Collaborative Contracting in Projects

Mohammad Suprapto
Collaborative Contracting
in
Projects

Proefschrift

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Mohammad SUPRAPTO
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Dit proefschrift is goedgekeurd door de
promotor: Prof. dr. H.L.M. Bakker
copromotor: Dr. ir. H.G. Mooi

Samenstelling promotiecommissie:
Rector Magnificus Technische Universiteit Delft, voorzitter
Prof. dr. H.L.M. Bakker Technische Universiteit Delft, promotor
Dr. ir. H.G. Mooi Technische Universiteit Delft, copromotor

Onafhankelijke leden:
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Prof. dr. ir. A. Verbraeck Technische Universiteit Delft
Prof. dr. ir. M.J.C.M. Hertogh Technische Universiteit Delft, reserve lid

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e-mail: suprapto@live.nl

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Summary

Capital projects —such as oil platforms, LNG plants, chemical plants, or mass transportation systems that involve significant private and public investment— are of strategic importance to the owners, government, and societies in the long run. In spite of professionalization of project management and owners’ willingness to invest in the front-end development more than half of these projects are delivered over budget and behind schedule. Although the delivered assets or facilities or products eventually come into operation, the owners’ financial performance and reputation in the eyes of the financers and/or shareholders are at stake. Both industry analysts and project management scholars agree that more efforts in owner-contractor collaboration are needed to improve the overall project performance.

Extant literature recognizes the concept collaborative relationship in projects as a broad term representing a range of relationship contracts such as project partnering, project alliancing, and integrated project team. The success stories of project partnering or alliancing have been widely reported in the United States, the United Kingdom, Hong Kong, and Australia. However, a number of in-depth case studies also reveal that partnering or alliancing is not always realized to its full extent and thus question what such collaborative contracting practice actually entail. A more thorough empirical research was suggested to understand the essence (factors, mechanisms, and attributes) of collaborative relationships and their specific effects upon project outcomes. The main research question to be addressed was: How could collaborative relationships be designed and developed to improve the overall project performance? Accordingly, this research was conducted in four stages combining qualitative and quantitative empirical studies with the focus on the execution of capital projects within, but not limited to, the Dutch process industry competence network (NAP).

The first stage of this research is reported in Chapter 2 and 3. Chapter 2 describes a case study in which a pair of an owner and a contractor implemented a collaborative relationship in delivering a complex engineering project. Although they did not formally adhere to a specific form of collaborative contract, the relationship was characterized by a number of practices and success factors that were found in project partnering or alliancing. Such practices and success factors were behavioral alignment, team building exercises, open communication, joint problem solving, integrated project team, competent team, leadership, trust, and long-term orientation. Although team building and an integrated project team were recognized as important aspects, they were not in themselves perceived as sufficient to ensure a truly collaborative relationship. The case study also revealed a difficulty in embedding the agreed behavior protocol at senior level into effective working relationships at team level.
Based on the initial findings, the literature review in Chapter 3 focuses on elements that constitute a collaborative relationship in more detail. Upon a systematic literature search, 21 empirical studies (10 case studies, 9 survey studies, and 2 longitudinal studies) were selected for an in-depth textual analysis. The analysis resulted in a number of factors of collaborative relationships: teamworking, relational attitudes, team integration, trust, joint working, contract, communication, commitment, and capability. Building on an input-mediator-output framework known in team effectiveness literature, an integrated model was conceptualized in which teamworking and team trust act as mediators that link the antecedents (relational attitudes, team integration, joint working, senior management commitment, owner-contractor capability, and contract) to the outcomes (project performance and expectation of a continuing relationship).

The second stage is reported in Chapter 4 and presents the practitioners’ own perception, belief, and reflection in understanding the essence of collaborative relationships in projects. It focuses on a systematic analysis of the project practitioners’ subjectivity through application of Q-methodology—a discursive, constructivist approach that combines both qualitative and quantitative methods. A concourse of 115 statements was compiled from 10 interviews with senior project managers, popular articles from websites and blogs of project management and contracting professionals, popular literature, and journal articles. Based on six factors of collaborative relationship identified in Chapter 3 (teamworking, relational attitudes, capabilities, team integration, joint working, and contractual aspects), 55 statements were arbitrarily selected as the Q-set. Subsequently, the Q-sorting and interviews were conducted with 30 project practitioners (15 practitioners from 9 different owners and 15 practitioners from 10 different engineering contractors).

The Q-factor analysis revealed four distinct perspectives for improving owner-contractor relationship, namely: shared team responsibility, execution focused team, joint capability and structure, and senior leadership pair. Across the four perspectives, the top-10 most important elements of collaborative relationships are team’s affective trust, open and honest communication, shared objectives, no blame culture, contractor’s project management capability, owner’s senior management leadership, senior management involvement in conflict handling, contractor’s senior management support, contractor’s trust, and conductor’s senior management leadership. At the higher conceptual or factor level, it was found that collaborative relationships as perceived by the practitioners are more about teamworking and relational attitudes, i.e.: by nurturing the team’s affective trust and shared objectives, by intentionally establishing no blame culture and open and honest communication on inter-firm level, social interaction, acceptance of conflicting opinions, and senior management commitment and leadership. Overall, more effective collaborative relationships could be achieved through relational attitudes shared by senior management and day-to-day management attention for teamworking. According to the Q-sort results, capable teams, team integration practice, joint working procedures, and contract are necessary but not sufficient for effective collaboration. Interestingly, contractual functions
were perceived to be relatively less important than other elements and therefore it is suggested that a collaborative relationship in projects is not so much about contract and there is a real role for senior management to play in the relationship.

The third stage of this research was reported in Chapter 5 and 6. In Chapter 5, the initial conceptual model (formulated in Chapter 3) was operationalized and empirically tested. With the focus on inter-team collaborative processes, teamworking quality (with 7 components: communication, coordination, balanced contribution, aligned effort, mutual support, cohesion, and affective trust) was positioned as the mediator that links the effects of three antecedents—relational attitudes (relational norms and senior management commitment), collaborative practices (team integration and joint working procedures), and teams' joint capability (the project team's overall competence and experience)—on the outcomes—project performance (efficiency, effectiveness, perceived satisfaction, and perceived success) and perceived relationship continuity (expectation of a continuing relationship). Accordingly, it was hypothesized that the antecedents directly affect project performance and perceived relationship continuity, indirectly affect project performance through teamworking quality, and indirectly affect perceived relationship continuity through teamworking quality and project performance.

\[ R^2 = 50\% \]

\[ R^2 = 51\% \]

\[ R^2 = 67\% \]

The empirical data was collected through an online questionnaire in the period October–December 2013. The respondents were mainly project managers, team managers, and functional managers from companies within the Dutch Process Industry Competence.
Network (NAP). A sample of 113 responses was analyzed with partial least square structural equation modeling (PLS-SEM). The PLS-SEM analyses supported the hypotheses that teamworking quality significantly improves project performance and teamworking quality mediates the indirect effects of relational attitudes, collaborative practices, and teams’ joint capability to project performance. There was no empirical evidence that relational attitudes, collaborative practices, and teams’ joint capability directly affect project performance. Taken together, the results suggest the three antecedents do not automatically improve project performance without real teamworking. Furthermore, the relatively stronger effects of relational attitudes compared to collaborative practices on project performance, provide a confirmation that the focus on soft and people aspects is more influential than the formal application of supporting practices and techniques. It was also found that relative to project performance, relational attitudes have stronger effects to the parties’ expectation of a continuing relationship. This suggests that the opportunity for future relationships is also strongly determined by the extent of the relational norms built and the commitment retained between the two permanent organizations.

The mixed results of collaborative contracts on project performance suggest a missing mechanism linking effects of contract types to project performance. In Chapter 6, the relative effects of three different contract types (partnering/alliance, reimbursable, and lump-sum contracts) and contractual incentives (with incentives and without incentive) on project performance are hypothesized to be mediated through relational attitudes and teamworking quality. The PLS-SEM analyses supported the hypotheses that a partnering/alliance contract is likely to be more collaborative than a lump-sum or reimbursable contract; and through better relational attitudes and teamworking quality, projects with a partnering/alliance contract are likely to perform better than those with lump-sum and reimbursable contracts. In the same way, through better relational attitudes and teamworking quality, projects with contractual incentives are likely to perform better than those without incentives. Apart from this indirect mechanism, no differences in the performance of projects can be directly attributed to different contract types and contractual incentives. Contrary to a common belief that a lump-sum contract tends to be more adversarial than a reimbursable contract, no difference was found in the degree of relational attitudes and teamworking quality between reimbursable and lump-sum projects. This suggests that the predominant use of lump-sum contracts does not always result in adversarial attitudes.

After controlling for contract types and incentives, it was found that relational attitudes significantly lead to enhanced teamworking quality which in turn improves project performance. This suggests that regardless of contract type and incentive, the quality of owner-contractor collaboration significantly contributes to project performance. Taken together and also consistent with the relatively low ranked contractual aspects as perceived by practitioners in the Q-study (Chapter 4), it was concluded that partnering/alliance and contractual incentives by themselves are not the game changer but the parties’ attitudes
towards collaborative relationships and how they play out throughout the project into actual teamworking behavior do make a difference.

Given the dynamic nature of collaborative relationships over the project life cycle, it is important to recognize that collaboration is a fluid concept that emerges from individual and organizational interactions. The fourth stage of this research focuses on a managerial tool to assess how well the owner and contractor and the teams work together and change over time. In Chapter 7, the RELational CAPability assessment tool (RECAP) was developed and validated for the project practitioners to measure the current state of their collaborative working. Connecting all findings from chapters 2 to 6, RECAP includes 4 relational capability criteria: relational attitudes, teamworking quality, good collaborative practices, and front-end definition; and 2 performance criteria: project performance and relationship continuity. RECAP was validated on the basis of pilot applications in three projects and interviews involving 6 project practitioners from both sides. It was shown that RECAP could be applied by the project practitioners to measure what it is supposed to measure: the soft and relational aspects of collaboration in real-life projects at different stages. The assessment results, score levels and gaps in responses between the owner and the contractor were recognized by the participants as useful to discuss specific improvement of their collaboration. In addition, positive feedback has been received from all participants on the practicality and usefulness of RECAP. Not only did they perceive RECAP as practical to measure the collaboration health but they also foresee its usefulness as instrument to building awareness and facilitating constructive discussions for improving ongoing working relationships. The practitioners can apply RECAP on any project with any contract because the assessment criteria/sub-criteria are generic and independent of any prescribed model of collaboration.

Integrating all findings, this dissertation ends with Chapter 8 that concludes how collaborative relationship could be designed and developed to improve the performance of capital projects. A real collaborative relationship needs day-to-day managerial attention for teamworking: ongoing communication, coordination, affective trust, cohesion, balanced contribution, aligned effort, and mutual support are manifested between teams. Owners’ and contractors’ project managers need to constantly manage their relationships over time at the permanent organizational level by catalyzing shared relational attitudes (characterized by mutual trust, commitment, openness, and a no-blame culture) between the senior management of both the owner and the contractor. Apart from assembling teams with sufficient capability, project managers from both sides can apply collaborative practices—such as formal team integration, team building, and joint risk management—early and throughout the project.

Additionally, owners and contractors can adopt a formal collaborative contract like partnering or alliance to structure their collaborative relationships but need to be aware that such a contract does not directly increase project performance on its own but indirectly
through its effect on relational attitudes and then teamworking quality. Partnering/alliance and contractual incentives do have a positive influence on the project but they also come at a cost. The most costly resources of collaboration are not money but extra time and thoughtful effort that are needed for establishing relational norms of trust, building credible commitment from senior management, and ensuring effective task-related and social interactions in teamworking while coping with accountability issues and other organizational priorities outside the collaboration process.

Besides delivering a successful project, it is of mutual interest to both owner and contractor to establish a longer-term relationship. Shared relational attitudes between senior management at the firms level are highly influential in shaping the parties’ expectations (as perceived by project managers) regarding a future relationship. To establish a longer-term relationship with a particular owner or contractor, it is crucial for the senior management from both sides to not only build their reputation through successful projects, but also maintain their relationships over time across projects.

A real collaborative relationship is a fluid phenomenon, individual and organizational interactions evolve and unforeseen events emerge over the project life-cycle. Failing to recognize this creates surprises and potential dysfunction. Owner and contractor need to be aware and identify specific aspects of their collaboration so that together they can formulate specific interventions, in a constructive way to improve the ongoing (and potentially future) relationship. The RECAP enables the practitioners to self-diagnose the soft and relational nature of collaboration in projects over different phases and regardless of contract types.

The scientific contributions of this dissertation can be summarized as follows. Firstly, this research demonstrated the suitability of a relationship approach to project management research by taking a position that projects are about people, their mind sets, and characterized by competing cultures and rationalities. Secondly, the Q-study was performed to reconstruct the practitioners’ views on collaborative relationships. The results supported the notion that collaboration cannot only be prescribed through formal arrangements/contracts but should also be socially constructed. Thirdly, extant literature presumes that owner-contractor collaboration quality positively influences project performance, but lacks empirical support. The survey study confirmed the positive effect of owner-contractor collaboration quality on project performance. Fourthly, a systematic analysis on the relative effects of three different contract types and the presence (or absence) of contractual incentives provided a clearer understanding on the role of contract types and incentives. It was found that partnering/alliance contracts or incentive-based contracts do work but through relational attitudes and how they play out into actual teamworking behavior. Finally, the structural models empirically tested in this research contributed to the call for more research towards development of middle range theory that examines causal relationships between success factors, project success and organizational success.
Important practical implications emerged from this research. It turns out that a successful collaboration is not so much about innovation in contractual arrangements but more about a new way of ‘managing teams’ with more emphasis on social and behavioral skills. A collaborative relationship is about working together and integrating different sets of skills, expertise, experience, views, and thoughts from many people with diverse backgrounds and interests. It is neither a given nor flourishes automatically. It needs to be “managed” in an ongoing manner at all levels, from the project steering committee or senior management to the project management team, team leaders, and team-members on both owner and contractor sides. Because after all project success is mainly realized by people.

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<tr>
<td>ACA</td>
<td>Australian Constructors Association</td>
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<tr>
<td>APM</td>
<td>Association of Project Management</td>
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<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
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<tr>
<td>BCB-CI</td>
<td>Bias Corrected Bootstrap Confidence Interval</td>
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<tr>
<td>BOOT</td>
<td>Build Own Operate and Transfer</td>
</tr>
<tr>
<td>BOT</td>
<td>Build Operate and Transfer</td>
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<tr>
<td>BSI</td>
<td>British Standard Institute</td>
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<tr>
<td>CB-SEM</td>
<td>Covariance Based Structural Equation Modeling</td>
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<td>CEV</td>
<td>Cumulative Explained Variance</td>
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<tr>
<td>CII</td>
<td>Construction Industry Institute</td>
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<tr>
<td>CMV</td>
<td>Common Method Variance</td>
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<td>CSF</td>
<td>Critical Success Factor</td>
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<tr>
<td>DBFM/O</td>
<td>Design Build Finance and Maintain/ Operate</td>
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<tr>
<td>DBO</td>
<td>Design Build and Operate</td>
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<tr>
<td>EC</td>
<td>Engineering and Construction contractor</td>
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<tr>
<td>EPC</td>
<td>Engineering, Procurement, and Construction</td>
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<tr>
<td>EPCM/EPCm</td>
<td>Engineering, Procurement, and Construction Management</td>
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<tr>
<td>FED</td>
<td>Front-End Development</td>
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<td>FEED</td>
<td>Front-End Engineering Design</td>
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<td>FEL</td>
<td>Front-End Loading</td>
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<td>FID</td>
<td>Final Investment Decision</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>IMO</td>
<td>Input-Mediator-Output</td>
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<tr>
<td>IPA</td>
<td>Independent Project Analysis</td>
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<td>IPD</td>
<td>Integrated Project Delivery</td>
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<tr>
<td>IMEC</td>
<td>International Program in the Management of Engineering and Construction</td>
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<td>IMR</td>
<td>Inverse Mills Ratio</td>
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<td>JRM</td>
<td>Joint Risk Management</td>
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<td>MCAR</td>
<td>Missing Completely at Random</td>
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<tr>
<td>NAP</td>
<td>Nederlands Apparatenbouw en Processindustrie</td>
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<td>NEDC</td>
<td>National Economic Development Council</td>
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<tr>
<td>PFI</td>
<td>Private Finance Initiative</td>
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<td>PLS-SEM</td>
<td>Partial Least Square Structural Equation Modeling</td>
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<td>PM</td>
<td>Project Manager</td>
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<td>PPP</td>
<td>Public Private Partnership</td>
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<td>RCT</td>
<td>Relational Contract Theory</td>
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<td>Relational Capability assessment tool</td>
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<td>ROI</td>
<td>Return of Investment</td>
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<td>TCE</td>
<td>Transaction Cost Economics theory</td>
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<td>VIF</td>
<td>Variance Inflation Factor</td>
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Chapter 1

INTRODUCTION
Chapter 1 | Abstract

This chapter sets the starting point of this PhD research. Projects are beneficial human endeavors. Projectification or ‘doing projects’ has become a common form of organizational activity besides routine or functional operations. This research focuses on capital projects. The strategic importance of capital projects is fully acknowledged, yet more than half of them are still delivered over budget and behind schedule. This problem persists over time despite professionalization of project management, efforts invested in front-end development, and rigorous risk management. Both project management scholars and industry analysts suggest that owners and contractors need to embrace collaborative relationships in their projects. How could collaborative relationships be designed and developed to improve the performance of capital projects is the main research question to be addressed throughout this dissertation. The rest of this chapter describes the research approach and outlines the subsequent chapters of this book.
Chapter 1 Introduction

Capital projects play a crucial role in advancing owners’ competitiveness and long-term growth. If executed well, these projects create a competitive edge and enhance the owners’ business value; however, when execution is poor, the result may be a project that is uneconomically, not competitive and a threat to the owners’ financial performance. Governments and societies have an equally strong interest in these projects. Capital projects have a multiplier effect. These projects do not just contribute to the well-being of the societies through delivery of vital services, such as a clean water supply, energy, transport, waste management, flood defense, and telecommunications but also provide jobs and drive local and national economic growth.

