr F2F Deputy project director 1 hr 20 m FTF	Quality manager- 1.5 hrs F2F	Safety manager 1 hr phone	Engineering manager 1 hr 30 m F2F Engineering manager 1 hr 10 m F2F Lead, electrical 1 hr F2F Lead, civil 1 hr 15 m F2F Lead, piping 50 m F2F	Site manager 1.5 hrs F2F Modular yard manager 1 hr phone Construction manager 1 hr 10 m phone	Contracts manager 3 interviews x ~ 1 hr F2F Contract engineer 1 hr F2F Project material manager 1 hr 30 m F2F	Project controls manager 1 hr 30 m F2F Senior estimator 1 hr F2F
Subcontractor H 2 interviews	Project executive 1 hr phone Site manager 1 hr phone						
Subcontractor I 2 interviews	Project executive 1 hr phone Site manager 1 hr phone						
Subcontractor J 2 interviews	Project executive 1 hr 15 m phone Site manager 1.5 hrs F2F						

+ 3 interviews with consultants (1 hr 15 m phone, 1 hr phone; 1,5 hours F2F); 2 - with student researchers (phone, ~1 hr)

Appendix 5B. Integrative mechanisms identified in the collaborative projects (full list) - based on observations, interviews and analysis of the project documentation

Project "Delta"	Project "Epsilon"
Governance and administration	
• Agreed rules of conducting daily management and functional team meetings (time, duration, order of flow, behavioural rules) • Key project principles adopted from another collaborative project; not formalized but visualized in the project team meeting room • Project team org chart available for all team members (shows counterparts, names and people's pictures)	• Team charter • Collaboration (partnership) declaration signed by all partnership participants • Agreed rules about conducting meetings (see Initiative I) • Agreed rules about frequency and content of executive meetings • Agreed rules about management and executive site walks
Development, maintenance, and improvement of collaboration	
• Collaboration measurement tool to capture collaborative 'moods' in the team (towards the end of the phase), collaboration KPIs and discussions • Liked-Learned session • Collaboration coach (temporary) for the team to conduct effective collaborative meetings • One 'new wave' team meeting at introduction of collaboration approach • Informal social gatherings in the functional groups • Team co-location in the Contractor's office (2-3 days a week) • Counterparts for (almost) most team members (lead and manager level) • One 'mission control room' for team meetings with project information (visual materials)	• Coaching sessions (team and individual) with collaboration consultants • Observation and feedback on work meetings by collaboration consultants • Alignment sessions for executives and managers • Team building events (social) • Team recognition program • Collaboration measurement and improvement efforts • Capturing project experiences on collaboration • Alignment sessions (partnership declaration development) and team building for all partnership executives and managers • Team co-location (same office floor, different offices) and shared offices for some disciplines (e.g. safety and process) • Counterparts for team members (lead and manager level) • One "mission control room" for team meetings with project information (visual materials) • One shared incentive agreement and gift vouchers for the boots on the ground workers

Joint work activities	
• Daily meetings. Engineering team – twice weekly internal meetings, twice weekly with counterparts). Designer team – daily with counterpart teams, daily with management team. If managers are not present, team leads replace them) • Joint workshops (engineering, constructability, etc.) • Progress reviews with extended number of team members (not only managers)	• Joint workshops (engineering, construction, etc.) - multifunctional • Weekly function reviews include client (process, safety, engineering) • Integrated safety team: one organigram, chart, one safety program, joint safety meetings, etc. • Daily planning meetings • Weekly collaborative management reviews • Bi-weekly executive meetings and site walks • Managers take a daily morning walk on site

Appendix 5C. Data extracts supporting relational norms

Relational norms (attitudes) *Quotes from the studied do Project charter and Collaboration declaration*	**Collaborative behaviours in which relational norms manifest** *Based on the observations and interviews*
Commitment We honour our commitment/word and recognize its value for the team. We demonstrate learning through action inside a 24-hour performance cycle. Being responsible matters. We are delivering something difficult; the faster we recognize failures and recover, the sooner we succeed.	• The project director and functional managers talk about 'doing it together' in meetings and townhalls, act openly and collaboratively, walk across the project floor, keep their office doors open, and ask if any help is needed. • In the execution phase, project managers from all collaborating companies walk the site to check performance, safety, etc. All managers can comment on unsafe behaviours of any workers, regardless of the company they work for. • The team sticks to joint actions and problem solving in situations where things do not go as planned – e.g. when the client announces tender for the next phase, the team continues to work with the counterparts, daily meetings, etc. to deliver the design, schedule, and cost estimate. If one of the parties underperforms in the coalition, all managers discuss what can be adjusted in their work and what extra resources can be brought in to help this subcontractor. • All executives meet and visit the project site regularly. Each company executive visits the site regularly and explains what behavioural changes are needed and why – talking to managers, supervisors, and blue-collar workers.
Win-win philosophy We act for what works best for the project. There is no individual success without the team succeeding as a whole. We do what is best for the project. We are aligned in our common goal. We are fair and reasonable.	• The team discusses how possible solutions affect each other's work; solutions that harm some of the team members are discarded. • Executive teams daily discuss work plans, identify conflicts and discuss priorities and adjustments; those who 'lose' today accept it and do not insist on continuing their own work. • Managers help each other, "no blame" approach. Subcontractors offer each other available equipment and suggest bringing additional people to staff up an underperforming contractor. • When the problem is identified, there is no discussion about who is guilty. The focus is on how to solve it and who can do what to fix the issue. • Resources, e.g. equipment, can be shared among the collaborating parties.

	• Team members agree to adjust work plans to optimize overall work, even if there is short term compromise for one of the participants. • The team discusses solutions and ways to help underperforming parties and find ways to save overall performance.
Shared vision and values We function as One Team with One Brain.	• Project charter and coalition declaration are discussed together. Suggested wording from team members is recorded and combined in one document. • Core values and what they mean for the project are discussed in team meetings. • Project directors and managers talk about goals and project principles regularly, also in team meetings. • Safety mission is strictly followed. If any team members observe unsafe behaviours, they stop work, even if it is the crew from another collaborating party, and even if it puts performance/schedule at risk.
Transparency (openness) We operate from trust, openness of mind, and willingness to listen. When in doubt, we speak so that problems surface early. Feedback from others says how open and trusted I am. Silence is the least helpful contribution we can make. The only stupid question is the one not asked.	• Providing information about project progress, risks, and deliverables available to all team members (charts in meeting rooms, weekly memo updates, etc.). • Sharing reasonably "sensitive" information shows openness (e.g. information from previous projects that can be valuable for the current). • Communicating face-to-face: team members walk to each other, instead of using email or phone. • Communicating frequently with counterparts to align on all steps. • Providing feedback constructively and respectfully if something goes wrong. • Having time for your counterpart and team members. • An 'open-door approach' by the project directors and functional managers.
Trust We operate in trust, openness of mind, and willingness to listen. The feedback from others says how open and trusted I am. I will restore the trust and openness that my actions may have eroded. We honour our commitment/word and recognize its value for the team.	• Counterparts share 'reasonably confidential information' e.g. related to relevant experiences from other projects with different counterparts, regarding traditionally sensitive subjects such as price or proprietary drawings. • Functional managers empower leads to make decisions and work with their counterparts, without overcontrolling. • In the team meetings, people who promised something say that they may not deliver it on time, and then a new commitment is jointly agreed. •

Respect We care about the well-being of every team member. We care about everyone on the project. We operate in trust, openness of mind, and willingness to listen. We are respectful and known for generous acts of collaboration.	• Treating everyone equally. Every person and job is important for the project. No hierarchy. Project directors and functional managers have an open-door policy, walk on the project floor to talk casually to any team members. • Everybody has the right to voice their own ideas, thoughts, and concerns; one person talks at a time, everybody listens. • "Thank you" is regularly said for good work. Contributions are recognized and celebrated in weekly meetings, newsletters, etc. • Managers try to understand and accommodate different cultures (e.g. Asia, Europe). • People arrive at meetings on time and keep to the time schedule. Volunteer timekeeper gives notice of how much time is left, and meetings end on time.

Appendix 5D. Relational norms and corresponding integrative mechanisms (Support and Joint work activities)

(Based on observations, interviews and analysis of project documentation)

Examples of relational norms and related collaborative behaviours	Support mechanisms
• The team was clearly interested to see the results and discussed them formally and informally. • Work crews also evaluate collaboration. The questionnaires were translated into 16 languages. • "We collaborate about collaboration" (Construction manager, Client) – about the discussion of collaboration measurement results in a dedicated team session.	Collaboration performance evaluations
• The team discussed what was done right and openly reflected on what it could have done better. Participation was voluntary, but all key managers from the Client and Contractor were present at the meeting. Feeling of a fair discussion and openness, focus on what can be learned for the future, what will be accepted as a good idea, and what needs to change in the next collaborations.	Lessons learned session about collaboration
• "I think you can coach people to collaborate. Probably some will need more push than others, as we're very different. Some are introvert and not in the comfort zone. But you can coach this to a certain extent. "Coaching can help to get people to open up.") (Engineering manager, Client)	Collaboration coaches and facilitators for leadership/management team
• "It was important to have a break and to speak about collaborating and aligning goals. Sometimes it was difficult to make time for that, and not everybody was always willing. People were complaining about aligning and aligning… but it matters when some big decisions about the project course need to be made. And I think [consultants] were really useful by steering us through these discussions, although in the end, it's of course up to people… […] and it's also an opportunity to talk to each other outside the usual office walls." (Construction/site manager, Client)	Facilitated leadership team alignment sessions
• "It was nice to get out and do something fun with the other people outside work. [name'] had an idea to build a kite in teams, and it was great, and we were also working in these teams with people that we don't work with regularly in the project, so it was good fun, and you also see quite some personalities in such competitions," (Materials manager, Client) •	Team building events organized in the project for the whole team

• A shared incentive (targeted on completion date) applied when collaboration scope extended to six parties to support the required change of behaviours and helping others. • "We all acted as partners for the benefit of the project, but also because we felt comfortable in taking decisions that required a big investment. We were aware of a clear completion scheme that granted a big prize to us." (Executive, subcontractor I) • "I think incentive was a critical factor. It wouldn't have worked without it. I personally know [Contractor project director, name], so if he asks me to help, I'll help him. But why would I help someone I don't know? Then the result would purely depend on relationships." (Executive, subcontractor H)	Shared incentive
• Any team member can nominate any other team member, regardless of which organization they belong to. The jury (joint and rotating) decides on the awards. • "It was like small weekly celebrations of achievements and good working. We received minimal rewards, but the recognition itself was important. Everybody could nominate anyone and we as the jury could decide who deserved the reward each week. It was an easy way to boost the team spirit. […] We have these programs available, but for whatever reason, they are rarely used, but you see that they do make a huge difference in the atmosphere." (Project deputy director, Contractor)	Team recognition program
• Introduced to support a behavioural change to 'helping each other' in the work crews. Store vouchers are given monthly to the most collaborative workers nominated by the supervisors. Posters describing behaviours are put on the site to explain which behaviours are rewarded. • "Craft recognition program was a key element. There are various levels of people. and not everybody has the right mindset to enter into a different game, especially foremen and workers. They may not understand and care until you show that their commitment is rewarded." (Executive, subcontractor I)	Crafts (boots on the ground) recognition program
• Four sessions were held with the subcontractor executives and managers to jointly develop the partnership principles and declaration. 'Things that matter' discussion on what was important for each party in the partnership. Organigram, roles, and responsibilities were discussed to ensure a bottom-up process of the partnership development.	Collaboration development workshops
• Active socialization - team members regularly chat about personal matters (discussing weekends, tips about vacation destinations, children, etc.). Team members go for coffee and lunches together.	Team co-location