Capital projects are the vehicles for the development of complex engineering products with significant capital expenditure with a long payback period. They are massive economic activities. Oxford Economics (2014) estimates that worldwide spending for capital projects (covering oil and gas, power and utilities, manufacturing, transportation and social sectors) will grow from $4,000 billion per year in 2012 to more than $9,000 billion per year by 2025. Cumulatively, up to $78,000 billion is expected to be spent globally over the next 10 years. In 2014 alone, the worldwide spending for capital projects was $4,450 billion. This amount is equivalent to 5.7% of the 2014 world total GDP ($77,869 billion) or slightly below Japan’s GDP ($4,600 billion) but above Germany’s GDP ($3,850 billion) (see World Bank, 2015).

Given the strategic importance of the assets created through capital projects, however, owners often do not or cannot (even if they want to) perform the entire project on their own. Owners typically procure project-related services and supplies from project-based firms serving different roles from main engineering and construction contractor (ECs) to specialist (specific engineering or construction) contractor (Berends, 2007). In its realization process, a capital project inherently involves an intertwined relationship between two (or more) permanent organizations: owner and contractor with different but complementing roles in which “owner specifies the right project ... and contractor delivers a project right as specified on time and on budget [among other criteria]” (Merrow, 2011, p126).

Over the last decades, capital projects have become increasingly more complex and make the project management efforts even more challenging than before. In spite of the development in the professionalization of project management and the range of tools and systems now available, cost overruns and time delays persist over the time (Flyvbjerg, 2011; Merrow, 2011; Miller and Lessard, 2000; Morris and Hough, 1987).
Chapter 1

Industry benchmarking data also confirms that cost overruns or schedule delays are common across sectors. As an indication, IPA’s database (Merrow, 2011) of 318 industrial megaprojects indicates that, on average, 65% of the projects faced cost overruns or delays (see Figure 1-1a). The figures were even worse in oil and gas upstream projects and minerals projects, 78% and 70% respectively. In 2014, Ernst & Young (2014) highlights that from 365 oil and gas megaprojects, 64% faced cost overruns and 73% suffered schedule delays (see Figure 1-1b).

Figure 1-1. Industrial megaprojects cost overruns and schedule delays

A recent KPMG (2015) global construction survey of the senior management of 109 owners reveals that 53% of projects, with budgets ranging from around $10 million to more than $5 billion, were underperforming in meeting targeted cost and schedule. Of course this does not necessarily mean that all of these projects have been a commercial or business disaster to the owners. However, the projects that are unable to deliver planned production levels in line with targeted budget and schedule become more expensive and eventually lower the owner’s return on investment and financial performance in general.
The industry and project practitioners have responded by putting more effort on front-end development (FED), risk management, as well as applying better contracting strategies with fair risk allocation. However, most owners are still facing failures (cost and time overruns) in their projects. “As engineering and construction projects get bigger, the complexity grows exponentially, the improvements by owners in planning [front-end development] and risk management have been significant, yet there is further work to be done to reduce the number of project failures, and bring in more projects on-time and on-budget” (KPMG, 2015). Besides the insufficient effort invested in front-end development, project management scholars also agree that performance problems are strongly related to the inadequate owner-contractor collaboration and lack of attention to its social dynamics (Morris and Pinto, 2007; Smyth and Pryke, 2008; Walker and Hampson, 2003).

Given the above background, this PhD research focuses on owner-contractor collaboration in the execution of capital projects. This chapter proceeds as follows. Firstly, the problems around collaboration in capital projects are presented. Next, the research objectives and research questions are formulated. Subsequently, the approach to answer the research questions is described. Finally, at the end of this chapter the structure of this dissertation is presented.

### 1.1. Collaboration in capital projects delivery

There has been an increasing attention towards better collaboration in the management of capital projects (Bygballe, Jahre and Swärd, 2010; KPMG, 2015; Xue, Shen and Ren, 2010). Apart from improving project performance, the need towards collaborative relationships can be traced back to the fragmentation and specialization of project-based industry and the predominant use of lump-sum contracts with risk transferring strategy.

The fragmentation implies that many firms with different specializations are involved in a particular engineering and construction project and when completed they move on to different projects (Bakker and de Kleijn, 2014; Morris and Pinto, 2007). In an extreme case, an owner will hire an engineering firm to do basic engineering design. Then another engineering firm and/or specialist get the call to detail the engineering design, before a separate construction contractor takes the turn to execute and construct the designed facility/asset. In most situations, the construction contractor will not directly employ many of the people working on site but through subcontractors assigned to perform various parts of the work. There have been various approaches like *design and build*, *EPC* (Engineering, Procurement, and Construction), and *Turnkey* where an owner hires a so-called integrated or EPC or main contractor as a single point of responsibility to minimize the required number of interfaces for the owner with many engineering and construction contractors, subcontractors, and suppliers. The fragmentation remains and the responsibility for dealing with the fragmentation is shifted to one main contractor or a limited number of main contractors. With many contracting firms involved it is not unusual that communication, coordination, and decision making take a long time to cascade through all parties. The
problem with this fragmentation is that it leads to a difficulty in aligning all parties' towards the project objectives.

Majority of contracting in capital projects still relies upon the traditional lump-sum contracts in combination with risk transfer strategy. Berends (2007) and Merrow (2011) indicate that owner and contractor have different abilities to absorb risks. No contractor is willing to absorb all project risks without some premium. Even so, when certain risks emerge and hurt their profit margin, the contractors will start playing their game to the owners to reclaim their loss (to maintain expected short-term profit). This eventually leads to inefficiency and higher capital expenditure thus lowering the owner’s ROI (return of investment). On the contractor side, although they can recover additional money, the additional effort they put in is also costly and they may eventually end-up with a small or insignificant net profit margin. At worst, the claims game can lead to litigation and turn to a zero-sum game. If the experience in zero-sum game also spreads out across the industry then exploitation and retaliation create a snowball effect damaging the project-based industry. In the end, owners' will suffer as well directly from higher capital cost due to a limited number of contractors that are willing to take part in the tendering process.

1.2. Objective of this research

The poor performance of the construction industry in the 1990s had prompted the rejection of short-term and adversarial relationships in favor of more collaborative relationships. It is widely believed that the competitive bidding of lump sum contracts most likely lead to opportunistic behavior and adversarial relationships between owner and contractor (Humphreys, Matthews and Kumaraswamy, 2003; Yang, Yang and Kao, 2010). Under adversarial relationships, the owner assumes that ‘the contractor takes advantage of us’. While the contractor, on the other hand, feels that the owner ‘only cares about the lowest price’. This stand-off is often considered to result in poorly established relationships and a failure to focus on creating mutual ‘value added’. Collaborative relationships, on the other hand, are characterized by transparency, reciprocal commitment, mutual trust, and long-term orientation (Smyth and Pryke, 2008; Walker and Rowlinson, 2008). Collaborative relationships are about working together and integrating different sets of skills, expertise, experience, views, and thoughts from many people with diverse backgrounds and interests.

However, the case for collaborative versus adversarial relationships is not clear cut. Both adversarial and collaborative are necessary and complementing but in different situations (Cox and Ireland, 2006; Parker and Hartley, 1997). Competitive attitudes or even adversarial behavior is still needed prior to and during the contract. Competitive attitudes can be focused to challenge the assumptions underlying the project definition and estimates. This can encourage innovation, reduce optimism bias, and at the end result in a mature and realistic front-end definition. When the owner and the contractor enter a relationship and start working together, they have to ‘cease to be strangers’ and change their attitudes and behavior into a collaborative mode. Of course, working together collaboratively will not
eliminate, but make the teams more able to actively cope with conflicts, tensions, and potential disputes between the parties and between people due to internal or external unforeseen events.

The term relationship contracting (Smyth and Pryke, 2008; Walker and Rowlinson, 2008) is generally used to espouse collaborative relationships in projects. It includes various forms of prescriptive models such as project partnering, project alliancing, and integrated project team. This practice has been reinforced within the literature in supply chain management, relationship marketing, and inter-firm alliances.

A number of studies in different countries report ‘the success stories’ of project partnering or alliancing, for example, in the United States (Drexler and Larson, 2000), United Kingdom (Barlow, 2000; Black, Akintoye and Fitzgerald, 2000), Hong Kong (Bayliss, Cheung, Suen and Wong, 2004; Chan et al., 2006), and Australia (Walker and Hampson, 2003; Yeung, Chan and Chan, 2009). Despite such extensive success stories, several in-depth case studies reveal that partnering or alliancing is not always realized to its full extent. Bresnan and Marshall (2002) highlight that “partnering by itself does not necessarily solve some of the problems that it is set up and designed to cope with [such as lack of responsiveness, contractor input into design, design-construction coordination]... partnering is clearly no panacea…” (p.504). Likewise, Alderman and Ivory (2007) as well as Aarseth et al. (2012) highlight a paradox of project partnering where the ideal collaborative relationship prescribed in partnering is hardly realized due to the persisting adversarial attitudes. This is especially true when the project circumstances changed and external or commercial pressure emerged (Bresnen, 2007; Chan et al., 2006). In summary, a systematic research is needed to understand the essence (factors, mechanisms, and attributes) of collaborative relationships and their specific effects upon project outcomes.

There have been some notable works in conceptualizing collaborative relationships based on their essential ingredients. Smyth and Pryke (2008), for example, propose a ‘relationship approach’ for researching collaborative relationships in construction built upon Williamson’s transaction cost economics framework (Williamson, 1981) and Macneil’s relational contract theory (Macneil, 2000). Such an approach focuses on the soft aspects of management of projects, i.e.: relationship aspects between project actors at different levels: the project level, the individual firm level, and the inter-firm level. A number of empirical studies (Bakker, Arkesteijn, Bosch-Rekveldt and Mooi, 2010; Berends, 2007; Bosch-Rekveldt et al., 2011; Carolynn, Akintola and Eamon, 2000; Chan et al., 2004) suggest some high level attributes to collaborative relationships such as mutual trust, long term orientation, and senior management commitment. With such attributes, the relationships are likely to result in various positive effects on the team effectiveness such as aligned goals and interests among parties, better communication, problem solving and dispute handling, and better working condition among parties. All in all, these positive attributes are considered determinants to project performance (Baiden and Price, 2011; Meng, 2011).
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The objective of this research is threefold. The first objective is to investigate what are the antecedents and dimensions of collaborative relationship quality. The second objective is to empirically test the relations between antecedents, collaborative relationship quality, and project performance. Finally, the third objective is to develop and validate a managerial tool to assess collaborative relationship in real-life projects.

1.3. Research questions

Extant literature on collaborative relationships in projects suggests four important gaps. Firstly, there have been formal prescriptions to collaborative relationships such as partnering and alliancing. A number of empirical studies, however, indicate that some partnering projects often failed to display the expected collaborative attributes (Bresnen and Marshall, 2002; Chan et al., 2006). In other projects, in the absence of formal partnering, the owner-contractor relationships were perceived to be collaborative (Bresnen and Marshall, 2002; Chan, Johansen and Moor, 2012). This calls for a need to investigate what factors, mechanisms, and attributes actually make collaborative relationships (Bresnen, 2007; Hartmann and Bresnen, 2011).

Secondly, the effect of formal collaborative arrangements like partnering and alliancing on project performance is normatively assumed or drawn upon anecdotal evidence (Bygballe et al., 2010; Xue et al., 2010). More thorough empirical research, particularly quantitative evidence, is needed to compare the eventual effects of elements in collaborative relationship on the project performance across capital projects.

Thirdly, literature in the industry suggests that there is no clear or direct relationship between the contract type and project performance (CII, 1986; Merrow, 2011). Contrary to the proponents of partnering/alliance contracts, Merrow (2011) coins a controversial view on the role of alliance contracts that “alliance contracts do nothing to help [owner and contractor] understand who is responsible for what” (p.293). The same contradiction also applies to the effect of contractual incentives. Contrary to a common belief that incentive schemes might have a positive effect (Berends, 2006; Bubshait, 2003; Herten and Peeters, 1986), Merrow (2011) questions the effectiveness of incentivizing contracts. Based on a sample of 318 industrial megaprojects, he finds that contractual incentives do not have any effect on project success: the success rate of projects with incentives, although not statistically significant, was lower than those without incentives.

Fourthly and finally, the importance of long term relationship is often mentioned in the project management literature; however, there is no common agreement what it entails. It has been long debated whether long-term relationships and inter-organizational trust can be developed in the projects context that may be affected by the prevailing commercial settings in project-based industry (Cox and Ireland, 2006). There is an ambiguity around whether a long term relationship is antecedent or outcome of collaborative relationship. An empirical study focusing on practitioners’ views on whether long-term relationships across projects
can be designed or that they simply naturally evolve from prior repeated relationships could resolve this ambiguity.

The four identified gaps —the imprecise definition regarding factors, mechanisms, and attributes of collaborative relationships, the lack of thorough empirical research, the mixed effects of collaborative contracts and incentives on project performance, and the ambiguity of long-term relationship— suggest the need for better understanding what characterizes effective owner-contractor collaborative relationships in practice. This research therefore starts from a view that the primary ingredients in transforming an idea into value in project-based endeavors are the collaboration at inter-firm and project team levels (Morris, Pinto and Söderlund, 2010; Smyth and Pryke, 2008). It also builds on the notion that it is people who deliver a project through their ability to work together and engage intelligently with associated complexity and not so much on formal procedures, tools, and contracts (Winter, Smith, Morris and Cicmil, 2006).

The main research question is therefore:

*How could collaborative relationships be designed and developed to improve the performance of capital projects?*

In order to answer this main research question, the following sub-research questions are to be addressed:

**Q1. What are the dimensions and elements of collaborative relationships in projects?**

**Q2. How could the practitioners improve their collaborative relationships to ensure successful project delivery?**

**Q3. To what extent do relational factors determine collaborative relationships, project performance and expectation of a continuing relationship?**

**Q4. How do different contract types and contractual incentives influence collaborative relationships and project performance?**

**Q5. How can the practitioners improve their collaborative relationship in real-life project practice?**

Given the nature of the research questions implying value-oriented inquiry (what and how) to better inform practitioners in real-world practice, this research focuses on the ‘actuality’ of project-based working that is the practitioner’s actions and associated consequences in projects (Cicmil, Williams, Thomas and Hodgson, 2006). With such an emphasis, this research follows a pragmatism paradigm. Pragmatism embraces the use of both qualitative and quantitative methods to provide the best possible ways for answering the research questions (Creswell, 2009; Morgan, 2007). The use of alternative paradigms (positivism or interpretivism/constructivism) leads to either quantitative or qualitative method and is too limited to fully address the research questions.
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The empirical setting of this research is focused on engineering and construction projects. Such projects typically have a technological component, leading to technological as well as commercial risks and involve significant investments. They have a large impact on both the owner’s and the contractor’s business, both in case of a greenfield project (new asset for business growth) and a brownfield project (extension or modification of existing facility for ongoing production). Capital projects can differ largely in size and content, ranging from several million Euro (major turnaround project) to over 1 billion Euro (megaproject). These projects are highly customized products with the involvement of multiple disciplines and parties (main contractor, consultants, subcontractors, and suppliers).

1.4. Research approach

This research is conducted through 4 stages of sequential mixed-methods studies (Creswell, 2009). Figure 1-2 shows the stages of this research and the corresponding qualitative, quantitative, or mixed methods: case study, literature study, Q-study, survey study, and validation study. It also shows the research questions and main results.

<table>
<thead>
<tr>
<th>Stages of research</th>
<th>Research question(s)</th>
<th>Main result(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I (Qualitative): Case study (Chapter 2) and Literature study (Chapter 3)</td>
<td>Q1. What are the dimensions, and elements of collaborative relationships in project?</td>
<td>Problems, research focus, theoretical foundation for initial conceptual model</td>
</tr>
<tr>
<td>Stage II (Mixed): Q-Study (Chapter 4)</td>
<td>Q2. How could the practitioners improve their collaborative relationships to ensure successful project delivery?</td>
<td>Practitioners’ perspective and key factors on collaborative relationships</td>
</tr>
<tr>
<td>Stage IV (Mixed): Validation (Chapter 7)</td>
<td>Q5. How can the practitioners improve their collaborative relationship in real-life project practice?</td>
<td>Assessment tool to measure and improve collaborative relationships</td>
</tr>
</tbody>
</table>

Figure 1-2. Research stages, questions, and main results

The first stage is mainly qualitative and consists of a case study and literature study performed in parallel. The case study is an explorative pilot study aiming to gain better
understanding on how the elements of collaborative relationships are perceived and implemented in practice. This is conducted through semi-structured interviews with two project managers each representing an owner and a main contractor involved in a capital project. The literature study identifies and analyzes both conceptual and empirical studies on relationship contracting such as partnering, alliance, and integrated project team. The main purpose of the literature study is to identify antecedents, mediators, and consequences of collaborative relationship in projects and subsequently synthesize an initial conceptual model.

In the second stage, a systematic study based on Q-methodology (a mixed quantitative-qualitative method) is conducted to sort out essential aspects to improve the working relationships between owners and contractors. Empirical data both quantitative and qualitative data are gathered through Q-sorting with project directors, project managers, project engineers, contracting and procurement managers, and sales managers from a number of owners and engineering contractors. This stage aims to explore project practitioners’ perspectives towards the roles of contract, integration, trust, capability, and orientation for developing better working relationship.

In the third stage, the initial conceptual model formulated in the first stage (literature study) and all insights perceived by practitioners resulting from the second stage are further elaborated into a number of hypotheses. A survey is conducted to collect data from project practitioners involved in the execution of capital projects. A quantitative method, in particular, statistical inferential analysis is used to test the associated hypotheses on the mediating role of teamworking that: 1) links the relational factors to project performance; and 2) differentiates the relative effects of different contract types and incentives on project performance.

Finally in the fourth stage, a validation study was performed in cooperation with three owner-contractor pairs. This study applies a mixed method with quantitative and qualitative data analysis embedded in pilot cases. The purpose of this stage is to translate, evaluate, and validate the earlier developed empirical model into an assessment tool for practical use.

1.5. Outline of this dissertation

This dissertation is structured into 8 chapters. The core chapters (Chapter 2, 4, 5, and 6) of this dissertation have been published as separate articles that can be read independently. To follow the chronology of the research, these articles are represented in full length. Chapter 2 (Suprapto, Mooi and Bakker, 2012) presents a case study that explores the practice of collaborative relationships in an engineering and construction project. The findings from the case study are compared to the results from literature study.

Chapter 3 describes a review of various literature on project contracting and relationship contracting like partnering/alliance models. The theoretical basis of the collaborative
relationships is presented. Prior empirical studies are analyzed to compile the essential elements of collaborative relationships.