• "When I'm at the office, I see people smiling - they like working on this project. And when I need an answer, I easily get it, I think we can work together very well." (Construction manager, Client) • "Last week I had some questions to [name], and instead of sending an email I asked him, and he went to the leads and the question was solved. It's more efficient. If you have a distance, then it becomes formal. The problem is always if you go formal with these kinds of documents, they are easily misinterpreted. During the discussions, you can always correct and explain what you mean." (Engineering manager, Client)	
• Dedicated room space and whiteboards provide an easy start to meetings; Teams can see where they left the discussion the previous time. • The room is used very extensively both for scheduled and ad-hoc meetings and team celebrations. • Key information about the project (plans, progress, etc.) is available in the room, and sometimes team members go there to consult materials.	One 'mission control room' with the project information (plans, progress, risks, etc.) for the team meetings
• "I'm very satisfied about working with [name]. I think we managed to build trust and a good relationship from the beginning. For example, in the beginning I showed him what we had done with other clients so that he could review this and provide feedback to me in terms of level of detail and if that was sufficient. I think this created a feeling of openness that's very important." (Lead engineer, Contractor) • "When you don't have a counterpart or if he arrives late, I think it creates a big risk of rework. Because you may think that you're doing the right thing, but then the person comes on board and he doesn't like it, and you have to start over." (Lead engineer, Contractor)	Counterparts for directors, managers and (some) leads
Examples of relational norms and collaborative behaviours	**Joint work activities**
• Project director and functional managers talk about 'doing it together' in meetings and on the project floor "Well, you have to constantly mention and explain to people that you have expectations, that you raise expectations about their behaviours. You have to focus on the behaviour of people." (Engineering manager, Client) • The volunteer meeting moderator chooses one of the guiding principles on the whiteboard and the team discusses what it means and how it reflects in the work. This is done at all management and functional team meetings.	Regular (daily, several times a week, or weekly) management team and functional group meetings

• Posters with project charter and guiding work principles are on the whiteboards. If any of these principles are violated (e.g. not listening to someone speaking), the meeting moderator points this out. • Team members attend these meetings, They are on time, speak openly and give feedback. • The team discusses potential risks and what they mean, and openly share information about problems, focusing on solutions. • Conflicts are constructive. When voices are raised, the moderator intervenes and resolves the conflict). • The team discusses the content and frequency of such meetings, leading to their redesign. • The team sticks to joint actions and problem solving in situations where things do not go as planned – e.g. when the client announces tender for the next phase, the team continues to work with the counterparts, daily meetings, etc. to deliver the design, schedule, and cost estimate. If one of the parties is underperforming, all managers discuss what can be adjusted in their work and what extra resources can be brought in to help this subcontractor. • Teams discuss how possible solutions affect each other's work; solutions that harm some of the team members are discarded. Regular lunch and learn (informal) and 'all hands' safety meetings with all representatives on site to strengthen team thinking about safety.	
• Bi-weekly joint meetings on site. All executives dedicate time to the project. • Executive bi-weekly meetings include site walks to show working together principles and practices to workers. • Executives regularly explain to their team what behavioural changes are needed and why – talking to managers, supervisors, and site workers. Sometimes a peer from another organization joins in to show how helping each other works. "I had about eight to twelve meetings with all crews explaining what partnership is. For them it was new and they had to change their attitude. The crew was very suspicious. So how do I convince them? I was there once or twice a week, talking to the foremen, our crews, and management. I think they trust me. Trust is very important. If you're not on site it doesn't work. I was on site very often." (Executive, subcontractor H)	Regular executive team meetings and executive visits to site
• Team representatives (Client and Contractor) go on regular safety walks to demonstrate that safety is a joint value. As the partnership develops, these walks include managers from other organizations. Any manager can comment about safety to any worker, regardless of the organizations they work for.	Joint site walks of management and executive team

• After the partnership is set up, managers jointly walk the site every morning to check progress, talk about issues, talk to workers. "The rule is no meetings before ten o'clock. We go to the site together and first find out what is going on with our own eyes." (Site manager, subcontractor J)	
• Progress reviews are focused on problem-solving and risk analysis, not on identifying who is guilty for delays "Traditionally, you'd hear who was responsible for the trouble. The client would be demanding and asking questions and the contractor would be explaining and reporting." (Engineering lead, Contractor) • More team members are present at progress reviews. They can all ask questions and answer within their responsibility – this is not left to managers only. • Workshops are multifunctional. For example, all teams are present at procurement workshops so that they become aware of procurement strategies and can ask questions, suggest improvements, and raise their needs. • Joint safety presentation during the selection of subcontractors. ("From my perspective, subcontractors could not tell which of us was [Client] or [Contractor], so it gave them the message that safety is really a team priority." (Safety manager, Contractor) • "We present the project to the executives of our main suppliers together. We introduce ourselves as the project team and do not say who we are - [Client] or [Contractor]." (Deputy project manager, Client)	Joint workshops (engineering, constructability, procurement), presentations, and progress reviews
• The safety team comprises Client and Contractor representatives, without duplication of roles (except two managers). • Safety is implemented so that everybody cares about their own safety and the safety of others. • When a safety incident is reported, the team investigates it jointly (not as representatives of various organizations). • Monthly safety performance celebrations are held and include all subcontractors. • To ensure safety is everybody's value, a joint safety (workers) leadership group (including all participating organizations) identifying areas that need attention (e.g. fire awareness) and develops actions together with managers.	Integrated safety team (one org chart, one safety program, joint meetings, and presentations)

6. GENERAL CONCLUSION

Complex projects involve multiple parties whose diverging interests and motivations need to be aligned on the desired outcome (Artto et al., 2016). This dissertation includes studies about various aspects of the interorganizational governance in the construction projects, with the ultimate goal to advance theoretical understanding of how contracts and collaborative relationships can become more effective alignment mechanisms in project supply chains.

The dissertation focuses on three research gaps: 1) what motivates parties to accept a highly uncertain multi-party performance-based contract, 2) how organizations can improve the initial contracts and learn to contract during lengthy projects, and 3) what is the relationship between managerial (formal) and relational (behavioural) sides of collaboration between the project parties.

This research primarily contributes to the PSM literature and is one of the few studies performed in the context of complex project settings. It is also of relevance for the PM research due to its empirical setting and its investigation of collaboration in project teams. In all the empirical studies in this dissertation, I draw from the management and organizational literature, which have developed a vast body of knowledge on interorganizational governance. Thus, this dissertation may also provide a ground for reflection for scholars in these two disciplines.

6.1. THEORETICAL IMPLICATIONS

My literature review demonstrates that PSM research has paid very little attention to the contract strategies in the construction sector. However, the role of the contracts in the sector is vital due to the high levels of outsourcing and strong reliance on contractual governance in the industry. It also signals interest in performance-based contracts, which often involve multiple parties but are generally

studied at the dyad level. Research has mainly investigated contract design or outcomes (performance) but has not examined the contract management phase and has not applied longitudinal research strategies. Thus, the findings of my literature review in Chapter 2 justify the focus of this dissertation on the chosen empirical setting and indicate gaps and potential research questions for the empirical projects.

Addressing the first research gap – the lack of theoretical explanation of multi-party PBCs - this dissertation advances theory on performance-based contracts in several ways. It connects the adoption of PBCs to a fine-grained understanding of interdependence in the supply chain. The findings show that PBCs are particularly applicable in situations when parties are reciprocally interdependent in the outcome creation. In this case, the contract business model mirrors the existing technical dependencies. Multi-party PBCs can reduce the buyer's effort and cost to coordinate this complex interdependency that requires constant dynamic adjustment among involved parties (Thompson, 2003). This study also introduces motivational theories into PBC research, particularly Expectancy theory (Vroom, 1964; Rose and Manley, 2011). It offers a detailed understanding of supplier motivation by the reward offered, and this way complements Agency theory, which relates the applicability of PBCs to the characteristics of the task (Eisenhardt, 1989).

PBCs are viewed as contracts that align buyers' and suppliers' interests and thus mitigate suppliers' opportunistic behaviours (Nullmeier, 2019). Uncovering what motivates suppliers to accept a particular contract can help us understand the importance of buyer's actions and behaviours in the contract design phase for the prevention of parties' future undesired behaviours. Both improved clarity about supply chain interdependence and motivational theories could be valuable for PBC research in dyad or triad settings. This approach can also be extended to studies of other types of contracts, as any reward is an extrinsic financial motivator (Kadefors,

2004). For instance, it can help understand how contractors can be appropriately motivated under 'traditional' cost-reimbursable and fixed-price agreements in the construction sector, as these contracts are notoriously known for misaligning client and contractor goals (Berends, 2007).

This dissertation also develops theory about how contracts can be improved in a lengthy exchange. It shifts from discussing a particular type of contract in Chapter 3 to a higher-level discussion about contract design and management in Chapter 4 (although by default, it applies to PBCs) and shows when and how contracts can be renegotiated. This research offers an integrated theoretical framework and an extended definition of the learning to contract phenomenon. It demonstrates which gaps exist in the knowledge about its key constructs and the relationships among them. It also adopts a dynamic view on contracting (Van der Valk et al. , 2020) and a longitudinal research strategy, and builds theory about the process of intra-contract learning that happens within the contract implementation phase. In this way the dissertation complements the existing knowledge about learning to contract in between transactions.

Studying learning to contract by looking at changes to texts from one transaction to another limits potential insights, particularly the possibility of uncovering specific roles and relationships between the key theoretical constructs (objects, mechanisms, and moments of learning). Looking at the process dynamically, I demonstrate that learning about contracts follows learning about transactions and parties. The understanding that contract revisions may be the results of adaptations rather than learnings may challenge prior findings of learning to contract, especially if the process of contract revisions is slow and incremental (Mayer and Argyres, 2004).

Studies of contract design view the effect of learning as a change in contract provisions over time. Thus, this literature implicitly considers that learning is in the

shift in a range of behaviours (Huber, 1991), as it is unknown which of the contract clauses will be enforced in the future. Looking at learning to contract within the contract implementation phase indicates that the effect of learning shall be understood as an actual, accomplished change in the parties' behaviours (Argyris, 1977; Argyris and Schön, 1997), rather than mere changes in the contract texts. Insufficient or wrong learning (Huber, 1991) leads to the repetition of the learning cycle within the transaction (Doz, 1996). Thus, this study raises the question of how learning to contract should be operationalized and measured as a general phenomenon.

The management and implementation phase of the contract and understanding how this can be improved to continue serving as effective alignment mechanism is relevant for PSM research. This dissertation, however, may also be useful for organizational and management researchers, as it provides a synthesis of rather fragmented knowledge on the learning to contract phenomenon and offers opportunities for new studies.

This dissertation also contributes to understanding the process of project collaboration by exploring the role of and interplay between two categories of collaborative elements: integrative mechanisms and relational norms. Integrative 'engineered' mechanisms (Bresnen, 2009) create a framework of processes, procedures, and events across which collaboration occurs. Agreed relational norms and 'emergent' collaborative behaviours (Bresnen, 2009) exercised within this framework transform traditional project management activities into integrative ones. Thus, these two categories complement each other in the dynamic and complex process of collaboration. This study focuses on informal, non-contractual collaboration, often labelled as a 'partnering approach'.

The existing definitions, frameworks, and models of collaboration in the project management literature tend to be descriptive and include long lists of

identified success factors, antecedents, elements, etc. At the same time, a view on project collaboration as a deeply contextual phenomenon (Bresnen and Marshall, 2002) leads to inconsistency in understanding what the essential elements of collaboration are (Yeung et al., 2012; Eriksson, 2010). Chapter 5 builds on existing research and extends the search for knowledge beyond the project management literature (Thomson and Perry, 2006; Wood and Gray, 1991) and creates a project collaboration model that is not context-specific and generalizable to different collaborative strategies and contexts.

As the study in Chapter 5 focuses on the collaborating team as a level of analysis and does not investigate the views of buyer and supplier organizations, it primarily contributes to the PM literature. Its importance for PSM researchers may lie in demonstrating the role and place of incentives in project collaboration and the applicability of such a model to any type of supply chain, also in manufacturing settings.

6.2. MANAGERIAL INSIGHTS

As practitioners are the ultimate users of management research (Voss et al., 2002), developing valid and relevant recommendations for business is one of the aspirations of this dissertation. The engineering & construction projects investigated in this dissertation are a sub-sector of complex construction projects and, consequently, a representative example of project-based production setting. The insights provided in this dissertation can be helpful for companies involved in complex projects in various industries.