Chapter 4 (Suprapto, Bakker, Mooi and Moree, 2015) presents a mixed qualitative and quantitative study applying Q-methodology to reconstruct the practitioners’ perception on the key ingredients to improve their collaborative relationships. Systematic analyses of the subjective opinions and reflections of 30 practitioners are reported. Four perspectives are revealed from the analyses. Key factors and elements of collaborative relationship are then discussed and compared across the perspectives.

The research to date in collaborative relationships is limited to critical success factors and not adequately focused towards an integrative model with empirical validation. In Chapter 5 (Suprapto, Bakker and Mooi, 2015) it is hypothesized that the relations between key success factors, collaborative relationship quality, and project performance can be formed into an integrated input-mediator-outcome model. The initial conceptual model from Chapter 3 is further refined and operationalized using the insights gained from Chapter 4. Using a sample of 113 responses, the hypotheses are tested with partial least square structural equation modeling (PLS-SEM). Theoretical and managerial implications of the findings are discussed and compared with related studies on relationship contracting.

How different types of contract and incentives might influence project performance remains an equivocal aspect of project contracting. Chapter 6 (Suprapto, Bakker, Mooi and Hertogh, 2015) extends the model and the analyses reported in Chapter 5 and systematically compares the effects of different contract types (partnering/alliance, reimbursable, and lump-sum) and contractual incentives (with and without incentives) on project performance. Analyzing the similar sample of responses reported in Chapter 5, the relative direct effects and indirect effects (through relational attitudes and teamworking quality) of contract types and incentives on project performance are statistically tested. Key results and managerial implications are discussed accordingly.

Real collaboration in capital projects requires deliberation between management and between project teams from both owner and contractor. Chapter 7 presents the Relational CAPability assessment tool (RECAP) for measuring the current state of the owner-contractor collaboration. RECAP is built from the earlier performed studies, framework, and empirical models described in chapters 2–6. To ensure its validity, the RECAP is applied into three projects with the cooperation of six project practitioners. Specific aspects concerning the practicality, usefulness, and key features of the RECAP are discussed accordingly.

Each of the chapters 2, 4–7 contains an abstract, introduction, method, results, and conclusions concerning the chapter’s specific subject. Chapter 8 outlines the overall research findings as well as an outlook on project-based collaboration, project management, and project performance.
References


Chapter 1


Chapter 2

HOW FAR CAN YOU GO?
EXPLORING A COLLABORATIVE RELATIONSHIP
IN AN ENGINEERING PROJECT
Chapter 2 | Abstract

There has been a significant development, both in practice and in theory regarding collaborative relationships based on formal project partnering. Yet, empirical research shows mixed results of this particular collaborative relationship. This exploratory case study investigates a collaborative relationship between an owner and a contractor in a complex engineering project. With the focus on its essential ingredients, it seeks to understand how a collaborative relationship was perceived and practiced by project managers from both sides. The results indicate that although there was no formal collaborative agreement between the owner and the contractor, both parties were actually doing collaboration as they believe. Some known principles from project partnering and integrated project team were explicitly promoted by both project managers during the course of the project. It also turned out that commitment and support from senior management of the permanent organizations, and project managers’ leadership are necessary ingredients to transcend down collaborative principles into practice at individual level. This research suggests two unresolved issues for future research. First, it is still unclear whether long-term relationship is the result of or the contributing factor to a successful collaborative relationship. Second, there is an ambiguity of trust as perceived by practitioners need to be investigated. Further exploration of these two issues from the perspectives of the project actors can provide alternative explanation on different natures and outcomes of collaboration relationships in complex projects.

Keywords: Collaborative relationship; Team integration; Long-term; Trust.

Note:
- The author of this dissertation contributed in study design, literature search, data collection and analysis, interpretation of data, writing and finalizing the manuscript. The co-authors contributed in interpretation of data and manuscript review.
Chapter 2 How far can you go? Exploring a collaborative relationship in an engineering project

2.1. Introduction

Over the last decade, the efforts in delivering successful engineering and construction projects are increasingly becoming more complex due to increased uncertainty, complexity, time pressure, and technical novelty (Olsen, Haugland, Karlsen and Husøy, 2005; Shenhar and Dvir, 2007; Williams, 2005). Interestingly, cost overruns and time delays are persisted over the time in spite of the development in the professionalization of project management and the range of tools and systems now available (Bakker, Arkesteijn, Bosch-Rekveldt and Mooi, 2010; Morris and Pinto, 2004). Several authors suggest the performance problems in project-based industry are rooted from inadequate inter-firm collaboration and lack of attention to its social dynamics (Morris, 1994; Morris and Pinto, 2004; Morris and Pinto, 2007; Smyth and Pryke, 2008a; Walker and Hampson, 2003b).

In the light of this, owners have increasingly shifted to alternative ways of working with contractors and suppliers. Various forms of collaborative relationships have emerged in the construction industry aiming to align all project parties’ interests and to facilitate a more cooperative and conducive working atmosphere (Rahman and Kumaraswamy, 2005; Smyth and Pryke, 2008b; Xue, Shen and Ren, 2010). Reinforcing these practical developments, there has been a number of emerging practices within the US, the UK, Hong Kong, and Australian construction industry using so-called project ‘partnering’ or ‘alliancing’ to improving collaboration and integration across the project supply chain (for extensive list of literature see Bygballe, Jahre and Swärd, 2010; Xue et al., 2010).

While a lot of success stories were reported on project partnering (for example Barlow, 2000; Bayliss, Cheung, Sun and Wong, 2004; Larson, 1995), there are also some empirical studies highlighting the failure of project partnering (for example Bresnen and Marshall, 2002; Chan, Chan and Ho, 2003; Ng, Rose, Mak and Chen, 2002). Ng’s et al. (2002, p.437) investigation on six Australian Government construction project suggests that “the unwillingness of [the owner] to fully commit to the partnering agreement was the main reason for ineffective project partnering”. Bresnen and Marshall (2002) highlight that current practices of project partnering might put too much emphasis on formal mechanisms (such as contracts, tools and techniques). Such formalization often underplays the important social dimensions of collaboration in practice and the dynamics of relationships among different individuals within an organization and between different organizations. Similarly, in Hong Kong construction projects, Chan et al. (2003) find that the major obstacle of partnering success to be the failure of bringing actual partnering attitude due to commercial
pressure. Alderman & Ivory (2007) call this ‘partnering paradox’ where the ideal form of relationships in partnering is hardly realized in practices mainly due to the existence of adversarial attitudes. In short, project partnering is limited to address adversarial means of the parties in difficult projects, particularly when the project circumstances changed or external pressure emerged (Bresnen, 2007).

Conceptually, there has been some notable works in formulating a framework of collaborative relationships based on its essential ingredients. Some terms such as ‘collaborative relationship’ (Smyth and Pryke, 2008a), ‘relational contracting’ (Rahman and Kumaraswamy, 2008), ‘partnering relationship’ (Bygballe et al., 2010), and ‘relationship management’ (Meng, 2011; Smyth and Edkins, 2007) are often used interchangeably to define a relationship that is characterized by such as aligned goals and interests, open and honest communication, mutual commitment and trust, long-term orientation, joint problem solving and dispute handling among parties which are also not surprisingly overlapping with the principles of project partnering.

In response to a discourse by Bresnen (2007) on partnering principles in practice, we aim to ‘deconstruct’ collaborative relationship from the perspectives of project practitioners, in particular, how they make sense and practice the essence of collaborative relationship in the absence of ‘formal partnering’ mechanisms. This paper reports on finding from an empirical study of an owner-contractor relationship in a complex industrial project. Our intent is to move from an understanding of relationship formation in theory towards an appreciation of the problems of relationship management in practice.

The paper is structured in the following way. First, we discuss the concept of collaborative relationship: what we know about it and its essential elements. Second, we systematically present how a collaborative relationship in a complex engineering project was practiced and perceived by the owner’s and the contractor’s project managers. Finally, we discuss the practical and theoretical implications of our findings.

### 2.2. Collaborative relationship in project setting

#### 2.2.1. What is collaborative relationship in project?

The academic literature suggests that the term ‘collaborative relationship’ in positive sense includes various forms of inter-organizational relationship ranging from strategic alliances, long-term partnerships, supply chain partnership, coalitions, joint ventures, franchises, and consortia covering both vertical and horizontal value chains (Ring and Van de Ven 1992; Spekman, Forbes III, Isabella and MacAvoy, 1998). Collaborative relationship in project context can be considered as a broad term representing a range of practices and contractual arrangements such as project partnering, project alliancing, and supply chain management (Xue et al., 2010); relational contracting (Gil, 2009; Rahman and Kumaraswamy, 2008); and integrated team working (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011b; Rahman and
How far can you go?

Kumaraswamy, 2008). Despite the differences in labeling, each of these practices converge on several common features. Clearly, some features such as aligned objectives between project parties, mutual trust and equity, open communication, knowledge sharing, joint problem solving, fair incentives or gain/pain sharing, and joint risk management are commonly across these practices.

Bresnen (2007) and Smyth & Pryke (2008a) suggest that the attempts to form collaborative relationship should be focused on people and their relationships in addition to contractual arrangement and the practices. Relationships need to be understood and managed at the inter-personal and inter-organizational levels. This raises the needs of management of relationship (Meng, 2011; Rahman and Kumaraswamy, 2008; Smyth and Pryke, 2008a; Walker and Hampson, 2003b) and trust-building (Cheung, Wong, Yiu and Pang, 2011; Maurer, 2010; Nooteboom, Berger and Noorderhaven, 1997; Pinto, Slevin and English, 2009; Seppänen, Blomqvist and Sundqvist, 2007; Smyth, Gustafsson and Ganskau, 2010) to engage people from top management to project team level, from and within the contracting parties (the owner and contractors) to align their values, trust, and behaviors appropriately to the project and long-term business goals.

2.2.2. What are the key ingredients of collaborative relationship in project?

To identify the constituent elements to collaborative relationship, we first conducted a literature search in academic publications in two literature databases (Scopus and Google Scholar) for relevant journal articles published until the end of 2011. The searching was based on several keywords such as ‘collaborative relationship’, ‘relationship management’, ‘project relationship’, integrated (project) team’, and ‘relational contracting’ in combination with ‘construction’, and ‘industrial project’. Based on a collection of 107 articles, we selected only a sample of 11 empirical-based articles in project context for in-depth analysis (see Table 2-1).

By reading and analyzing the sample empirical articles, we identified 24 elements mentioned as critical success factors and indicators of collaborative relationship in project context. The elements listed in Table 2-2 provide sufficient overview on what constitutes to collaborative relationships. However, it is important to note here that most elements were considered as critical success factors. Based on our understanding of these elements we further categorized them into 4 categories, namely: owner-contractor capabilities (CAP), relationship indicators (RI), relationship practices (RP), and relational attitudes (RA) as shown in column ‘category’ in Table 2-2.

a. Owner and contractor capabilities

It is widely recognized that the contractor’s capabilities are the basic requirement for delivering a successful project. Current project procurement procedures inevitably are designed to select the best capable contractor from the market pool (Morris and Pinto, 2007; Pesämaa, Eriksson and Hair, 2009; Pryke, 2009; Turner, 2003; Walker and
Hampson, 2003a). However, with the increasing project complexities, owner’s (in-house) capabilities also become crucial to ensure project performance (Berends, 2007; Miller and Lessard, 2000; Rahman and Kumaraswamy, 2008). The concept of capabilities include financial capacity, prior experience, technical and project management competence, and reputation (Black, Akintoye and Fitzgerald, 2000; Chan et al., 2004; Drexler and Larson, 2000; Rahman and Kumaraswamy, 2008).

**Table 2-1. The sample of past empirical research**

<table>
<thead>
<tr>
<th>No.</th>
<th>Author(s)</th>
<th>Focus</th>
<th>Method and context</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baiden &amp; Price (2011)</td>
<td>The impact of integration on teamwork effectiveness within construction project teams</td>
<td>Case study of 9 construction projects in the UK</td>
</tr>
<tr>
<td>2</td>
<td>Black et al. (2000)</td>
<td>The assessment of the success factors and benefits of partnering from the perspectives of owners, consultants, and contractors</td>
<td>Survey with 78 responses from the UK construction industry</td>
</tr>
<tr>
<td>3</td>
<td>Bosch-Rekveldt et al. (2011b)</td>
<td>The application of value improving practices during FED on project performance</td>
<td>Case study of 5 engineering projects in the Dutch process industry</td>
</tr>
<tr>
<td>4</td>
<td>Chan et al. (2004)</td>
<td>Identifying the critical success factors for partnering projects</td>
<td>Survey with 78 responses in Hong Kong</td>
</tr>
<tr>
<td>5</td>
<td>Cheung et al. (2011)</td>
<td>A framework of measuring trust in construction projects</td>
<td>Survey validation based on 163 responses from Hong Kong construction practitioners</td>
</tr>
<tr>
<td>6</td>
<td>Davis &amp; Walker (2008)</td>
<td>Project alliancing practices in Australia</td>
<td>Case study of 49 senior participants involved in Australia alliancing projects</td>
</tr>
<tr>
<td>7</td>
<td>Drexler &amp; Larson (2000)</td>
<td>The stability (declining and improvement) of the owner-contractor relationship in construction projects</td>
<td>Survey on 276 project cases</td>
</tr>
<tr>
<td>9</td>
<td>Meng (2011)</td>
<td>The effect of relationship management on project performance in construction</td>
<td>Survey with 105 responses from UK construction practitioners</td>
</tr>
<tr>
<td>10</td>
<td>Pinto et al. (2009)</td>
<td>The effects of competence and integrity trust on enhanced owner/contractor relationships and project success</td>
<td>Survey with 92 responses from 44 large construction projects in Northwest Canada</td>
</tr>
<tr>
<td>11</td>
<td>Rahman &amp; Kumaraswamy (2008)</td>
<td>The relative usefulness of various potential strategies and factors for building a relational contracting culture and integrated project team</td>
<td>Survey with 83 responses from Hong Kong construction practitioners</td>
</tr>
</tbody>
</table>
### Table 2-2. Elements of collaborative relationship from literature

<table>
<thead>
<tr>
<th>Elements from literature</th>
<th>Category</th>
<th>Author(s) from Table 2-1</th>
<th>Example of definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner’s technical capability</td>
<td>CAP</td>
<td>2, 4, 7, 11</td>
<td>Owner’s technical capability which includes knowledge and skills in specific area and the ability to generate innovative ideas</td>
</tr>
<tr>
<td>Top/senior management commitment and support</td>
<td>CAP</td>
<td>2, 4, 7, 11</td>
<td>Commitment and support from senior management of the permanent organization from both owner and contractor</td>
</tr>
<tr>
<td>Financial strength</td>
<td>CAP</td>
<td>2, 7, 11</td>
<td>Sufficient financial capacity from different parties</td>
</tr>
<tr>
<td>Prior relationship experience</td>
<td>CAP</td>
<td>11</td>
<td>Prior understanding/relationship experience among contracting parties help build integrated teams</td>
</tr>
<tr>
<td>Mutual objectives, goal alignment, and/or shared vision</td>
<td>RI</td>
<td>1, 2, 3, 4, 6, 7, 8, 9, 11</td>
<td>Mutual objectives ensure that every party’s interests will be best served by concentrating on the same direction towards the overall success of the project for best value and mutual benefits.</td>
</tr>
<tr>
<td>Mutual trust and trust-based arrangement</td>
<td>RI</td>
<td>1, 2, 3, 4, 5, 6, 8, 9, 10</td>
<td>Trust is the willingness to rely upon or be vulnerable towards another party. There are various types of trust such as system-based trust, cognitive-based trust, and affective-based trust</td>
</tr>
<tr>
<td>Open and honest communication</td>
<td>RI</td>
<td>1, 2, 4, 7, 9, 11</td>
<td>An open, two-way communication that is characterized by the exchange of information, sharing ideas and knowledge, which can maximize understanding and stimulate mutual trust</td>
</tr>
<tr>
<td>“No blame” culture attitudes</td>
<td>RI</td>
<td>1, 2, 9</td>
<td>The parties collectively concentrate on finding the best possible solution instead of seeking to minimize their own exposure to poor performance</td>
</tr>
<tr>
<td>Balance or equitable participation</td>
<td>RI</td>
<td>1, 2</td>
<td>All members are treated equal, involved in project decision-making process and significant professional capability needed on the project</td>
</tr>
<tr>
<td>Clear definition of responsibilities</td>
<td>RI</td>
<td>4, 11</td>
<td>The clear responsibilities of participants help the parties should develop aligned relationships to support the objectives</td>
</tr>
<tr>
<td>Joint problem solving and active dispute resolution</td>
<td>RP</td>
<td>1, 2, 4, 7, 8, 9, 11</td>
<td>Joint problem solving need to be focused on problems at the lowest possible level and as early as possible</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>RP</td>
<td>1, 2, 4, 7, 9, 11</td>
<td>Sharing ideas and knowledge, which can maximize understanding and stimulate mutual trust</td>
</tr>
<tr>
<td>Integrated team working</td>
<td>RP</td>
<td>1, 2, 3, 9, 11</td>
<td>The parties working together as an integrated team and is reflected by joint efforts in decision making, problem solving, and continuous improvement</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>RP</td>
<td>2, 5, 9, 11</td>
<td>Constantly monitoring and improving works including reducing duplication, and eliminate waste and barriers in delivering greater value and increasing mutual competitive advantages</td>
</tr>
<tr>
<td>Elements from literature</td>
<td>Category</td>
<td>Author(s) from Table 2-1</td>
<td>Example of definition</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------</td>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Contractor’s early involvement</td>
<td>RP</td>
<td>2, 3, 4</td>
<td>The relationship is developed as earliest as possible during the design or front end phase by involving contractors, major subcontractors and key suppliers</td>
</tr>
<tr>
<td>Performance measurement and benchmarking</td>
<td>RP</td>
<td>4, 9, 11</td>
<td>Performance need to be monitored on a regular basis throughout the project, which helps the team to review progress and identify opportunities for further improvement</td>
</tr>
<tr>
<td>Risk-reward or gain-pain sharing scheme</td>
<td>RP</td>
<td>6, 9, 11</td>
<td>An arrangement to allow the parties to share profits and/or losses due to cost increases and may include satisfaction and recognition; this provides the parties incentives to achieve project goals</td>
</tr>
<tr>
<td>Joint risk management</td>
<td>RP</td>
<td>3, 11</td>
<td>Joint risk management involves identification and mitigation planning of the project risks by the project parties to deal with unforeseen risk events</td>
</tr>
<tr>
<td>Long-term orientation/ commitment</td>
<td>RA</td>
<td>2, 3, 4, 11</td>
<td>Orientation of the parties towards future added values, reputation, and/or repeat relationship</td>
</tr>
<tr>
<td>Adequate resources or willingness to share resources</td>
<td>RA</td>
<td>2, 4, 11</td>
<td>Sufficient allocation of resources from different parties includes knowledge, technology, information, and specific skills</td>
</tr>
<tr>
<td>Organizational cultural compatibility</td>
<td>RA</td>
<td>2, 11</td>
<td>The fitness of the different sets of corporate value toward shared values</td>
</tr>
<tr>
<td>Owner’s commitment and support</td>
<td>RA</td>
<td>2, 11</td>
<td>Owner’s organization-wide acceptance reflected in commitment and support from cross-functional units</td>
</tr>
<tr>
<td>Expectation of future work</td>
<td>RA</td>
<td>11</td>
<td>Expectations of continuity that affect the behavior of parties in the project so that opportunistic behavior may be reduced</td>
</tr>
<tr>
<td>Reflection and self-assessment</td>
<td>RA</td>
<td>1</td>
<td>The awareness and recognition of the team on of each member’s different roles and responsibilities</td>
</tr>
</tbody>
</table>