Focusing the resources and motivations of multiple parties on the goals necessary for the owner is a crucial task for every project. This dissertation provides insights for organizations that aim to align numerous (sub)suppliers and

(sub)contractors on the project outcome, either by designing and managing contracts or applying a collaborative approach in the project implementation. These can be the project owners (clients) or the contractors, as both can play the buyer role, depending on the pursued project strategy. This research could also be informative for organizations representing the supplier side in such transactions, as it explains why their counterparts behave and act in a certain way.

The dissertation offers guidance on designing and planning the implementation of a multi-party performance-based (incentive) contract. This can be useful for procurement teams in the buying organizations, as they typically have the responsibility to develop effective contracts. A multi-party PBC can be considered when parties need to be aligned on one goal and when none of the participating parties fully controls the final result and is dependent on others to perform. The reward should be more significant than in traditional contracts to account for the increased risk. However, it is not the only deciding factor for the suppliers[9] to accept such a risky contract. The buyer organization needs to select highly reputable and professional parties, as reputation promises the ability to perform and achieve the desired goal. It thus decreases the perception of risk and uncertainty. The buyer organization should also commit to collaboration with the counterparts in the contract implementation and behave collaboratively during contract negotiations. Commitment to collaboration also increases if it is part of the binding contractual obligations.

Still, a reward that is fully dependent on performance of many parties can be perceived as too risky. This is why hybrid contracts, in which performance rewards are offered on top of the traditional input-based remuneration, are sometimes preferred. If such approach is taken in the multi-party setting, it is important to

[9] By saying 'suppliers' I also mean contractors, as well as organizations in lower tiers of supply chains (subsuppliers and subcontractors)

ensure that when parties are offered a shared performance-based reward, their individual contracts do not contain conflicting financial goals. Otherwise, such conflicts will hamper the parties' alignment on the project outcome and the motivational effect of the shared performance-based reward. Naturally, the findings of this study regarding suppliers' motivation apply to bilateral contracts. Moreover, they can be applied to any agreements (cost reimbursable, fixed price, unit rate), as all contracts create a particular financial motivation to act. Chapter 3 discusses further details on this topic.

Contracts signed at the beginning of the project are based on the initial implementation plans and assumptions about suppliers' performance. However, challenges in project implementation are likely to occur and may make the initial plans and contracts obsolete. This research provides recommendations about how contracts can be renegotiated during the project and thus maintain the role of effective alignment mechanisms. Such recommendations are applicable to performance-based contracts or any other type of agreement. Construction, engineering, and procurement teams are often actively involved in contract management during the project execution. Chapter 4 provides valuable information on how to approach the contract revision task. It explains what needs to be done, how it should be done, and the sequence of events that should be followed.

Problems in project implementation require root cause analysis and the development of corrective plans. It is important to analyse whether the parties can perform the necessary corrective actions, and only after that - whether the contracts support and motivate them to do so. If not, the contracts need to be renegotiated to encourage parties to make the desired changes, but careful analysis of the motivational effect of proposed amendments is needed. Leaving the contracts unchanged creates a risk for the success of corrective plans, as suppliers will not change their ways of working. To design the required contract amendments,

organizations can use their own experience, knowledge of third parties, or inference (assumptions, forecasting, brainstorming). If monitoring of corrective plans shows they are insufficient in correcting the project course, a new cycle of improvements and learning should begin.

Yet, contracts are not the only alignment tools organizations can use in projects. Formal contracts are not always applied when a partnering or collaborative approach is pursued. Depending on the project context and team experience, parties can use various formal integrative mechanisms and agree on relational norms (expected behaviours). Both sides of collaboration should be given equal attention. Integrative mechanisms, or the formal managerial side of collaboration, allow establishing rules and procedures, facilitate the development and improvement of cooperation, and redesign daily project management activities. Thus, their role should not be under-evaluated. Relational norms are part of the collaboration agreements and rules. In the beginning, these norms are expected, promised behaviours, but they need to become actual team behaviours by developing and practicing collaborative skills. I find that the two sides of collaboration are complementary and require equal management attention. Skipping the integrative mechanisms or not paying attention to team behaviours will leave collaboration simply an 'intention on paper'. I hope that the findings of Chapter 5 are helpful for project leaders and functional managers who are responsible for developing and 'translating' collaboration to the team members.

6.3. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This dissertation explores contractual and relational governance in construction projects, which makes the findings deeply contextual. This approach leads to an

enhanced depth of the results and value for practitioners (Welch et al., 2011; Dubois and Salmi, 2016). However, it may limit the explanatory power and generalizability of findings to other sectors. It is also likely that conclusions can be challenged and refined in other empirical settings. For instance, the study of project collaboration in Chapter 5 shows a prominent role of daily collaborative (joint working) practices because collaborating parties are typically co-located in such projects and naturally perform daily work together. Yet collaboration may happen between organizations in various geographical locations which will make co-location impossible; such setup could likely lead to a different role of these integrative mechanisms.

Qualitative investigation and the use of case studies as research methods is another limitation. I undertook a significant effort to ensure the analytical generalizability of the findings by carefully selecting cases, applying multiple data collection methods, capturing perspectives of multiple parties, and taking various approaches to data analysis. Yet, case studies represent 'messy' empirical reality, and it is not possible to control for the presence or absence of certain constructs or the outcomes in real-time studies (Voss et al., 2002). Empirical data are always limited so that certain constructs may have been missed, as well as certain relationships between them. For instance, it was not possible to make any conclusions about the role of vicarious learning in Chapter 4. At the current stage of knowledge about the investigated topics, exploratory and theory-building research based on qualitative strategies is appropriate. However, the next step could involve theory-testing and quantitative strategies.

Finally, the concepts – contracts, supplier motivation, organizational learning, and collaboration are very complex, and their studies at various levels are justifiable, as well as multi-level investigations (Roehrich et al., 2020a). However, the choice of level of analysis inevitably limits possible insights. In Chapter 3, for example, I study supplier motivation at the organizational level. Still, individual

managers in these organizations are likely to have different motivational drivers, especially if they do not directly benefit financially from the organizational performance (as financial incentives are not always shared with the team).

The generalizability of the findings in this dissertation varies, and some are more sector-specific than others. For instance, results about the role of supply chain interdependence or the fine-grained structure of supplier motivation by the financial reward in Chapter 3 are not industry-specific. However, the extensive involvement of the buyer (client) in the organization of the project supply chain and design of PBCs may be unique for construction projects. In Chapter 4, the suggested approach to distinguish between the contract adaptations and learning, or overall intra-transaction learning process, should be applicable for any sector. At the same time, the pace of learning and the relationship of learning over time (Van der Valk et al., 2020) can be unique to the studied empirical settings, as projects have a different perception of available time compared to permanent organizations (Lundin and Söderholm, 1995). The proposed model of project collaboration in Chapter 5 applies to both multi-party and dyad settings and collaboration in any type of supply chain. However, further validation is required.

Any advance in scientific knowledge always leads to new questions and the need to verify discovered but unclear phenomena or relationships between them. Specific ideas for future research shown as limitations (see above) have already been proposed. Below I highlight some opportunities that may be important in advancing the findings in this dissertation.

Chapter 3 focuses on the contract design phase. Further investigation of multi-party PBCs in the contract implementation phase is needed for a complete picture. Prior research has shown the value of insights in the management phase of PBCs (Nullmeier et al., 2016). The motivational effect of PBCs will likely be dynamic due to inevitable uncertainties or challenges in the course of project

implementation. I also have not identified the significance of the identified relationships in each of the three antecedents of motivation (Expectancy, Instrumentality, and Valence), so theory-testing studies are necessary.

The learning to contract process investigated in Chapter 4 may have specific features due to perception of limited time and drive for action in project settings (Lundin and Söderholm, 1995). In series manufacturing settings organizations may demonstrate different dynamic of LtC within transactions, or different interplay between objects or mechanisms of learning (e.g. a strong presence of vicarious learning).

Finally, I expect that the proposed collaboration model in Chapter 5 is applicable for various types of vertical (buyer-supplier) relationships, but verification in series manufacturing setting may be needed. Also, transferring it to the setting of long-term, strategic collaboration would allow understanding its boundaries. Further studies can also identify how the relationship between the integrative mechanisms and relational norms evolves over time or whether it is affected by repeated interactions among the parties in multiple collaborative projects.

This dissertation is inspired by two major business trends: increasing number and sophistication of interorganizational relationships and rising number of complex projects in many industries. Starting from and combining these two trends, it discusses various aspects of interorganizational governance in projects and is one of the few examples of PSM research in complex construction projects. Hopefully, it brings valuable theoretical and practical insights and demonstrates the potential and the need for more investigations of project settings in the PSM discipline.

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SUMMARY

In this dissertation I study interorganizational governance in projects, focusing on how contracts and collaboration can effectively align diverging interests of multiple parties. In particular, I look into complex construction projects as a representative example of project organizing, investigating them in a literature review and three empirical studies. The dissertation structure is further explained in *Chapter 1*.

In *Chapter 2* we analyse the current state of knowledge about contract strategies in complex construction projects. To combine functional, setting, and contextual knowledge on the topic, we review the purchasing and supply management (PSM), project management (PM), and engineering and construction management (ECM) literatures. We conclude that current research extensively discusses design and success factors of contract strategies, primarily performance-based contracts, compares performance of various strategies, and touches upon the strategy selection process of projects. Current research appears to be largely undertheorized, rarely investigates the contract management phase, and mainly focuses on contractor-client dyads, despite multi-party contracts' application in practice. These results provide insights for the following empirical investigations into the role of contracting and collaboration in projects.

In *Chapter 3* we study how clients[10] can design effective multi-party performance-based contracts (PBC) to align interests of contractor and subcontractors on the project outcome. Generally, subcontractors are unwilling to accept the shared reward due to perception of low outcome attributability (high outcome uncertainty). We apply comparative case study strategy and bring in Expectancy theory to understand the motivational effect of the contract and to

[10] In the empirical setting of construction project and related research the terms 'client' and 'contractor' are commonly applied instead of 'buyer' and 'supplier'. In the dissertation, I use them interchangeably.

reveal how perception of outcome attributability can be improved. The findings show that not only the reward – its amount, achievability of set targets and distribution ratio - plays a role in parties' motivation to accept the PBC. To improve perception of outcome attributability, clients need to select highly professional and reputable parties, commit to shared control (collaboration) over the transaction execution, and demonstrate collaborative behaviours during the contract negotiations. Codification in the multi-party contract of intensions to engage in shared control also reduces the perception of outcome uncertainty. We also find that multi-party PBCs are applicable in case of reciprocal interdependence between the parties in the process of outcome creation. In this study we elaborate theory on performance-based contracts by extending the discussion into the multi-party setting, and bringing into it motivational theories and fine-grained understanding of supply chain interdependence. This study also offers advice to practitioners about the adoption and design of multi-party PBCs.

In Chapter 4 we investigate how organizations can learn to contract, or revise their contracts during the contract management phase to maintain their role of effective alignment mechanisms. By analysing the existing learning to contract (LtC) and organizational learning literature, we establish an integrated LtC framework and steps of the LtC process. Then, engaging in a longitudinal study of a lengthy project and using process approach, we build theory about the process of intra-project, or intra-contract learning. We find that learning about contracts (a contract revision) only happens after the buyer 1) learns about issues with the transaction and parties' performance, and 2) positively evaluates the possibility to correct the transaction course and parties' potential to improve performance. Multiple LtC cycles can happen within an ongoing transaction: if the desired change in behaviours and transaction course is not achieved, a new contract revision can be initiated. The buyer organization learns from its own experience, but also

extensively complements experiential knowledge with inferential (assumptions, forecasting, brainstorming) to develop effective contract revisions. This study complements the existing literature on LtC that has mostly focused on the contract design phase and inter-contract learning. It also provides guidance to practitioners about how contract revisions within ongoing projects can be approached.