Note: Category, CAP = owner-contractor capabilities; RI = relationship indicators, RP = relationship practices; RA = relational attitudes.
b. **Relationship practice and indicators**

The term of ‘relationship practices’ has been well recognized in extant of empirical research on collaborative relationship. Examples of relationship practices are: team integration, early involvement, team building, joint problem solving, joint risk management, and performance measurement (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011b; Meng, 2011; Rahman and Kumaraswamy, 2008). In essence such practices are intended to establish the actual collaboration. In other words, relationship indicators of collaborative relationship such as aligned objectives, mutual trust, open and honest communication, no-blame cultures, equitable involvement, and clear definition of responsibilities among parties (both organizational and individuals) are results of relationship practices.

c. **Relational attitudes**

Under relational attitudes, we position inter-organizational trust between owner and contractor and inter-personal trust between individuals in the project team together with organizational cultural fit, long-term orientation, and top management commitment from owner and contractor. Inter-organizational trust is evidence to improve buyer-supplier relationships (Ring and van de Ven, 1994; Zaheer, McEvily and Perrone, 1998) and project performance (Pinto et al., 2009). While inter-personal trust or trust within the project team is considered to catalyze team effectiveness (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011b; Webber, 2008). Organizational incompatibility (cultural and strategic misfits) and lack of top management commitment have often been cited as the reasons for some difficulties or failures in project (Chan et al., 2003; Ng et al., 2002) and in strategic alliance (Dyer, Kale and Singh, 2002; Lorange and Roos, 1993; Powell, 1990). The importance of long term orientation is well-supported in research in long-term buyer-supplier relationship (Cannon, Doney, Mullen and Petersen, 2010; Ganesan, 1994; Kalwani and Narayandas, 1995).

By analyzing a sample of empirical studies, we identify a list of key ingredients for collaborative relationship. This review of empirical research indicates a significant development from prescription approach towards critical approach of collaborative relationships. In our view, only capability and relational factors can be considered as critical success factors (CSFs). Next, we use the identified ‘practices’ and CSFs to analyze the case study.

**2.3. Research methodology**

In this study, the process (oil, gas and petrochemicals) industry serves as the empirical context. The process industry have often been selected for studying project complexity, the role of front-end development, and team integration (Bosch-Rekveldt et al., 2011a; Bosch-Rekveldt et al., 2011b; Merrow, 2011) but not much on project-based relationships. Capital investment projects in the process industry are typically have a technological component, leading to high technical as well as commercial risks. The owners in the process industry can
be characterized as global companies with high degree of purchasing power. This situation fits into what Cox and Ireland (2006) suggested as the required condition for long term relationships. Because capital investment project is significant revenue generating endeavor, the contractors tend to maintain long-term relationships with the owner to sustain future business. At the same time, the owners maintain flexible pools of capabilities from their partners (main contractors, consultants, specialist contractors, key suppliers) to serve their needs.

To explore a potential case, we conducted a close contact with a senior management responsible for global project from an owner company, an international company in the process industry. We asked him to provide potential list of project cases in which the owner have worked successfully and collaboratively with a contractor in a complex project in the past. Finally one project case was chosen based on the availability of project managers from both sides. A so-called project X, a successful engineering and construction project of a refinery expansion in Asia is used as the case. It was completed on schedule and within budget and both the owner “A” and the main contractor “B” expressed general satisfaction with the processes involved and the quality of relations. We also consulted the official statements and press releases from both sides to check the project description and achievement.

The primary data were gathered through semi-structured interview with two project managers, each representing the owner and the contractor. An interview protocol was formulated without preference to any forms of collaborative working relationship and comprising of 5 blocks of questions (see Appendix 2-1. List of indicative questions): a) the company and the profile of the project portfolio; b) the practices in developing a collaborative and long term relationship; c) the key success factors of a collaborative and long term relationship; d) the perceived benefits of a collaborative and long term relationship in general; and e) the challenges in developing a collaborative and long term relationship.

The results of interviews and the subsequent analysis are as follows. First, statements from each project manager are summarized and compared. Subsequently, upon authors’ understanding, some key statements are compared against the expectations from literature.

2.4. Results

The data reported were drawn from semi-structured interviews held with two project managers separately each spent for about two hours each. The owner’s project manager has more than 13 years experience in managing projects in the process industry, while the contractor’s project manager has more than 30 years experience in managing engineering projects. The resultant interview transcripts (nearly 18 pages in total for the two interviews) were summarized manually to capture key insights based on key terms of the questions. Any
How far can you go?

information regarding companies, projects, and interviewees’ personal information are treated anonymously.

2.4.1. Companies background

Company A (the owner) is a global company owning and operating oil, gas, and petrochemicals facilities in both upstream and downstream. Company A invests in hundreds of capital investment projects around the world, varying in sizes from small asset-based projects, to major projects and mega-projects. The downstream projects are highly characterized by the very narrow margin. So the focus in downstream projects is more about how to improve the productivity of the existing processing facilities, as well as complying with legal requirements. The focus of upstream projects is on how to add new and maintain the existing production capacity. Upstream projects are often implemented in joint ventures with international and national oil companies. With regard to the management of capital investment projects, company A has established a project management office that focuses on managing the delivery of major projects globally and the development of effective project management practices.

Company B (the contractor) is a global engineering and construction contractor. The company employs thousands of professionals with specialized expertise around the world. Company B considers itself as a collaborative EPC (engineering, procurement, and construction) company. This is reflected from its core values of valuing people and teamwork. In the past, Company B has been working with Company A for several engineering and construction projects in integrated teams.

Project X was a downstream project to expand a refinery in Asia. The objective of this project was to provide advantaged feedstock to a new (expanded) petrochemicals plant. The project was started in the third quarter of 2005 and completed in 2010. The owner appointed Company B for conducting front end development (FED) work. The FED work resulted in a comprehensive basic design engineering package and the associated cost estimate. After completing the FED work, Company B was again assigned as the main contractor to manage the whole engineering, procurement, and construction package on behalf of the owner. In short, the project was executed using an EPCm (Engineering, procurement, and construction management) approach with a target cost reimbursable contract. During the construction, the project team faced complex challenges such as space restriction due to working in a ‘live plant’ situation; limited site access and logistics; and very high safety expectations.

Project X was considered a successful complex project by both parties. This was reflected from the disclosures of success from both sides. The owner’s project manager disclosed a statement: “This was a complex project executed in a difficult economic climate. The joint project team should be rightly proud of its world-class performance and in particular its excellent safety record.” While the contractor’s project manager confirmed a similar
message: “Together we were stronger. The integrated teams were highly motivated to succeed right from the start and I am very, very proud of this very successful project.” Both sides acknowledged the success of the project (completed in time, excellent safety performance, and successful start-up) was largely due to the in-depth understanding of the project and the excellent working relationship that developed between the owner and the contractor teams. Furthermore, both sides recognized the importance of the owner’s full support and their joint commitment.

2.4.2. Practices in building the relationship

Table 2-3 summarizes the practices of relationship building exercised by both project managers during development and execution phases of project X.

<table>
<thead>
<tr>
<th>Question</th>
<th>Owner’s view</th>
<th>Contractor’s view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practices during development phase</td>
<td>• Forming a ‘behavior charter’</td>
<td>• Developing an agreement with all members on shared values</td>
</tr>
<tr>
<td></td>
<td>• Team building exercises</td>
<td>• Team building exercises</td>
</tr>
<tr>
<td></td>
<td>• Open communication</td>
<td>• Open communication</td>
</tr>
<tr>
<td>Practices during execution phase</td>
<td>• Forming a ‘behavior charter’</td>
<td>• Developing an agreement with all members (including sub-contractors) on shared values</td>
</tr>
<tr>
<td></td>
<td>• Open communication</td>
<td>• Open communication</td>
</tr>
<tr>
<td></td>
<td>• Team building exercises</td>
<td>• Team building and ensuring adaptability</td>
</tr>
<tr>
<td></td>
<td>• Recognizing and rewarding</td>
<td>• Focusing on achieving collective results through joint problem solving</td>
</tr>
<tr>
<td></td>
<td>• Joint problem solving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Providing ongoing support to contractor (access, permit, logistics,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>alignment with operation)</td>
<td></td>
</tr>
<tr>
<td>Practices for building a long-term relationship across projects</td>
<td>• Recognizing and rewarding the project teams performance and behavior</td>
<td>• Meeting the owner’s expectations on safety, cost, schedule, and quality of relationship</td>
</tr>
<tr>
<td></td>
<td>• Disclosure of the achievements from both parties’ top management</td>
<td>• Aligning the project results with the objectives by having regular reviews on project progress and results, continuous improvement, and tracking owner expectations</td>
</tr>
<tr>
<td></td>
<td>• Monitoring relationship with a particular contractor for quality and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>performance over projects (performed by a relationship manager)</td>
<td></td>
</tr>
</tbody>
</table>

Source: interviews

As the foundation of building collaborative relationship, both project managers admitted the effectiveness of behavioral alignment, team building exercises, and open communication in the project during both development and implementation phases. Behavioral alignment was reflected in formalizing shared values such as honesty, accountability, trust, sharing and lessons learned into behavioral agreement or charter. As the project progressed to execution phase, these practices were transcended down to sub-contractors and suppliers. Both project managers also recognized joint problem solving as another important practice during the project execution phase. Interestingly, owner’s project manager revealed two additional practices during project execution phase which centered on owner’s supportive
actions. First, the owner pro-actively induced teams’ and individuals’ good behavior and performance by applying recognition and reward. And second, the owner provided ongoing supports to streamline the contractor’s tasks such as taking care of permits, logistics access, and alignment with owner’s operational team.

With regard to the practices for building a long term relationship, both project managers seem to have different views. The owner’s project manager tended to focus on the practices for stimulating long term orientation through recognition and reward mechanism both for the project team and the firms involved. Moreover, the owner’s project manager revealed the role of a relationship manager for monitoring and maintaining relationship with a particular contractor across projects.

On the other side, the practices for building a long term relationship in the view of the contractor’s project manager should be aimed at delivering a successful project and ensuring the project results align with the objectives and satisfy the owner. This was done by practices such as regular reviews, continuous improvement, and tracking project performance on safety, cost, schedule, and relationship quality. Obviously, the contractor’s project manager considered the practices for delivering a successful project as the means for building a long term relationship with the owner.

2.4.3. Key success factors of the relationship

Table 2-4 summarizes the perceived key success factors from both project managers with regard to their collaborative and long term relationship. Moreover, Table 2-4 also highlights their perceptions on the success factors identified from literature (i.e.: culture, non-financial incentives, owner and contractor capabilities, and contract types).

Success factors for collaborative relationship

Although there are some variations in articulating key success factors, in essence both project managers established that the key success factors for a collaborative relationship are an integrated project team, trust and engagement among people in the project team, and leadership. An integrated project team was the first key success factor for collaborative relationship in which all people in the project team fully understand and own the same objectives. Furthermore, all people in the project team need to be engaged emotionally towards the project objectives and required behaviors. Trust here implies the trust between people within the project team and the trust between the project team and the parent organization. Consistent display of joint leadership from both sides (the owner and the contractor) was considered as a crucial element for ensuring collaborative behavior excelled among people in the project team.
Table 2-4. Key success factors of the relationship

<table>
<thead>
<tr>
<th>Question</th>
<th>Owner’s view</th>
<th>Contractor’s view</th>
</tr>
</thead>
</table>
| Success factors for this collaborative relationship | • Integrated project team  
• Trust among people in the project team  
• Engagement and emotional attachment in the project team  
• Consistent and passionate display of leadership  
• Getting people in the organizations truly believe in the project team | • Full understanding of owner’s expectations related to project objectives and reporting requirements  
• Visibility and engagement with all people in the project teams at all levels  
• Developed trust by proven performance |
| Success factor for this long-term relationship | • Trust from repeated successful relationships  
• Long term orientation beyond project-by-project at the senior management level from both sides  
• Openness, fairness and honesty in communicating and understanding each side’s business expectation | • Trust ensures long-term relationship  
• Trust is developed through delivered performance on promised  
• Treat owner’s objectives as the objectives for everyone |
| The role of culture | • Understanding cultural differences is important to build mutual understanding  
• Consistency in displaying trust and confidence among people | • Individual attitudes are more important aspect than culture  
• Culture in project team is developed over time |
| Effective nonfinancial incentives | • Clear appraisal criteria on hard deliverables and behavioral performance  
• Recognition and reward on good behavior and performance | • Recognition of performers within a team to encourage healthy competition within the team  
• Recognition and reward for team performance |
| Key owner’s capabilities | • Commitment and support  
• Reputation in treating contractors  
• Competent internal team | • Financial strength  
• Reputation in treating contractors  
• Competences |
| Key contractor’s capabilities | • Competent team  
• Good collaborative attitude  
• Reputation and long term orientation | • Competent team  
• Company reputation  
• Project execution plan  
• Financial strength |
| Lump sum contract on the relationship in a project | • Less owner’s involvement  
• Tends to create adversarial attitudes  
• But there is room for building collaborative relationship | • Less owner’s intervention thus more flexibility to execute the project  
• Less burden on reporting requirement  
• Potentially ignore long-term orientation |
| Reimbursable contract on the relationship in a project | • More owner’s involvement  
• More transparent so less barriers to stimulate collaborative relationship  
• But it does not always lead to collaborative relationship | • More owner’s involvement and support  
• Owner and contractor can develop an integrated team  
• More pressure from owner on cost and schedule |

Source: interviews

**Success factors for a long term relationship**

For building a long term relationship, both project managers again raised the importance of trust from the owner and the contractor at the organizational level. Trust in this context was
regarded as the developed trust from a successful project or repeated projects. Interestingly, the owner’s project manager put two additional factors, long term orientation and open, fair, and honest communication. Long term orientation encapsulated the intentions of both sides in maintaining a relationship at senior management level from both firms across projects. While openness, fairness and honesty in communicating each side’s business expectations would ensure better and faster alignment for future projects. It is important to note here that a long term relationship does not guarantee a future project, since each project has its own selection and contracting processes.

The role of culture
Both project managers considered the mutual culture as an important factor in terms of attitudes and consistent display of trust and confidence. Recognizing the differences in individual and organizational cultures are necessary but more important attention should be addressed on building mutual understanding or team culture behavior among all people within the project team.

The effectiveness of non-financial incentives
With regard to non-financial incentives, both project managers stated the importance of recognition and reward built upon good behavior and performance. A recognition and rewarding mechanism was considered to be an effective instrument to stimulate healthy competition between people within a sub team and between sub teams within the project team while at the same time encouraging collaborative working towards common objectives.

Owner’s and contractor’s capabilities
Owner’s capabilities, particularly in terms of reputation in treating contractor and competent project team were considered by both project managers as the key success factors for a collaborative relationship. There were two different aspects emerging from each side. Owner’s project manager added the importance of owner’s commitment and support to the contractor, while contractor’s project manager added the financial strength of the owner. Both sides recognized similar perceptions on contractor’s capabilities in terms of contractor’s competence and reputation. Additionally, the owner’s project manager mentioned that the contractor needs to have good collaborative attitudes and long term orientation. On the other hand, the contractor’s project manager mentioned contractor’s project management capability (for example, project execution plan) and financial strength as additional elements.

The role of contract types on the relationship quality
When asked about their opinions regarding the potential influence of different contract types (lump sum versus reimbursable) on the efforts in building collaborative relationship, both project managers shared common opinions. On one extreme, a lump sum contract means less owner’s intervention (or less involvement) therefore it offers more flexibility and
less administrative burden to the contractor in executing a project. But it certainly has some drawbacks. A lump sum contract tends to create adversarial relationship and ignore long term orientation. On the other end, a reimbursable contract means more owner’s involvement and support can be expected, less barriers to building a collaborative relationship and an integrated team. But a reimbursable contract also has some drawbacks for the contractor’s perspective. Surprisingly, the contractor’s project manager claimed that a reimbursable contract often creates more pressure to the contractor on achieving target cost and schedule. Certainly, this is not how the owner sees it.

Interestingly, the owner’s project manager raised an important note that despite the use of a lump sum contract, a collaborative relationship is still possible in a project. The reason is that a collaborative relationship is not necessarily solely relied on contractual terms as long as both parties fully recognize the needs of and commitment to working together in an integrated team. The same logic also applies to a reimbursable or incentive-based contract that it does not automatically create a collaborative relationship. This view implies that regardless the choice of contract type, a collaborative relationship in a project can be developed based on both parties’ mutual interest, intention, and commitment.

In the case of project X, an EPCm (engineering, procurement, construction, and management) unit rates with target cost contract (a variant of reimbursable contract) was chosen based on the owner’s perception on the project complexity and the prevailing market condition (contractors availability). Perhaps what we can infer from this finding is because it is more open book and transparent, a reimbursable contract reduces the barriers to a collaborative relationship more than a lump sum contract does.

2.4.4. The benefits of the relationship

Table 2-5 summarizes the owner and the contractor’s views on the meaning and the benefits of their collaborative and long term relationship. Both owner and contractor shared a common view that a collaborative relationship is a means to form an integrated project team with win-win or no blame attitudes. In short, both project managers recognized that it is the people working together based on win-win attitudes and shared culture that could deliver a successful project.