In *Chapter 5* we explore the interplay between managerial and behavioural sides of project collaboration, investigating partnering practices that develop as a response to the project execution challenges and the need to align parties' efforts on the desired outcome. Building on knowledge from the project management domain, but also on organizational and general management literature, combined with real-time and retrospective investigations of two collaborative project initiatives, we offer a project collaboration model that explains the interplay between these two sides. Our analysis shows that managerial (integrative mechanisms) and behavioural (relational norms) sides of collaboration are complementary. We identify three types of integrative mechanisms: 1) governance and administration, 2) support, and 3) joint working practices. Relational norms, or expected collaborative behaviours, are negotiated in parallel with the governance and administration procedures of collaboration. The norms are translated into actual collaborative behaviours, practiced within the support integrative mechanisms, and regularly applied within the joint working practices. Thus, integrative mechanisms provide a platform for relational norms to be negotiated and collaborative behaviours to be executed. At the same time, relational norms and collaborative behaviours transform traditional project management activities into truly integrative ones; without them the collaboration 'remains on paper'. This study contributes to the literature by studying the topic at a more aggregated level and offering a model that explains both the interplay and distinct roles of the managerial

and behavioural sides of collaboration. It also offers insights for the project teams and stresses the importance to pay equal attention to both aspects of collaboration.

This dissertation discusses various aspects of interorganizational governance in projects, and is one of the few examples of the PSM research in the complex construction projects in particular. This brings not only valuable theoretical and practical insights on this phenomenon, but hopefully also demonstrates the potential and the need for more investigations of project settings in the PSM discipline.

SAMENVATTING

In dit proefschrift doe ik onderzoek naar interorganisationele bestuursvormen in projecten, waarbij de aandacht ligt op de wijze waarop de uiteenlopende belangen van meerdere partijen door middel van contracten en samenwerking effectief op elkaar kunnen worden afgestemd. Ik richt me in het bijzonder op complexe bouwprojecten als representatief voorbeeld van projectorganisatie, en bestudeer deze projecten door middel van literatuuronderzoek en drie empirische onderzoeken. De structuur van het proefschrift wordt toegelicht in *hoofdstuk 1*.

In *hoofdstuk 2* analyseren we de huidige stand van de kennis over contractstrategieën in complexe bouwprojecten. Om functionele, achtergrond- en contextuele kennis over het onderwerp te kunnen combineren, bestuderen we de literatuur over inkoop- en voorraadbeheer (purchasing and supply management, PSM), projectbeheer (project management, PM) en techniek- en constructiebeheer (engineering and construction management, ECM). We concluderen dat er in de bestaande literatuur uitvoerig aandacht wordt besteed aan ontwerp- en succesfactoren van contractstrategieën, met name prestatiegerichte contracten. Ook worden hierin de prestaties van verschillende strategieën met elkaar vergeleken en het selectieproces van strategieën voor projecten behandeld. De bestaande literatuur lijkt grotendeels te zijn gespeend van theoretische onderbouwing, doet zelden onderzoek naar de contractbeheerfase en richt zich voornamelijk op de dyade van aannemer en opdrachtgever, ondanks het gebruik van meerpartijencontracten in de praktijk. Deze bevindingen bieden inzichten voor de volgende empirische onderzoeken naar de rol van aanbesteding en samenwerking in projecten.

In *hoofdstuk 3* onderzoeken we hoe opdrachtgevers[11] effectieve prestatiegerichte meerpartijencontracten (multi-party performance-based contracts, PBC) kunnen opzetten om de belangen van aannemers en onderaannemers op elkaar af stemmen met betrekking tot het projectresultaat. Over het algemeen zijn onderaannemers niet bereid om de gedeelde beloning te aanvaarden omdat er in hun ogen weinig invloed op het resultaat kan worden uitgeoefend (grote onzekerheid over het resultaat). We passen een vergelijkende casestudy-strategie toe en maken gebruik van de verwachtingstheorie om inzicht te krijgen in het motiverende effect van het contract en om te achterhalen hoe de perceptie van de eigen invloed op het resultaat kan worden verbeterd. De resultaten laten zien dat niet alleen de beloning (de hoogte, de haalbaarheid van de gestelde doelen en de verdeling) een rol speelt bij de motivatie van partijen om een PBC aan te gaan. Om de perceptie van de eigen invloed op het resultaat te verbeteren, moeten opdrachtgevers kiezen voor zeer professionele partijen met een goede reputatie, moeten ze zich verplichten tot gezamenlijke zeggenschap (samenwerking) over de uitvoering van de transactie, en moeten ze tijdens de contractonderhandelingen coöperatief gedrag laten zien. Het in het meerpartijencontract vastleggen van de intentie om tot gezamenlijke zeggenschap over te gaan, vermindert ook de ervaren onzekerheid over het resultaat. We constateren ook dat meerpartijen-PBC's kunnen worden toegepast in het geval van wederzijdse afhankelijkheid tussen de partijen bij de totstandkoming van het resultaat. In dit onderzoek bouwen we de theorie over prestatiegerichte contracten uit door in de discussie de meerpartijencontext mee te nemen en door gebruik te maken van motivatietheorieën en een diepgaand inzicht in de onderlinge afhankelijkheid van de toeleveringsketen. Dit onderzoek biedt ook

[11] In de empirische context van bouwprojecten en aanverwant onderzoek worden doorgaans de termen 'client' (opdrachtgever) en 'contractor' (aannemer) gebruikt in plaats van 'buyer' (afnemer) en 'supplier' (leverancier). In dit proefschrift gebruik ik deze begrippen door elkaar.

advies aan mensen in de praktijk over de ingebruikname en opzet van PBC's voor meerdere partijen.