Interestingly, the owner’s project manager indicated that a long term relationship with a particular major EPC contractor was not always applied across all business units within the company. Given that there is a limited pool of capable EPC contractors for a large number of major projects in the world, ultimately the owner would have worked with particular major EPC contractors. By having regular working relations and successful projects with a particular EPC contractor, both owner and contractor would eventually develop a long term relationship. The contractor’s project manager indicated that a long term relationship with a particular owner was the result of repeated works in several projects. Clearly, both project managers have similar perception regarding the meaning of a long term relationship.
Table 2-5. Benefits of the relationship

<table>
<thead>
<tr>
<th>Question</th>
<th>Owner’s view</th>
<th>Contractor’s view</th>
</tr>
</thead>
<tbody>
<tr>
<td>The meaning of collaborative and long term relationship</td>
<td>• Collaborative relationship as a way to manage working relations with people in the project based on win-win attitudes</td>
<td>• Collaborative relationship as a way to develop integrated project team since it is the people, the culture, and the system and procedures that deliver a project</td>
</tr>
<tr>
<td></td>
<td>• Long-term relationship as the result of regular work relations and successful projects</td>
<td>• Long term relationship as the result of repeated work relations and successful projects</td>
</tr>
<tr>
<td>The benefits of having a collaborative relationship</td>
<td>• Enables the project teams to stay focused on the project objectives to deliver a successful project (safe, high quality, on time, and within budget)</td>
<td>• Integration of project teams and teamwork resulting in high performing project teams</td>
</tr>
<tr>
<td></td>
<td>• Enables the project teams to have better engagement with project stakeholders and to deal with external issues</td>
<td>• Successful delivery of project from satisfied relationship with the owner</td>
</tr>
<tr>
<td></td>
<td>• Allows effective problem solving on real issues thereby reducing potential claims or disputes</td>
<td>• Self-interested behavior can be reduced</td>
</tr>
<tr>
<td>The benefits of having a long-term relationship</td>
<td>• With an EPC contractor, long term relationship enables better value for money and reduced learning curve</td>
<td>• Enables repeated projects through developed trust</td>
</tr>
<tr>
<td></td>
<td>• For small or site-based projects, a long term relationship allows cost efficiency (either through long-term or portfolio contract)</td>
<td>• Continuous business enables better value for money for the owner and assures future business for the contractor</td>
</tr>
<tr>
<td></td>
<td>• Ensures on-going learning process that enables owner to drive better safety programs and major improvement overtime</td>
<td>• Quick adaptation due to familiarity of both the parties to the system and procedures</td>
</tr>
<tr>
<td></td>
<td>• Allows both sides to mitigate potential claims or disputes at the top management level</td>
<td>• Improvement through joint development in particular area such as process, safety, project management tools, sharing lessons learned.</td>
</tr>
</tbody>
</table>

Source: interviews

In essence, both project managers shared a similar view on the benefits of collaborative relationships. An integrated project team was mentioned as the immediate effect of a collaborative relationship in a particular project. Although mentioned in different terms, a successful project - a project that meets the safety and quality requirements, on time, within budget and satisfied owner was considered as the consequence of team integration, owner’s commitment and support, and effective problem solving. An integrated team here is defined as a team that focuses on a common goal (project objectives) and shares a common behavior. An important view of the owner’s project manager is that a collaborative relationship enables the project team to engage with the project stakeholders and to address external issues more effectively.

With regard to the benefits of long-term relationships, both project managers indicated that a long term relationship enables better value for money and reduced learning curve as well
as facilitates continuous improvement through learning process. Repeated relationships over several projects would increase each party’s confidence and understanding of each other’s capabilities and commercial interests. As the consequence, both parties can better focus on discussing real issues to demonstrate better value for money for both sides. The reduced learning curve is considered as the result of familiarity of both parties with the ways of working and organization culture and enables quick adaptation among the project teams. Continuous improvements could be achieved through joint efforts in the development of project processes and management tools and sharing lessons learned. Furthermore, both project managers recognized that there are economic incentives for having a long-term relationship to both sides (i.e.: value for money, long-term gains from continuous improvement, repeat business).

Furthermore, the contractor’s project manager mentioned that the benefits of a long term relationship to his company are the developed trust and thus securing future projects from the owner. The developed trust here can be regarded as the trust gained from delivering successful outcomes, satisfied owner, and healthy working relations across projects. Interestingly, the owner’s project manager pointed out that an additional benefit of a long term relationship is that there is a place at higher level from both sides (senior management levels from both sides) to resolve any issues and conflicts in an individual project before they are escalated into contractual claims or disputes.

2.4.5. Challenges in developing the relationship

Table 2-6 summarizes some perceived challenges and risks that potentially emerged from a collaborative and long term relationship, as well as the associated mitigation. In general, some of the challenges in realizing a collaborative relationship were expressed as “different business objectives from both sides”, the “real behavior was not always as expected” or difficulty in “ensuring all people or parties involved to behave truly collaborative”, “a tension between ensuring contractor’s accountability and driving close relationship”, and some degree of internal “reluctance within owner’s organization” towards collaborative relationship.

Both project managers have different perceptions regarding the risks in applying a collaborative and long term relationship. From the owner’s point of view, the risks might emerge around a perceived fear of a ‘cozy relationship’. If not properly managed, having a long term relationship or a relationship that endured quite a long time might reduce the team performance due to the fact that when people get too comfortable to each other as such the necessary healthy tensions might disappear. Also, there was a perception from the owner that a contractor would reserve its best people for a project with lump sum contract (perceived as a project with high risk and high margin) and not for a project with reimbursable contract (perceived as a project with low risk and low margin).
Table 2-6. Challenges in developing a collaborative and long term relationship

<table>
<thead>
<tr>
<th>Question</th>
<th>Owner’s view</th>
<th>Contractor’s view</th>
</tr>
</thead>
</table>
| The challenges in applying collaborative and/or long term relationships in general | • Difficulty in getting people to really understand and display collaborative behavior  
• A tension between ensuring accountability and at the same time driving a close relationship  
• Overcoming skepticism and reluctance of all people with the team and the organizations | • Different objectives from both sides  
• Owner’s real behavior is not always as expected |
| The risks that have often emerged from a collaborative and long term relationship in general | • If not properly managed, a long term relationship potentially decreases the performance due to people becoming too comfortable with each other and healthy tensions disappeared  
• With a long term relationship, there is a fear that the contractor does not always put its best people on the project | • Owner’s direct intervention with sub-contractor’s top management without involving project manager  
• Owner’s auditor challenging actions instead of supportive  
• Owner’s requests on the report and information often steer the project team away from main issues  
• Potential conflicts with owner’s internal team (particularly with the operation team) |
| Addressing the challenges in a collaborative and long term relationship | • Clear and passionate display of leadership from both sides  
• Engendering real collaborative behavior in practice within the project team and the firms involved  
• With regard to long term relationship, introduce some changes or refreshment into the project team | • Supportive actions from owner’s project manager |
| Mitigating the risks from a collaborative relationship | • Commitment and supportive actions from both parties’ senior management | • Supportive actions from owner’s project manager |

Source: interviews

From the contractor point of view, there were so called relational risks that might emerge from a collaborative relationship. The contractor’s project manager mentioned several relational risks typically emerging in a collaborative relationship. Foremost are the owner’s intervention and direct communication with sub-contractor’s top management without involving contractor’s project manager; challenging actions from owner’s team or an individual to the contractor’s works instead of being supportive; and some individual tends to seek additional reports and technical information which potentially steers the project team away from focusing on main issues. Also in many cases, the contractor often faced coordination problems with the owner’s individuals (including from operation). If not properly managed, these risks could end up with conflicts that in turn lead to delays and cost overrun.
When asked what could be done to address the challenges in a collaborative relationship, both project managers stressed the importance of the top management’s commitment and support. To be more specific, the owner’s project manager underlined that leadership from both sides, engendering truly collaborative behavior within the project team and within the parent organizations were crucial to overcome these challenges. Important to note here, the contractor’s project manager tended to rely only on the owner’s commitment and supportive actions. It seems that the contractor has adopted one-sided attitudes in facing the challenges.

To mitigate the aforementioned risks, the owner’s project manager suggested that such risks can only be managed through commitment and supportive actions from both parties’ senior management. While the contractor’s project manager had one-sided view that relational risks can only be mitigated by commitment and supportive actions from the owner’s project manager. In case of project X, contractor’s project manager believed that the owner’s project manager had put his efforts in resolving most of the issues coming from within the owner’s cross functional team, engaging all stakeholders, and ensuring an agreement to the benefit of all parties.

2.5. Discussion

The present preliminary case study indicates that a collaborative and a long term relationship are promising concepts for relationship management research in project context. As Bresnen (2007) argued a more critical view would offer a clearer understanding on how collaborative relationships work in practice. In the next sub sections we confront the key findings regarding practices, success factors, meanings, benefits, and challenges of a collaborative and long term relationship with findings from literature.

2.5.1. Relationship building practices

The findings indicate that behavioral alignment, team building exercises, open communication, and joint problem solving are important practices for building a collaborative relationship in the project case. This result supports what has been prescribed in extant literature on project partnering, alliancing, and collaborative working (Bennet and Peace, 2006; Mosey, 2009; Thomas and Thomas, 2005) and corroborates existing research in relational contracting (Meng, 2011; Rahman and Kumaraswamy, 2008).

The findings also suggest that a long term relationship can be built upon trust through successful project(s) and satisfactory collaborative relationship(s). This support what scholars suggested the important role of the ‘shadow of the past’ in which prior successful relations build inter-organizational trust (e.g., Adobor, 2005; Ahola, 2009; Gulati and Gargiulo, 1999; Poppo, Zhou and Ryu, 2008; Zaheer et al., 1998). However, as noted by the owner’s project manager, some deliberate practices are needed to maintain a long term relationship. One practice is providing recognition and non-financial reward for both
individuals and firms involved in a successful project. Another practice is through management of relationship at the firm level between the owner and the contractor. From theoretical perspective, these practices relate to relationship-specific investments to drive so called the ‘shadow of the future’ or the expectation of continued relationship in which it is necessary to promote cooperation and build inter-organizational trust (Ahola, 2009; Poppo et al., 2008).

2.5.2. Key success factors

Based on the above description, both project managers shared a similar view that an integrated project team was the key success factor for building a collaborative relationship. This view was based on their recognition that the people involved play the key role in delivering a successful project. Here, integration was perceived as integration of all people from all parties involved (owner, contractor, sub-contractors, and suppliers) into a single team with single focus and shared objectives and values. Other success factors such as trust within project team, engagement with all people in the project team, and mutual culture can be considered as key attributes of an integrated project team (Baiden and Price, 2011; Forbes and Ahmed, 2011; Thomas and Thomas, 2005).

Interestingly, although both project managers shared a similar view, their perceptions on the degree of the integration were quite different. The owner’s project manager considered team integration should include the people from the owner’s different organizational functions (such as senior management and operation). While the contractor’s project manager still restrict the integration within the people or organizations who involved directly in performing the project activities. Regardless this difference, the evidence of integrated project team in the project case supports prior empirical studies (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011b) that team integration contributes significantly to the project performance.

Other mentioned success factors that reflect organizational capabilities such as reputation, financial strength and competent team have been well recognized in other empirical research (Black et al., 2000; Drexler and Larson, 2000; Rahman and Kumaraswamy, 2008). Interesting to discuss is leadership, a success factor that was often mentioned in the literature (Andersen, 2010; PMI, 2008) but received lack of attention in the research on collaborative relationship. Based on his study of 128 Norwegian projects, Andersen (2010) suggests that for managing a successful project, it is of importance to have the focus on the motivation of the team members besides their competences (knowledge and experience). Good management or leadership is considered as the key success factor for motivating the project team (Andersen, 2010).

Two success factors for building a long term relationship, inter-organizational trust and long term orientation are worth of further discussion. As discussed earlier, these success factors seem to overlap with the practices for building a long term relationship. Inter-organizational
trust that built upon prior or repeated successful project(s) is also known as an accumulated concept in the extant literature (Davis and Walker, 2008; Pinto et al., 2009; Poppo et al., 2008; Schoorman, Mayer and Davis, 2007). Conceptually, long term orientation is considered as an element of inter-organizational trust (Ahola, 2009; Poppo et al., 2008) and therefore leads to a long term relationship (Kadefors, 2004; Rousseau, Sitkin, Burt and Camerer, 1998). These findings suggest the intertwined relations between trust, long term orientation, and the actual long term relationship.

2.5.3. The relationship benefits

As expected from literature, the benefits of collaborative relationship in a particular project were attributed to the formation of an integrated project team. What implies from this view is an overlapping understanding regarding the results of a collaborative relationship and project team integration in practice. Perhaps this is not so surprising that in actual practice, integration often refers to best practices, methods and behaviors that promote a working atmosphere in which various parties can exchange information freely, synchronize their efforts seamlessly, make decision and solve problems jointly (Baiden and Price, 2011; Rahman and Kumaraswamy, 2008).

The benefits of a long-term relationship in this study were mentioned as better value for money, reduced learning curve, and continuous improvement through learning process. It is important to note here, these benefits imply increased values from repeated relationships over several projects (Bennet and Peace, 2006; Eriksson and Westerberg, 2011).

2.5.4. The challenges in collaborative relationship

There were three most revealing challenges in developing a collaborative and long term relationship identified in this study.

The first major challenge was that both project managers can experience problems like role ambiguities and conflicts, unexpected intervention form the owner’s internal teams, and reversion at times to more traditional structures. These problems are to be expected when forming teams for the first time (Dent, 2004) and are not uncommon in project setting (Bresnen and Marshall, 2000; Thomas and Thomas, 2005). What was noticeable from this case study is the difficulty experienced in embedding the agreed behavior protocol at senior level into effective working relationships at operational level. With respect to embedding the principles or values of collaborative relationship into project team members, there was clearly some degree of difficulty. It is widely recognized in the literature that formal team-building exercises can help ease the situation (Meng, Sun and Jones, 2011; Rahman and Kumaraswamy, 2008). However, it was also evident that they were not in themselves seen as sufficient to establish close, well-integrated collaborative relationships. As stated by both project managers, on-going experiences, developed trust, actual performance, leaderships, as well as recognition and reward were the critical success factors of easing the project team members into a truly collaborative working relationship. Significantly, these dynamics were
just as important in Project X, where continuity in the relationship at corporate level was also matched by continuity at the level of the team.

The second major challenge was found in the difficulties faced by contractor’s project manager in *interfacing* with owner’s internal teams. Again, these difficulties are to be expected, given what we know of the tensions caused by cross-functional conflicts within an organization and project teams (Morris and Pinto, 2007; Turner, 2009). In particular, there were continuing problems perceived by the contractor in accommodating owner’s operational team, getting auditor approval, and direct intervention by owner’s team members to the sub-contractors and suppliers. Again, in case of Project X, this challenge was mitigated by *strong commitment* and *supportive actions* from owner’s project manager.

Finally, the third major challenge was related to the fear that a long term relationship becomes a ‘cozy relationship’. The notion of cozy relationship can be traced back to the relationships between the UK defense ministry with its contractors during 1970s, which led to *dependency* and *non-competitive* relationship (Parker and Hartley, 1997). Indeed current commercial practices (contracting and procurement practices) impose tendering processes for any new project as a *mechanism for renewing* a long term relationship with a particular contractor. The implication of this challenge is then in what ways the owner and the contractor can build a long term relationship across projects. This remains unclear.

### 2.6. Concluding remark

The findings suggest that *team integration* is useful for building an effective collaborative relationship in a project. Team integration-related practices such as *team alignment*, *team building exercises*, *open communication*, and *joint problem solving* were regarded as the most important practice for developing a collaborative relationship. This research, therefore, supports the position that team integration is desirable in ensuring team effectiveness (Baiden and Price, 2011) and potentially lead to better project performance (Bosch-Rekveldt et al., 2011b; CII, 2011). The results also show, however, that the extent of team integration can be given different priority in the eyes of owner and contractor.

Another important finding is a distinction between collaborative relationship and long term relationship. A long term relationship can be expected to be formed from successful prior project(s) between an owner and a contractor yet some deliberate practices to manage expectation on the relationship continuity still need to be done at the firm level.

The result suggests two potential managerial implications. *First*, along with the importance of the practices and success factors, more attention is needed to ensure a true integration of key individual actors from all related functional units of the owner and from the contractor, sub-contractor and suppliers. *Second*, the engagement of management at various levels within the organizations from the contracting parties is needed to mitigate any potential challenges and relational risks that might still emerge in collaborative relationship.
Implication for research is that the role of long term relationship is still unclear whether it is the result of or the contributing factor for a successful collaborative relationship. The latter seems to follow the evolutionary logic that successful project(s) induces repeated relationships and therefore creates a long term relationship. While the former follows the design logic that a long term relationship can be designed to induce a collaborative relationship between owner and contractor and therefore better results across projects. Further research needs to be conducted to clarify these intertwined concepts based on the perception of the project actors.

Further research is also needed to investigate the dimensions of trust and the influence of these dimensions to the nature and outcome of the working relationship. Different dimensions of trust, such as competence trust, relational trust, and institutional trust, have been suggested to play different roles in the projects relationships (Cheung et al., 2011; Rousseau et al., 1998; Wong, Cheung, Yiua and Pang, 2008). Some authors suggest the importance of inter-organizational trust on the formation of long-term relationship (Ring and van de Ven, 1994; Zaheer et al., 1998). Because inter-organizational trust tends to institutionalized within the permanent organizations, it is more stable and enduring compared to inter-personal trust embedded in the individuals that come and go across different projects (Bachmann and Inkpen, 2011; Seppänen et al., 2007). By investigating trust at both inter-organizational and inter-personal levels could shed some light on collaborative or long term relationship in project setting.

Finally, we should admit sever limitations of this paper. It should be considered as an initial work toward future investigation on how different perspectives and mindset of the key project actors’ in collaborative relationships might affect the collaboration outcome in projects. Clearly, more owner-contractor dyads and each with more informants are required to obtain more representative practitioners’ and a systematic discourse analysis is needed to structure the future research.
References


Ahola, T., 2009. Efficiency in project networks: the role of inter-organizational relationships in project implementation, Department of Industrial Engineering and Management. Helsinki University of Technology, Helsinki, Finland.


Chapter 2


How far can you go?


## Appendix 2-1. List of interview questions

<table>
<thead>
<tr>
<th>Category of question</th>
<th>Indicative questions</th>
</tr>
</thead>
</table>
| **A. Company & respondent profile** | 1. Company profile  
2. Number of project managers in your company  
3. Experience in managing projects |
| **B. Practices for developing a collaborative and long term relationship** | 4. What practices are there during FED phase in order to build a collaborative relationship? Are they effective?  
5. What practices are there during execution phase in order to build a collaborative relationship? Are they effective?  
6. What practices are there for building a long-term relationship with an owner or a contractor across projects? Are they effective? |
| **C. Key success factors of a collaborative and long term relationship** | 7. What are the key success factors of collaborative relationships? Why?  
8. What are the key success factors for long-term relationships? Why?  
9. How did trust play a role in the relationships?  
10. How did organizational culture play a role in the relationships?  
11. What non-financial incentives are the most effective to encourage effective collaboration? Why?  
12. What owner’s capabilities are the most important for stimulating effective collaboration in projects? Why?  
13. What contractor’s capabilities are the most important for stimulating effective collaboration in projects? Why?  
14. In what ways can the contract type stimulate/inhibit collaborative relationship? |
| **D. Benefits on a collaborative and long term relationship** | 15. What does a long-term and/or collaborative relationship mean to your company?  
16. What are the benefits of having long-term relationships to the project performance, learning and innovation and business/operational performance  
17. What are the benefits of having collaborative relationships to the project performance, learning and innovation and business/operational performance |
| **E. Challenges in a collaborative and long term relationship** | 18. What challenges are there in applying collaborative and/or long term relationships in general?  
19. What risks have often emerged from the relationships with the contractors?  
20. How could you manage those risks? |
Chapter 3

COLLABORATION IN PROJECTS:
A LITERATURE REVIEW
Chapter 3 | Abstract

This chapter lays a theoretical foundation for conceptualizing collaborative relationships in projects. Firstly, the challenges and research perspectives in managing projects are presented as the background. Secondly, recognizing the performance problems in projects, common causes and success factors associated with owner-contractor relationships are highlighted. Thirdly, based on a review of literature on project contracting and relationship contracting, the concept “collaborative relationship” is positioned within this research. Subsequently, a systematic review of empirical studies provides a list of critical success factors for collaborative relationships. Finally, an initial conceptual framework of collaborative relationships is proposed as the basis for subsequent study.
Chapter 3  Collaboration in projects: A literature review

3.1. Management of projects

Over decades, project management has evolved from execution-based focus ‘on time, in budget, to scope’ towards a more broad and strategic approach particularly to include managing the definition of the project (Morris and Pinto, 2004). Inspired by a staggering fact of project overruns from about 3,600 projects realized in the period between 1959 and 1984 (Morris and Hough, 1987), Morris (1994) introduces the term management of projects. Morris and Pinto (2004) define management of projects as managing the front-end definition, the delivery of projects, and the early operation/start-up of the project results. Implication of this view is that the project lifecycle is no longer considered as separated stages with different responsible actors but rather as an integrated process. Project lifecycle begins with project definition (including concept, feasibility, and the early define phases), then the traditional project delivery (including the later define, execute, and close-out/completion phases) and finally ends with the start-up phase. Management of projects also includes other functional area such as strategy and finance, technology, supply chain and procurement, and organizational as well as their interactions to the external factors such as political, economic, social, technical, legal, and environmental.

A similar distinction between traditional project management and management of projects is also suggested by Turner. In the Handbook of Project-based Management, Turner (2009) suggests that each project takes place within a context, which itself has three components: the strategy of the parent organization, the project strategy, and the people involved. He distinguishes five phases of typical project life-cycle: concept, feasibility, design, execution, and close-out in which the first three phases should be linked into those three components. In hindsight, what Morris, Turner, and other scholars suggest is that a traditional or tools-based approach is inadequate to ensure successful delivery of projects that are increasingly more complex, uncertain, and multidimensional. Projects cannot be managed in isolation neglecting the influence of or interaction with the organizational and external environmental aspects.

In line with the management of projects, research focus in project management has shifted from hard aspects (traditional) towards soft (people and social) aspects. Söderlund (2004) reviews project-related research published in major scientific journals on management of organization and articles published between 1993 and 2002 in the International Journal of Project Management. He find that with regard to management of inter-firm projects, there have been trends in theoretical development concerning the role of contracts, the establishment of inter-firm relationships, and the development of project networks. He also indicates that the main issues are cooperation and coordination, governance structures, role
and limits of contracts, knowledge sharing, trust and cultural aspects.

Winch (2002) states that the project manager’s role is to facilitate *alignments between the various actors* involved in the project: the owner, stakeholders, designers, contractors, actors in the supply chain, and operators. This view is in line with Provan & Kenis (2007) who suggest that management under complexity and uncertainty demands for the development of *reciprocal interactions* in networks that foster trust and cooperation. Pryke & Smyth (2006) and Walker & Hampson (2003a) support this line of thought with their ‘*relationship approach*’ that in order to achieve better project performance, it is important to understand the relationships between project actors (people and firms) and to properly manage the way they work together. Furthermore, Morris (2006) suggests the importance of *socialization*, that is getting person-to-person exchange of primarily tacitly held knowledge to be able to manage projects better. Additional literature that takes this angle also suggests approaches such as *early involvement, integrated team working, learning and knowledge integration, partnering* and *collaborative working* in order to improve the project performance (Ahola, 2009; Brady and Söderlund, 2008; Bresnen and Marshall, 2002; Geraldi et al., 2008; Maurer, 2010; Smyth and Pryke, 2008a).

A more recent overview on project management research is provided by Söderlund (2011). Based upon analysis of 305 articles published in 30 leading management and organization journals over the last five years, he proposes 7 schools of project management research (see Table 3-1) that suggest the idea of theoretical pluralism.

**Table 3-1. Schools of project management research**

<table>
<thead>
<tr>
<th>School</th>
<th>Focus</th>
<th>Primary research approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimization school</strong></td>
<td>Improving projects implementation through formalized planning techniques</td>
<td>Analytical &amp; mathematical modeling, simulation, and experiments, static or dynamic</td>
</tr>
<tr>
<td><strong>Factor school</strong></td>
<td>Identifying success factors that determine projects performance</td>
<td>Surveys, quantitative/statistical analysis, deductive, static</td>
</tr>
<tr>
<td><strong>Contingency school</strong></td>
<td>Adapting project organization (design, structure, processes) upon contingencies factors (project, organization, and external factors)</td>
<td>Surveys, case studies, deductive or inductive, static</td>
</tr>
<tr>
<td><strong>Behavior school</strong></td>
<td>Shaping the project processes, including behavioral interactions between people, team, and actors</td>
<td>Case studies, experiments, longitudinal, inductive, dynamic</td>
</tr>
<tr>
<td><strong>Governance school</strong></td>
<td>Mode of governance to the project organization in inter-organizational setting</td>
<td>Case studies, deductive, static</td>
</tr>
<tr>
<td><strong>Relationship school</strong></td>
<td>Collaborative relationships between actors or network of actors in projects</td>
<td>Case studies, longitudinal, inductive, dynamic</td>
</tr>
<tr>
<td><strong>Decision school</strong></td>
<td>Decision making processes given the interplay among decision-makers during different stages of projects</td>
<td>Case studies, longitudinal, deductive/inductive, dynamic</td>
</tr>
</tbody>
</table>

Source: Söderlund, 2011
In summary, Söderlund suggests that project management research need to embrace pluralism of thoughts for better exploring and explaining the difficulties of managing projects. This approach would provide complementary understanding of the world of projects. By doing so, project management scholars can be better equipped in providing solid clues to the practitioners on how to best design and manage the relevant (behavioral, social, technical, organizational) processes and structures of their present-day projects.

Given the focus on owner-contractor collaboration, this research builds on both relationship and behavior schools in which the relationships/interactions between people, teams and organizations are of the main concern.

3.2. Performance problems of projects

Capital projects exist in many industry sectors from building and real estate, infrastructures and utilities (water, energy, transport, and telecommunications) to manufacturing (complex product development and production facilities) and process industries (oil and gas, and petrochemicals). These projects are complex endeavors and involve significant capital investments (Berends, 2007b) and collaboration among sponsoring organizations or owners, consultants, contractors, and suppliers (Miller and Lessard, 2000; Turner, 2009). Although there is no unified definition, most scholars share a common view that typical capital projects can be characterized by their products, processes, and the teams who conduct the processes in order to realize the products:

- **Technically complex and highly customized product**
  The product of a capital project can be any physical asset such as new structure, production system, large or small, or the expansion, replacement, and renewal of an existing one. Such a physical asset can be technically complex comprising a large number of different parts, components, and sub systems. Although some components of a physical asset can be standardized, as a whole it is a highly customized product designed and built to meet the owner’s requirements (Barlow, 2000; Hobday, Rush and Tidd, 2000; Miller and Lessard, 2000).

- **Long lead time process**
  The delivery processes pertaining to a capital project are usually divided into several stages or phases from initiation to commissioning. Different industries may use different terms, but generally they can be related to two main stages of development and implementation as shown in Figure 3-1 (Berends, 2007b; Morris and Pinto, 2004). The development stage also known as front-end development (FED) includes identification or conceptualization of solutions and front-end engineering design (FEED). The implementation stage comprises mainly execution activities so-called EPC or engineering, procurement, and construction. Berends (2007) indicates that typical large engineering and construction projects can take a duration of 2-3 years for development and 3-5 years for implementation and result in facilities or systems to be operated for 25-30 years.
Chapter 3

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Figure 3-1. Typical life-cycle of capital projects

- **High risks endeavor**
  Regardless the size, capital projects are inherently high risks endeavor (Miller and Lessard, 2000; Morris and Pinto, 2007; Shenhar and Dvir, 2007). Transactions in project-based industries are often one-off but involve significant value of investment capital to the owner (Barlow, 2000; Cox and Ireland, 2006; Miller and Lessard, 2000). Once executed they become specific investments to specific purpose to a particular owner. It will be very difficult to redeploy them for another purpose. The journey to generate positive revenue can take years only after the initial investment is paid back. Any mistakes made up-front and throughout the execution can have long-term consequences on the owner business. This creates an immense pressure to the owner’s senior management.

- **Temporary organization**
  Conflicting interests, different levels of commitment, and power inter-play between actors characterize the delivery processes. Although it is easy to say that projects are about value creation, there is a constant play between aligned goal and collaboration, which creates value, and self-interested behavior, which may destroy it (Miller and Lessard, 2000; Smyth and Pryke, 2008a; Van Marrewijk, Clegg, Pitsis and Veenswijk, 2008). Because the time needed to complete is long (compared to that of product or equipment procurement) capital projects are more susceptible to turbulences (Berends, 2007b; Miller and Lessard, 2000). The source of turbulences can be both *exogenous* (sociopolitical and macroeconomic shocks and sudden changes in public and political attitudes) and *endogenous* (opportunistic moves, social deadlocks, accidents or strikes, problems with new technology, and wrong forecasting). These events become turbulences because they are not foreseen by the actors involved and often disrupt the project’s continuity.

Empirical reports from time to time support this claim. Compiling various studies on project success from 1960s to 1980s, Morris and Hough (1987) in *the Anatomy of Major Projects* indicate that major engineering projects suffered from cost overrun and schedule delay. An empirical study by IMEC between 1995 and 1999 on 60 international engineering and construction projects indicates that a significant amount of the studied projects performed
very badly in terms of meeting most stated objectives (55%), schedule target (28%), and cost target (18%) (Miller and Lessard, 2000). A broader study by Shenhar and Dvir (2007), on the basis of 600 projects (with varying budgets between $40 thousand and $2.5 billion), even reports higher failure rates (85%) in terms of schedule and cost. A worldwide study by Flyvbjerg, Bruzelius and Rothengatter (2003) reports 86% of the 258 major infrastructure projects suffered from cost escalation. A study by IPA (Merrow, 2011) indicates that 65% of 318 industrial megaprojects (with individual budget larger than $1 billion) failed to meet their targeted budget and schedule.

There are numerous reasons for performance problems that can be found in literature. A number of scholars, inspired by contingency-theory, suggest project under-performance could also be caused by the increasing complexity of projects and/or the project actors’ inability to cope with complexity (Bosch-Rekveldt, 2011; Shenhar and Dvir, 2007; Williams, 2005). Other scholars also consider that performance problems are strongly related to the nature of owner-contractor relationships (Morris, 1994; Morris and Pinto, 2004; Morris and Pinto, 2007; Smyth and Pryke, 2008a; Smyth and Pryke, 2008b; Walker and Hampson, 2003a).

Sanderson (2012) systematically categorizes the performance problems in capital projects into three types of problems. The first problem (type A) is due to strategic rent-seeking behavior that performance problems are primarily caused by project sponsor’s strategic behavior to get the approval of immature projects by underestimating costs and overestimating benefits (Flyvbjerg et al., 2003; Flyvbjerg, 2011). The second problem (type B) reflects Miller and Lessard’s (2000) view that performance problems are the result of underdeveloped governance arrangements between owner and contractor so that they are unable to anticipate the emergent uncertainties. Finally, the third problem (type C) reflects the social constructionist view that projects inherently involve diverse cultures and rationalities, and consequently problems arise from normal day-to-day practice among project actors (Smyth and Pryke, 2008a; Van Marrewijk et al., 2008). Accordingly, Sanderson proposes three corresponding solutions: (1) “comprehensive policies, procedures, and institutional structures for strengthening project actors’ accountability”; (2) “governance mechanisms aiming for stronger, more cooperative, and more flexible relationships” (p438); (3) “shared culture supported by governance mechanisms to encourage collaborative and coordinated behavior” (p437) between project participants.

In essence, the first solution also corresponds to the owner’s effort in front-end development. Front-end development enables the owner/sponsor to make a well-informed decision prior to execution based on a sufficiently complete project definition (Bosch-Rekveldt, 2011; Merrow, 2011). The second solution focuses on ex-ante contractual governance in which the owner ex-ante designs and applies various means of incentives and alignment mechanisms to encourage contractor’s cooperation (Berends, 2007b; Müller and Turner, 2005; von Branconi and Loch, 2004). The third solution reflects a more soft approach, relational governance that suggests both parties to give more attention to
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relational aspects and manage their relationships based on norms of trust, commitment, transparency, and mutuality (ACA, 1999; Cowan and Davis, 2003; McLennan and Scott, 2002; Rahman and Kumaraswamy, 2004). With such norms shared by both parties, the relationship becomes more resilient in anticipating daily problems, risks, uncertainty, and unknown future (Akintoye and Main, 2007; Atkinson, Crawford and Ward, 2006; Smyth and Edkins, 2007; Winch and Maytorena, 2011).

From another angle, other empirical research has shown that different stakeholders have different preferences on the relative importance of the success factors. Table 3-2 lists top-10 critical success factors from four different studies. When the results of the four studies are compared, project managers have increasingly given attention on cost management and risk management in the two most recent studies (Bakker, Arkesteijn, Bosch-Rekveldt and Mooi, 2010; Shokri-Ghasabeh and Kavousi-Chabok, 2009). As was widely recognized in the project management literature (Morris and Pinto, 2007; Turner, 2009), the importance of cost and risk management seems to increase overtime.

Table 3-2. Comparing critical success factors over various studies

<table>
<thead>
<tr>
<th>Morris and Hough (1987), 8 major projects</th>
<th>Pinto and Slevin (1988), 418 responses</th>
<th>Shokri-Ghasabeh &amp; Kavousi-Chabok (2009), 65 responses</th>
<th>Bakker et al. (2010), 38 responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attitudes</td>
<td>1. Project mission</td>
<td>1. Top management support</td>
<td>1. Risk management</td>
</tr>
<tr>
<td>2. Project definition</td>
<td>2. Top management support</td>
<td>2. Cost management</td>
<td>2. SHE compliance</td>
</tr>
</tbody>
</table>

Apart from the activities prescribed by the project management body of knowledge: schedule/time, control, monitoring, scope/change, and communication management, all studies also indicate the importance of people side and soft factors. Whether it is labeled as ‘team composition’, ‘project team’, ‘personnel’, or ‘human qualities’, project team is ranked fifth to ninth.

Soft factors like ‘attitudes’ or ‘top management support’ are consistently ranked the top two in the three studies (Morris and Hough, 1987; Pinto and Slevin, 1988; Shokri-Ghasabeh and Kavousi-Chabok, 2009). In the Bakker’s et al. study this attention is also indicated by the factor of ‘trust’ and ‘involvement’. Obviously, this confirms the well-known notion that it is
people who deliver projects, not processes and systems (Bakker, 2008; Bakker and de Kleijn, 2014; Cicmil, Williams, Thomas and Hodgson, 2006; Winter, Smith, Morris and Cicmil, 2006).

3.3. Project contracting

Within the project management literature, the method to obtain the resources is known as project contracting and procurement (Lowe, 2007; PMI, 2008; Smith, 2002; Walker and Rowlinson, 2008a). The PMI (2008), in its “Body of Knowledge”, defines project procurement management as the processes of planning (identification of the owner’s needs, defining purchasing options, and identifying potential contractors and/or suppliers), conducting procurement (selection or tendering, negotiation, and awarding of contract(s) to contractors or suppliers), and administering and completing a procurement.

Nissen (2000) and Walker and Rowlinson (2008b) indicate that effective procurement is critical for effective project execution. Over 50% and up to 80% of the total project cost can be attributed to parts, supplies, and services procured. Moreover, due to long lead times, procured items constitute the critical paths of the project schedule. Berends (2007) suggests that effective project contracting and procurement can reduce potential principal-agent problems (e.g., information asymmetries, relational risks, disputes) and improve coordination (e.g., interface management, inter-organizational communications).

The terms procurement and contracting are often used interchangeably in the project management research (Berends, 2007a; Branconi and Loch, 2004; Cheung, Yiu and Chiu, 2009; Iyer, Chaphalkar and Joshi, 2008; Turner and Simister, 2001). In this study, procurement refers to the broad processes of defining procurement methods, identification and selection of contractors and/or suppliers, formulating and managing the contract(s) in projects. While contracting refers to the processes of defining contracting strategy, choosing the appropriate contract type or remuneration as well as formulating the contract terms and conditions.