In hoofdstuk 4 onderzoeken we op welke manier organisaties contracten kunnen leren aanbesteden, of hun contracten tijdens de beheerfase kunnen herzien om ervoor te zorgen dat zij een effectieve coördinerende rol kunnen blijven vervullen. Door de bestaande literatuur over leren aanbesteden (learning to contract, LtC) en organisatorisch leren te analyseren, creëren we een integraal kader voor LtC en stappen van het LtC-proces. Aan de hand van een longitudinaal onderzoek naar een langlopend project ontwikkelen we met behulp van een procesbenadering een theorie over het proces van leren binnen projecten (intra-project learning) of contracten (intra-contract learning). Uit onze bevindingen blijkt dat leerprocessen over contracten (een contractherziening) pas gebeurt nadat de afnemer 1) kennis heeft genomen van problemen met de transactie en de prestaties van de partijen, en 2) een positieve inschatting heeft gemaakt van de mogelijkheid om het verloop van de transactie te corrigeren, en van het potentieel van de partijen om de prestaties te verbeteren. Tijdens een lopende transactie kan er sprake zijn van meerdere LtC-cycli: als de gewenste wijziging in gedrag en het verloop van de transactie niet wordt bereikt, kan dit aanleiding geven tot een nieuwe contractherziening. De afnemende organisatie leert van haar eigen ervaring, maar vult de op ervaring gebaseerde kennis ook uitgebreid aan met inferentiële kennis (veronderstellingen, prognoses, brainstorming) voor het ontwikkelen van effectieve contractherzieningen. Dit onderzoek vormt een aanvulling op de bestaande literatuur over LtC die zich vooral richt op de ontwerpfase van het contract en op het leren tussen contracten (inter-contract learning). Het biedt tevens een leidraad voor mensen die in de praktijk werkzaam zijn voor de wijze waarop contractherzieningen binnen lopende projecten kunnen worden benaderd.

In *hoofdstuk 5* onderzoeken we de interactie tussen de bestuurlijke en gedragsmatige aspecten van samenwerking tijdens projecten, waarbij we kijken naar de samenwerkingspraktijken die zich ontwikkelen in reactie op de uitdagingen tijdens de projectuitvoering en de noodzaak om de inspanningen van de partijen af te stemmen op het gewenste resultaat. Voortbouwend op kennis uit het projectmanagementdomein, literatuur over organisatie en algemeen bestuur, gecombineerd met real-time en retrospectieve onderzoeken van twee samenwerkingsinitiatieven, bieden wij een model voor projectsamenwerking dat een verklaring biedt voor de wisselwerking tussen deze twee aspecten. Uit onze analyse blijkt dat de bestuurlijke (integratieve mechanismen) en gedragsmatige (relationele normen) aspecten van samenwerking elkaar aanvullen. We onderscheiden drie soorten integratieve mechanismen: 1) bestuur en administratie, 2) ondersteuning, en 3) gezamenlijke werkpraktijken. Relationele normen, ook wel verwacht coöperatief gedrag, komen gelijktijdig tot stand met de bestuurlijke en administratieve samenwerkingsprocedures. De normen worden omgezet in daadwerkelijk coöperatief gedrag dat wordt vertoond binnen de ondersteunende integratieve mechanismen, en worden regelmatig toegepast binnen de gezamenlijke werkpraktijken. Hierdoor vormen integratieve mechanismen een platform waarop kan worden onderhandeld over relationele normen en waar coöperatief gedrag kan worden uitgevoerd. Tegelijkertijd zorgen relationele normen en collectief gedrag ervoor dat de traditionele activiteiten van projectbeheer veranderen in daadwerkelijke integratieve activiteiten; zonder deze activiteiten blijft de samenwerking enkel een papieren werkelijkheid. Dit onderzoek levert een bijdrage aan de literatuur door dit onderwerp op een hoger aggregatieniveau te bestuderen en door een model te bieden dat zowel een verklaring biedt voor de onderlinge wisselwerking als voor de verschillende rollen van de bestuurlijke en de gedragsmatige aspecten van samenwerking. Het biedt ook inzichten voor de

projectteams en benadrukt het belang om evenveel aandacht te besteden aan beide aspecten van samenwerking.

Dit proefschrift bespreekt verschillende aspecten van interorganisationele bestuursvormen bij projecten, en is in het bijzonder een van de weinige voorbeelden van het PSM-onderzoek binnen complexe bouwprojecten. Dit biedt niet alleen waardevolle theoretische en praktische inzichten over dit verschijnsel, maar toont hopelijk ook het potentieel van en de behoefte aan verder onderzoek naar projectcontexten op het gebied van PSM.

ABOUT THE AUTHOR

Anna Nikulina was born in Moscow, Russia. After obtaining MSc degree in international economics from Russian Foreign Trade Academy, she started her career in business. Anna worked in the oil & gas and steel making industries in various roles in the internal audit and procurement teams in Russia and the USA.

Anna joined ERIM in September 2016 as a PhD candidate for an open topic project and was supervised by Professor Finn Wynstra (RSM) and Professor Leentje Volker (University of Twente). Anna's work background influenced the choice of the dissertation focus – contractual and relational governance (collaboration) in complex projects. She presented her papers in several conferences, including International Purchasing and Supply Education and Research Association (PSERA) and European Academy of Management (EURAM).

During the PhD years Anna assisted with various courses in Supply Chain Management Master programme, focusing primarily on Purchasing and Supply Management course. She also obtained The University Teacher Qualification certificate, and currently holds lecturer position at the Department of Technology and Operations Management, RSM.

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This dissertation studies various aspects of interorganizational governance in projects, focusing on how contracts and collaboration can effectively align diverging interests of multiple parties. Following the introduction in Chapter 1, it looks into complex construction projects as a representative example of project organizing, investigating them in a literature review and three empirical studies. Chapter 2 offers an analysis of the current state of knowledge about contract strategies in complex construction projects, combining the purchasing and supply management, project management, and engineering and construction management literatures. Chapter 3 studies how clients (buyers) can design effective multi-party performance-based contracts to align interests of contractor and subcontractors on the project outcome. Chapter 4 investigates how organizations can learn to contract or revise their contracts during an ongoing project to maintain their role of effective alignment mechanisms. Chapter 5 shifts focus to the relational governance and explores the interplay between managerial and behavioural sides of project collaboration. This dissertation is one of the few examples of the purchasing and supply management research in the complex construction projects. It brings not only theoretical insights, but hopefully also demonstrates the potential and the need for more investigations of project settings in this scientific discipline. This work also offers advice to practitioners about the adoption and design of multi-party PBCs, effective approach to contract revisions within ongoing projects, as well as the design and implementation of project collaboration.

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Erasmus Research Institute of Management
Mandeville (T) Building
Burgemeester Oudlaan 50
3062 PA Rotterdam, The Netherlands

P.O. Box 1738
3000 DR Rotterdam, The Netherlands
T +31 10 408 1182
E info@erim.eur.nl
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