Project delivery methods

There are various notions to describe the project procurement process. Both APM (2000) and PMI (2008) prescribe the generic processes of procurement in projects as in the manufacturing and other non-project-based industries that involve purchasing of products or services from suppliers or sellers. Such prescriptions are less effective in describing the key procurement processes in the context of capital investment projects (Dent, 2004; Walker and Hampson, 2003b). In executing capital projects, owners have to rely on external contractors, subcontractors, and suppliers to design and build the facilities or tangible assets as the end products (Walker and Hampson, 2003a). Moreover, due to technical complexity, the design and build activities are often fragmented comprising of different components, work packages, and hence require different specialized subcontractors or suppliers (Barlow, 2000; Berends, 2007a).
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Procurement, contracting, and contractor selection are the mostly discussed topics regarding project procurement in the project management handbooks (for example see Morris and Pinto, 2004; Morris and Pinto, 2007; Turner, 2003, 2009). A project procurement method is also a project delivery method defined as a way or an approach to get a project done within scope, on time, and on budget (Morris and Pinto, 2007; Walker and Hampson, 2003a). While practitioners in the industry often use the terms to reflect various arrangements of different project parties throughout the project life cycle (ACA, 1999; KPMG, 2010).

KPMG (2010) and Walker and Rowlinson (2008a) propose four generic procurement choices or project delivery approaches using two dimensions, the quality of relationship between owner and contractor; and the degree of integration within the project team, see Figure 3-2.

![Figure 3-2. Project delivery methods (KPMG, 2010)](image)

The quality of relationship implies the degree of collaboration, information sharing, and trust between the owner and the contractors throughout the project. If the relationship quality is high, the owner and the contractor teams will be intimately working in a joint problem solving and advice-giving role in the initiation stage. If the relationship quality is low, the relationship is likely to be transactional with the owner simply buying-in expertise to deliver the project with no joint benefit-sharing arrangements. The degree of integration refers to the integration within the project team from the design phase through the implementation phase. In the low degree of integration, the design team is completely separated from the implementation team with limited interaction or sharing of information. While the high degree of integration means the design and implementation teams are involved from the development phase throughout to the end of the implementation phase.

Figure 3-2 shows these procurement choices/delivery approaches in four quadrants. The procurement method in quadrant 1 (Q1) is characterized by low integration and low relationship, also known as traditional approach. This approach is fairly rigid and sequential,
with build or construction following procurement which can only be started after the completion of design. In Q2, high relationship and low integration, approaches like design and build or EPC or Turnkey allow medium to high degree of collaboration between the owner and the contractor, however, low to medium integration between the front-end engineering design team and the execution team. In Q3, high integration and high relationship, the project delivery builds on both collaboration and integration in such a way that owner, designer, and contractors are working together in a team and share all or part of project risks. This procurement choice is often linked through relationship contracting like partnering and alliance arrangement. Finally in Q4, known as the partnership approach with high integration and low relationship. This approach mostly used in the public sector projects that involve public and private parties working together over a period throughout and beyond the project life-cycle, including operation and maintenance phase.

**Project contracting methods**

There are two mainstream theories regarding the role of contract, (a) relational contract theory - RCT (Kimel, 2007; Macaulay, 2000; Macneil, 2000) and (b) transaction cost economics theory - TCE (Williamson, 1985, 2003, 2005). Through the lenses of RCT and TCE, there is a degree of convergence to the issue of contractual relationships in projects. A contract in project-based working is *ex-ante designed* to align the owner’s and contractor’s interest (Turner, 2003) and to establish explicit relational norms (McLennan and Scott, 2002). As the incompleteness of a contract implies, the parties need to develop appropriate *ex-post governance* to flexibly adapt their working relationships in anticipating unforeseen events. The relationships between owner and contractor in projects involve certain degree of ongoing adaptations, avoidance of detrimental behavior, and communication openness between the parties (McLennan and Scott, 2002; Müller and Turner, 2005). A contract is therefore a legally binding, enforceable, and reciprocal commitment governing the collaboration between owner and contractor (Berends, 2014; Turner, 2003).

Contracting strategy is a process of choosing various forms between a continuum of traditional lump sum to cost reimbursement as generally characterized in Table 3-3 (Lowe, 2007; Morris and Pinto, 2007; Smith, 2002; Walker and Hampson, 2003b; Walker and Rowlinson, 2008b). The most crucial objectives of appropriate contracting strategy are to select and to appoint the right contractors and suppliers to deliver the project in an optimal way (Griffiths, 1989; Smith, 2002; Turner and Simister, 2001).

The type(s) or scope(s) of contract is chosen by the owner depending on the nature of the project, the availability of in-house resources for managing the contract, the availability of the contractors, the project value drivers and the required competences, the time available to conduct the project. Generally, a contract specifies roles and responsibilities, remuneration and payment phases, incentive schemes, and apportion of risks (Lowe, 2007; Peeters, 1987; Smith, 2002; Walker and Hampson, 2003b).
Table 3-3. Key characteristics of various types of contracts

<table>
<thead>
<tr>
<th>Contract Type</th>
<th>Key Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lump sum / fixed price</td>
<td>• The contractor is selected based on best price offer against owner’s specifications.</td>
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<tr>
<td></td>
<td>• The contractor is paid a fixed total price for the whole scope defined in contract.</td>
</tr>
<tr>
<td>Negotiated fixed-price</td>
<td>• The contractor is selected first then the price is negotiated with the owner.</td>
</tr>
<tr>
<td></td>
<td>• It is generally used when the contractor start working before a final price is agreed upon.</td>
</tr>
<tr>
<td>Converted lump sum</td>
<td>• A hybrid form of reimbursable and lump sum contract with a single contract for development and implementation.</td>
</tr>
<tr>
<td></td>
<td>• Initially during development phase (FED), a reimbursable contract will be used, after the certainties of scope and costs are known, the contract is converted to lump sum for implementation phase (detail engineering, procurement, and construction works).</td>
</tr>
<tr>
<td>Unit price contract</td>
<td>• The contractor is paid a set amount for every “unit” of work performed.</td>
</tr>
<tr>
<td></td>
<td>• If the contractor performs well, contractor can benefit from cost savings. If the contractor does not perform according to the agreed plan, the contractor takes the risk of cost overruns unless under certain exceptional conditions agreed upon.</td>
</tr>
<tr>
<td>Cost reimbursable</td>
<td>• The owner reimburses all cost in performing a project and pays the contractors a <em>pre-determined fee</em> or a <em>percentage fee</em> of the cost incurred.</td>
</tr>
<tr>
<td></td>
<td>• The contractor’s profit may be in the form of a fee, a simple mark-up applied to labor cost incurred, or a combination of the two.</td>
</tr>
<tr>
<td></td>
<td>• The fee may include an <em>incentive fee</em> based upon achieving certain performance criteria, milestones or targets. It can be a certain amount <em>fixed</em> in the contract or based upon a <em>percentage of the cost</em> incurred.</td>
</tr>
<tr>
<td>Guaranteed maximum price</td>
<td>• It is specified in a similar way to cost reimbursable contract with an exception that the total fee plus the total cost cannot exceed an agreed upon guaranteed maximum price (GMP).</td>
</tr>
<tr>
<td></td>
<td>• The contractor maybe responsible for some or all of the total cost of the project if the cost exceeds the GMP; if the total cost is less than the negotiated GMP, the contractor may get the benefit of the cost savings based upon a negotiated agreement with the owner.</td>
</tr>
</tbody>
</table>


According to Merrow (2011), the most used forms of contract strategies in capital projects, particularly in industrial projects are _EPC lump-sum, EPCM reimbursable, mixed, and partnering/alliance_. EPC lump-sum is a contracting strategy in which detailed engineering (E), procurement (P), and construction (C) are performed by one main contractor or consortium based on a fixed-price contract. EPCM reimbursable strategy is where all works, detailed engineering (E), procurement (P), and construction management (CM), are performed on a cost-plus fee or a cost-plus incentive fee basis. While in mixed strategy,
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engineering and procurement are performed on a reimbursable basis while construction is performed on a fixed-price contract.

3.4. Relationship contracting

Relationship contracting is originated from the adaptation of relational contracting in the context of buyer-supplier relationships (Dyer and Singh, 1998; Nooteboom, Berger and Noorderhaven, 1997; Zaheer and Venkatraman, 1995). Relational contracts allow the parties to utilize their detailed knowledge of their specific situation and to adapt to new information as it becomes available (for conceptual discussion see Baker, Gibbons and Murphy, 2002; Goetz and Scott, 1981; Macneil, 2000). Baker et al. (2002) posit that relational contract cannot be enforced by a third party and so must be ‘self-enforcing’, which means the value of the future relationship or consequence must be sufficiently large that neither party wishes to renege.

In project setting, relationship contracting has been adopted as delivery management principles in infrastructure projects since the 1980’s (McLennan and Scott, 2002; Parker and Hartley, 1997). The Australian Constructors Association (ACA) defines relationship contracting as:

“a flexible approach to establish and manage relationships between owners and contractors and to implement proven practices and techniques to optimize project outcomes” (ACA, 1999, p3).

ACA characterizes relationship contracting as the relationship that is driven by strong people relationships and must be founded on a set of strong, mutually held core values such as commitment, trust, respect, innovation, fairness, and enthusiasm. Within the construction industry, relationship contracting has been practiced and known as ‘project partnering’ and ‘project alliancing’ (ACA, 1999; Cowan and Davis, 2003; McLennan and Scott, 2002; Quick, 2002). Project partnering emerged from the construction industry in the USA (CII, 1991; Larson, 1995; NEDC, 1991) while project alliancing emerged from oil and gas exploration and production in the North Sea (Morris, 1994; Thomson, 1999) and spread through the construction industry in the UK, Australia, and Hong Kong.

What project partnering and project alliancing entail are summarized as follows.

- **Project Partnering**

  There are various definitions around project partnering. The most cited definition is from CII, where “partnering is a long-term commitment by two or more organizations for the purpose of achieving specific business objectives by maximizing the effectiveness of each participant’s resources” (CII, 1991, p. iv). Many scholars question how long-term commitment can be materialized in the one-off nature of projects (see Bresnen and
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Marshall, 2002; Chan, Chan and Ho, 2003; Ng et al., 2002). In a more realistic sense, Bennet and Peace (2006, p.3) define project partnering as:

“A set of actions taken by the work teams that form a project team to help them cooperate in improving their joint performance. The actions are agreed by the project team by considering the project’s characteristics, their own experience, and normal performance. The choice of actions is guided by the principles of mutual objectives, trust, decision making processes, performance improvements, feedback, and joint problem resolution.”

According to Cowan and Davis (2003), project partnering is an attempt to formally bring a focus on relationships into traditional contracts. It is implemented based on a set of agreed partnering principles or charter. An integrated project team is formed to work on the basis of partnering principles. Partnering agreement does not change allocation of risks among parties in associated contract, but usually leads to open communication to discuss issues, quicker issue resolution and simpler variation management. The relationship is regularly monitored and corrective action swiftly taken to maintain the ‘health’ of the relationship.

- **Project Alliancing**

Ross (2003, p.1) defines project alliancing as:

*An arrangement “where an owner (or owners) and one or more contractors [including designer, main contractor, sub-contractors, and suppliers] work as an integrated team to deliver a specific project under a contractual framework where their commercial interests are aligned with actual project outcomes.”*

Under a ‘pure’ form of project alliance, the parties are collectively responsible for delivering the project; collectively own all associated risks and opportunities; and share the ‘pain’ and/or ‘gain’ of the actual project outcomes against agreed targets. In comparison to project partnering, Quick (2002) and Cowan & Davis (2003) characterize that project alliancing as the formation of a virtual entity for the delivery of a project. The alliance is more than just a co-operative relationship between separate and defined companies as in project partnering. It seeks to establish a separate or virtual entity, where original corporate cultures are left behind, and a new one is created for the delivery of outstanding outcomes for a project. This outcome is pursued in two ways. First, the alliance culture operates on the same principles as partnering but is preserved within a frame contract that legally binds all parties together. Second, these principles are implemented by aligning and merging owner and non-owner parties’ financial arrangements and outcomes to a win-win or lose-lose situation. In doing so, all parties work collaboratively on the basis of gain sharing and to some extent on pain sharing of remuneration and risk. Project alliancing also uses performance indicators to put
remuneration at risk, so that the alliance relationship is also outcome focused to ensure optimal performance.

While a lot of success stories were reported on project partnering (for example Barlow, 2000; Bayliss et al., 2004; Larson, 1995) there are also extensive empirical studies highlighting the failure of project partnering (for example Bresnen and Marshall, 2002; Chan et al., 2003; Ng et al., 2002). Quick (2002) and Cowan & Davis (2003) suggest that the fundamental flaw in project partnering is that the obligations in the partnering charter are considered by the parties to be non-binding, while the contract may be still adversarial. Ng’s et al. (2002) investigation of six Australian Government construction project suggests that one key reason for project partnering was unable to meet the parties’ expectation is the lack of owner’s commitment. Similarly, in Hong Kong construction setting, Chan et al. (2003) find the major obstacle of partnering success to be the failure of bringing actual partnering attitude due to commercial pressure. Alderman & Ivory (2007) call this the ‘partnering paradox’ where the ideal form of relationships in partnering is hardly realized in practice mainly due to the existence of adversarial attitudes. In short, project partnering is limited to address adversarial means of the parties particularly when external pressure emerged.

Although project alliancing conceptually creates better integration among the committed involved parties, it cannot solve or eliminate some of the problems that it is designed to cope with (Cowan and Davis, 2003; Quick, 2002; Walker and Hampson, 2003a; Yeung, Chan and Chan, 2007). Cowan and Davis (2003) highlight two critical challenges in project alliancing:

- a large amount of effort and resources is used initially to develop the alliance relationship. This initial initiative starts within the owner’s team which often hesitates to fully commit investing their efforts and time.
- it is often found that alliancing is practiced as a formula approach allowing just good scoring instead of real added values.

In summary, both project partnering and project alliancing can be seen as imprecise concepts capturing a wide range of behaviors, attitudes, values, practices, tools and techniques. It is often difficult to distinguish between partnering/alliancing as a prescription and an outcome. It is not sufficiently clear what mechanisms drive partnering/alliancing into real collaboration throughout the supply chain in projects (Bresnen and Marshall, 2002; Cox and Ireland, 2006). Bresnen (2007) and Smyth & Pryke (2008b) suggest that a more systematic research is needed to discern the essential ingredients of collaborative relationships in projects.

Revisiting the concept of collaboration in the extant literature, we arrive at the notion ‘complex collaboration’. Mankin, Cohen and Fitzgerald (2004) characterize the essence of ‘complex collaboration’ —which also fits the nature of collaboration in projects— in terms of two streams of elements that ‘tie together’ two (or more) different organizations in
orchestrated joint activities: ‘the soft side’, i.e.: the people/team, their relationships and how they work together; and ‘the structural side’, i.e.: the charters (norms), governance, and authority structures. Of the two elements, the soft side is considered to be the foundation of any kind of collaboration. It is where collaboration starts, rises and grows. The structural elements in themselves are secondary but necessary to support collaboration in reducing uncertainty, increasing predictability, and making the collaboration process more manageable.

In a nutshell, collaborative relationship is built on teamwork where a group of people with complementary skills are committed to a common purpose and by themselves share responsibilities and accountabilities for their achievement (Baiden and Price, 2011; Xue, Shen and Ren, 2010). Hoegl and Gemuenden (2001) consider ‘teamwork quality’ as a comprehensive measure of collaboration quality in teams. They operationalize teamwork quality by six facets of teams interactional processes, i.e., communication, coordination, balance of member contributions, mutual support, aligned effort, and cohesion. Such a concept has been empirically validated through a series of empirical studies (see Hoegl and Gemuenden, 2001; Hoegl and Weinkauf, 2005; Hoegl and Parboteeah, 2006; Hoegl and Parboteeah, 2007). Given the accumulated works of Hoegl and colleagues and the essence of complex collaboration that lies in the people/team as suggested by Mankin et al. (2004), the concept ‘teamworking’ can be used to characterize the quality of collaborative relationship.

3.5. Exploring elements of collaborative relationships

To identify the elements that constitute a collaborative relationship, a literature search was performed using keywords such as ‘teamwork’, ‘integrated project team’, ‘partnering’, ‘alliancing’, ‘collaborative working relationship’, ‘relationship management’, ‘project relationship’, and ‘relationship contracting’. The searching was stopped once no new relevant referenced articles were found. Based on the collection of articles, only articles related to empirical research in project context were selected, resulting in 21 articles for in-depth analysis (see Table 3-4). The articles analyzed include 10 case studies, 9 survey studies, and 2 longitudinal studies. The majority of the studies was focusing on partnering or alliancing but as emerging phenomenon rather than as prescription.
## Table 3-4. Empirical studies on collaborative relationships

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Research setting</th>
<th>Key Findings</th>
</tr>
</thead>
</table>
  - lack of shared understanding of key partnering concepts  
  - missing initial effort to establish shared ground rules and interpersonal relationships  
  - unclear perceived roles and responsibilities  
  - no pre-defined problem-solving process, ‘meetings for meeting’ without clear agendas. |
  - effective joint working and problem solving, positive attitudes and trust between project partners, and team working  
  - good inter-personal relationships and team spirit within the project team.  
But there were paradoxes between what was preached and practiced:  
  - Success achieved in one-off partnering did not ensure long term (repeated) relationship  
  - The principles agreed at the first-tier relationship did not cascade down to sub-contractors. |
| [3] Anderson & Polkinghorn (2011) | A longitudinal case study of 19 partnering contracts in the Woodrow Wilson Bridge project. | Collaboration quality (teamwork, communication, and cooperation) was not predetermined by bid results but instead:  
  - high degree collaboration was strongly associated with effective issue resolution and team satisfaction with budget and schedule  
  - trust does not automatically formed from a partnering workshop but more likely from consistent and transparent communication on the job, interaction, and a sense of interdependence among all partners. |
<p>| [4] Baiden &amp; Price (2011)     | A case study of 9 construction projects in the UK.                               | Team integration (single team focus and objectives, seamless operation without boundaries, unrestricted information sharing, creation of single and co-located team, equitable relationships, and no blame culture within team) either complements or increases the likelihood of effective teamwork (measured in terms of team identity, shared vision, communication, collaboration and participation, issue negotiation and resolution, and reflection and self-assessment). |
| [6] Berends (2006)            | A case study of cooperative contracting in three engineering projects.           | The success of three projects was resulted from cooperative relationships which are achieved through: early contractor involvement, balanced incentive, and integrated project team. |</p>
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Research setting</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>[8] Bosch-Rekveldt et al. (2011)</td>
<td>A case study of 5 engineering projects in the Dutch process industry</td>
<td>The most contributing practices during front-end development on project performance are integration of the different disciplines and parties involved to facilitate close collaboration between contractor and owner; early joint efforts and involvement to support development of trust and alertness within team.</td>
</tr>
<tr>
<td>[9] Bresnen &amp; Marshall (2002)</td>
<td>A case study on two partnering projects: Project A with a structured and informed partnering approach and Project B based on an evolved long-standing relationship.</td>
<td>Both partnering approach could lead to successful projects. However similar problems around role ambiguities and conflicts still exist due to: difficulty in transcending the agreed protocol at senior levels into effective working relationships at operational levels; lack of continuity of relationships within the team; lack of a dedicated project team structure; internal interfaces with other significant groups and stakeholders within the organizations.</td>
</tr>
<tr>
<td>[10] Chan et al. (2004)</td>
<td>A survey of 78 practitioners’ perception on partnering projects in the Hong Kong construction industry.</td>
<td>Five high level success factors were critical in explaining the personal perception of partnering: establishment and communication of conflict resolution strategy; willingness to share resources among project participants; clear definition of responsibilities; commitment to win-win attitude; regular monitoring of partnering process.</td>
</tr>
<tr>
<td>[12] Davis and Walker (2008)</td>
<td>A case study of 49 senior participants involved in Australia alliancing projects.</td>
<td>The success of alliancing projects under studied was determined by the degree of trust, commitment and mutual goals among contracting parties both the owner and non-owner parties.</td>
</tr>
<tr>
<td>[13] Drexler and Larson (2000)</td>
<td>A survey of 276 construction projects in North America to examine the dynamics of owner-contractor relationships.</td>
<td>The reasons for declining relationship (not limited to formal partnering) include: unclear contracts and resulting litigation, changes in scope, schedules, and personnel, failure to perform, lack of trust, and aggressive contract price.</td>
</tr>
<tr>
<td>[14] James Barlow (2000)</td>
<td>A case study of the Andrew alliance between BP and 8 key offshore contractors in 1994.</td>
<td>What makes the Andrew alliance successful: creation of a single team without duplication of functions or accountabilities; considerable effort in team building; direct communications between project team members; strong supports from BP and contracting partners' chief executives.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Research setting</td>
<td>Key Findings</td>
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<tr>
<td>[16] Laan et al. (2011)</td>
<td>A longitudinal study of one-off alliance in a rail construction project in the Netherlands (2006-2010).</td>
<td>Alliance arrangement with appropriate incentive structure is necessary but insufficient for cooperative relationship to develop. Substantial efforts are required through: careful staffing with appropriate attitudes and active demonstration of relationship-preserving behavior.</td>
</tr>
</tbody>
</table>
| [17] Lui and Ngo (2004) | A survey of 233 architect–contractor partnerships in Hong Kong to investigate the relation between trust (goodwill & competence) and contractual safeguards. | The relations between trust and contractual safeguards:  
- goodwill trust can reduce the need to design and monitor contractual safeguards  
- in high contractual safeguards, emphasis should be on development of competence trust, while in lower contractual safeguards, goodwill trust will be more important. |
- joint working could improve schedule performance  
- open communication, fair risk allocation, no blame culture, regular performance measurement, effective problem solving, and mutual trust could improve cost performance  
- effective problem solving, mutual trust, joint working, mutual objectives, and open communication could improve quality performance. |
| [19] Ng et al. (2002) | A study of contractors’ perceptions on 6 unsuccessful public construction projects in Australia. | Factors that make the partnering projects unsuccessful:  
- the client’s unwillingness to show leadership in supporting partnering relationship  
- commercial pressures perceived by contractor due to lack of empathy for the contractor’s financial burdens  
- lack of ‘intimacy’ in the relationship that lead to win-lose attitude  
- perceived inappropriateness of partnering arrangement to the project. |
| [21] Rahman & Kumaraswamy (2008) | A survey study of 83 responses from Hong Kong construction practitioners. | The relative contribution of various factors on building a collaborative culture and nurturing effective teamwork: top management support, mutual trust, open communication, enlightened and enthusiastic client, effective coordination, teamwork, long-term commitment, clear definition of risk allocation/sharing, and owner’s knowledge/capability. |
### Table 3-5. Elements of collaborative relationships identified from empirical studies

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<tr>
<td><strong>Teamworking:</strong> trust, communication, team identity, mutual support, cooperation, coordination, participation in team</td>
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<td><strong>Relational attitudes:</strong> mutual trust, transparent and open communication, no-blame culture, win-win attitude, interdependence, long-term orientation</td>
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<td><strong>Team integration:</strong> integrated team, single focus, shared vision, aligned goals, dedicated structure</td>
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<td><strong>Trust:</strong> competence trust, goodwill trust, integrity trust, trust in team, inter-organizational</td>
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<td><strong>Joint working:</strong> joint involvement, risk management, performance management, active dispute resolution, joint problem solving</td>
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<td><strong>Contract:</strong> clear definition of roles and responsibilities, incentives, fair risk allocation, safeguard</td>
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<td><strong>Communication:</strong> open, transparent/honest communication between parties and in team</td>
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<td><strong>Commitment:</strong> senior management commitment, support, involvement, leadership</td>
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<td><strong>Capability:</strong> project management and technical capability, financial capacity, early joint effort/involvement</td>
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</table>
Upon a careful textual analysis of the 21 empirical studies, 9 prominent factors of collaborative relationships was compiled in Table 3-5. Each factor served as conceptual categorization of detail elements of similar/related meaning and is ranked according to how many times it is cited in the empirical studies. For example, following Hoegl and Gemuenden’s (2001) as well as Baiden and Price’s (2011) definition, various aspects found at team level such as trust, communication, team identity, mutual support, relationship-preserving behavior, cooperation, and coordination are counted “Teamworking”. Similarly, “Relational attitudes” include relational norms, intentions, or routines that are co-developed by the owner and the contractor and represent inter-organizational level (Poppo and Zenger, 2002; Poppo et al., 2008; Spekman et al., 1998). Mutual trust, transparent and open communication, no-blame culture, win-win attitude, interdependence, long-term orientation between owner and contractor are also categorized as relational attitudes. Following the same logic, other elements are categorized into factors “Team integration”, “Trust”, “Joint working procedures”, “Contract”, “Communication”, “Commitment”, and “Capability”.

A closer look into trust

Trust is a fundamental ingredient or lubricant of social interaction and its positive impact on communication (Das and Teng, 1998), relationship development (Nootteboom et al., 1997; Woolthuis, Hillebrand and Nootteboom, 2005), management (Scott, 1980), negotiation processes, and performance in buyer-supplier exchanges (Zaheer, McEvily and Perrone, 1998) has been well documented. Conceptually, creating a trusting working environment has been identified as a major reform that can revitalize the construction industry (Kadefors, 2004; Pinto et al., 2009). Trust-based working relationship has been empirically identified as an effective tool to alleviate adversarial relationships (Bakker et al., 2010; Bayliss et al., 2004; Bosch-Rekveldt et al., 2011; Cheung, Wong, Yiu and Pang, 2011). In fact, trust has been suggested as one of the most important elements supporting the success of relationship contracting (Meng, 2011; Pinto et al., 2009; Rahman and Kumaraswamy, 2008). Recent studies including some conceptual frameworks on trust and project relationships between owner and contractor have been reported (Cheung et al., 2011; Kadefors, 2004). So what is trust?

Based on a multidisciplinary view, Rousseau et al. (1998) define trust:

“Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another”.

This definition implies the state of mind of the contracting parties to foster appropriate behavior so that both can jointly create a favorable working environment. But there is a vicious cycle around the concept of trust whether it is considered as a cause of or as the result of good or satisfying relationships. Certainly there are several dimensions of trust.
Rousseau et al. (1998) consolidate various views of trust and propose three forms of trust: a) institutional or system trust that refers to the role of institutions in shaping the conditions necessary for trust to arise; b) calculative or competence trust that describes a rational choice perspective, where trust emerges when the trustor (the trusting party) perceives that that the trustee (the trusted party) intends to perform an action that is beneficial to the trustor; and c) relational or affect-based trust that arises between individuals who repeatedly interact over time.

According to Kadefors (2004), the above forms of trust are not clear-cut, and the distinction of trust can only illustrate the various mechanisms and sources of information involved. Trust theory emphasizes that trust is not only tied to persons but also to circumstances or objects of trust. Upon a comprehensive analysis of trust literature, Fulmer and Gelfand (2012) suggest that trust should be defined according to the referent (trust in whom: interpersonal, team, organizational) and the level (trust at what level: interpersonal, team and organizational).

3.6. Conceptual framework

The analysis of empirical studies provides a comprehensive overview on prominent factors to collaborative relationships, however, two important research gaps remain in our understanding of collaborative relationships.

The first and most important gap is related to how the factors are interrelated and determine project performance. In most case studies, some factors such as win-win attitudes, no-blame culture, trust, senior management commitment, team integration were considered as antecedents to owner-contractor collaboration or relationship quality or teamwork; project performance or partnering success were in turn determined by the quality or degree of collaboration (see Pinto et al., 2009; Baiden & Price, 2011; Bayliss et al., 2004; Ross, 2003; Rahman & Kumaraswamy, 2008). This implies that various factors might be interrelated following an input-mediator-output (IMO) framework commonly known in organization and management studies (see Ilgen, Hollenbeck, Johnson and Jundt, 2005; Mathieu, Maynard, Rapp and Gilson, 2008). No survey studies investigated such a structural model. A comprehensive framework therefore is needed in particular: to measure collaborative relationships, to identify factors contributing to collaborative relationships; and to measure the effects of collaborative relationship on the project performance. This framework would increase the conceptual understanding and guide future empirical investigations. It would be possible to analyze when and how different constructs interact and affect one another.

The second gap is related to ambiguities in the operationalization of trust and communication. Pinto et al. (2009) conceptualize and empirically test ‘competence trust’ and ‘integrity trust’ as antecedents to the perceived quality of owner-contractor relationship. In contrast, Meng (2011) defines ‘mutual trust’ as an indicator to relationship
Collaboration in projects: A literature review

quality. With regard to communication, Anderson & Polkinghorn (2011) consider communication as an element to ‘collaboration quality’ in addition to trust, teamwork, and cooperation. While Rahman and Kumaraswamy (2008) consider open communication as a supporting factor or antecedent to ‘collaborative culture’ and therefore contributing to ‘effective teamwork’. To resolve these ambiguities, we adopt Fulmer and Gelfand’s (2012) view and distinguish communication and trust according to the referent (communication and trust in whom: team and inter-organizational) and the level (communication and trust at what level: team and inter-organizational). Communication and trust between owner and contractor can be included as elements of relational attitudes and considered as antecedents to collaboration quality. While communication and trust within team level can be operationalized as elements of teamworking (see Hoegl and Gemuenden, 2001) to measure collaboration quality.

To fill the aforementioned gaps, an initial model was conceptualized for collaborative relationships with three blocks of constructs, i.e.: a) antecedents, b) mediators, and c) outcomes (see Figure 3-3).

Using the initial conceptual model as a guiding framework, relational attitudes, team integration, joint working procedures, senior management commitment, owner-contractor capability, and contract are positioned as the antecedents; teamworking and team trust as the mediators; and project performance and expectation to a continuing relationship as the outcomes. The conceptual model also indicates that the antecedents may affect project performance through two mechanisms: directly (1) and indirectly through their effects on teamworking and team trust (2) which in turn affect project performance (3).

The rationale behind the mediating role of teamworking and team trust is the following. Formal collaborative arrangements often fail to change owner and contractor team behaviors and in turn lead to disappointing outcomes. This is due to the missing link between prescribed solutions and application in practice (Bresnen and Marshall, 2002; Hartmann and Bresnen, 2011). The missing link is the teamworking process that explains the
difference between superficial attempts at implementing collaborative relationship, where the tools and techniques are evident but the behavior has not changed, and the results are disappointing or not sustained throughout the project lifecycle (Aarseth et al., 2012; Chan, Johansen and Moor, 2012). The key to understanding how to implement collaborative relationships successfully is therefore to realize that teamworking is an integral part of owner-contractor collaboration, not an after-thought. The principles of relationship contracting should not be ex-ante designed but also used to manage the ongoing working relationship into effective teamworking behavior.

Besides the antecedents and mediators as the contributing factors to project performance, some contextual factors such as project characteristics, regulation, and market condition might influence the effects of antecedents or mediators on project performance. The operationalization of the initial conceptual model in the subsequent chapters will incorporate such factors in more detail.

Concluding remarks and next steps

This chapter presented a theoretical base for the subsequent empirical studies. The review suggests that relationship contracting has been predominantly practiced as project partnering/alliancing yet the imprecise concept it entails poses two important research gaps. The elements identified in Table 3-5 will be operationalized further in Chapter 4.
References


Ahola, T., 2009. Efficiency in project networks: the role of inter-organizational relationships in project implementation, Department of Industrial Engineering and Management. Helsinki University of Technology, Helsinki, Finland.


CII, 1991. In search of partnering excellence (special publication 17-1). Construction Industry Institute, Austin, TX.


Chapter 3

Collaborative contracting in projects
Chapter 4

SORTING OUT THE ESSENCE OF OWNER–CONTRACTOR COLLABORATION
Chapter 4 | Abstract

Despite the relatively widespread recognition of relational-based contracting in engineering and construction projects, literature indicates a range of paradoxical issues in practice. This study attempts to reconstruct project practitioner’s perspectives regarding the essence of collaborative relationships. Applying Q-methodology, subjective opinions and reflections of 30 project practitioners from 19 owner and engineering construction firms were systematically analyzed. The result suggests four distinct perspectives towards effective working relationships, namely a) shared team responsibility, b) execution focused team, c) joint capability and structure; and d) senior leadership pair. Across perspectives, all practitioners shared a belief that an effective owner–contractor relationship should be based on affective trust, shared vision, and mutual attitudes such as open and honest communication, solution seeking instead of blaming, and senior management leadership. In contrast to prior research, long-term orientation and contractual functions were perceived to play a relatively limited role in improving owner–contractor relationships.

Keywords: Contract; Integration; Owner–contractor relationship; Q-methodology; Relational; Trust.

Note:

- The author of this dissertation contributed in study design, analysis of literature, data collection and statistical analysis, interpretation of data, writing and finalizing the manuscript. The second and third co-authors contributed in study design, critical analysis of interpretation and review of the manuscript. The last co-author contributed in data collection partially and review of the manuscript.
Chapter 4 Sorting out the essence of owner–contractor collaboration in capital projects delivery

4.1. Introduction

The nature of working relationships between owner and contractor in engineering and construction projects is considered to have a major effect on project performance (Drexler and Larson, 2000; Larson, 1995; Meng, 2011). If both parties can align their interests and develop a collaborative working relationship, potential conflicts can be dealt with before becoming claims, knowledge is freely exchanged, problems can be solved, and in turn parties can integrate their specific capabilities to complete the project successfully. On the other hand, adversarial or deteriorated relationships between project parties might lead to poor project performance (Black et al., 2000; Humphreys et al., 2003; Meng, 2011). Under adversarial relationships, owners are likely to challenge requests for approval, force compliance by withholding funds, and overly control the contractors' works. Meanwhile, contractors might exploit potential claims by aggressively negotiating change orders and withholding vital information.

In the light of improving project performance, focus on developing and practicing better ways of working between owners and contractors has intensified. This resulted in prescriptive models of relational contract such as project partnering and project alliancing (see Anvuur and Kumaraswamy, 2007; Bygballe et al., 2010; Chan et al., 2003; Kumaraswamy et al., 2008). In essence, such prescriptions aim at developing a collaborative relationship characterized by quality such as aligned goals and interests, open and honest communication, mutual commitment and trust, long-term orientation, and joint problem solving (Anvuur and Kumaraswamy, 2007; Bresnen and Marshall, 2000; Rahman and Kumaraswamy, 2004a).

In one stream of research, project partnering or alliancing was reported to be practiced successfully (Barlow, 2000; Bayliss et al., 2004; Davis and Walker, 2008; Larson, 1995). Larson's (1995) examination of 280 construction projects suggests that partnered projects were more successful in controlling costs and resulted in better performance and customer satisfaction than projects managed under more adversarial conditions. Based on the BP Andrew Alliance case, Barlow (2000) claims that the partnering approach had not only delivered very significant performance gains, but also brought in technical and process innovation.

Another stream of research however also revealed the difficulties encountered in such practices. Bresnen and Marshall (2002) highlight that current practices might put too much...
emphasis on formal mechanisms (i.e. contracts, tools and techniques). Formalized practice often trivializes the important social dimensions of collaboration and the dynamics of relationships among different individuals within the permanent organizations and the project organization. Similarly, in Hong Kong construction projects, Chan et al. (2006; 2003) find the major obstacle of partnering success to be the failure of introducing desirable partnering attitude due to commercial pressure. Based on a case study of two projects in the UK, Alderman & Ivory (2007) highlight the ‘partnering paradox’ where the intended collaborative behavior is hardly realized mainly due to the existence of adversarial attitudes. A study of five projects in Norway and Canada (Aarseth et al., 2012) confirms the existence of ‘practical difficulties’ due to a lack of collaborative mind-set and insufficient initial effort to establish shared norms.

The authors aim to extend current literature on project-based collaborative relationships by empirically reconstructing the project practitioner's perception on essential ingredients to improve the owner–contractor relationships. The main question is: how could practitioners improve their working relationships to ensure successful project delivery? This paper is structured as follows: firstly, we discuss the concept of collaborative relationship — what we know about it and its essential elements. Then, we briefly discuss our approach, based on Q-methodology, to data collection and systematic analysis of the project practitioner's opinions. Next, we systematically present the revealed practitioners’ perspectives on the essence of improving owner–contractor relationships. Finally, we discuss the practical and theoretical implications of the results.

4.2. Owner–contractor relationships in projects

The effects of the nature of owner–contractor relationships have been investigated in a series of project partnering studies (Chan et al., 2004; Drexler and Larson, 2000; Larson, 1995; Meng, 2011). There is a mixed result in project performance when some degree of partnering (informal partnering, project partnering, and strategic partnering) was used to measure the owner–contractor relationship quality. Almost two decades ago, Larson (1995) reports superior project performance achieved by both informal-partnered and fully formal-partnered projects. Recent findings by Meng (2011) however, show that partnered and even strategic partnered projects did not significantly differ from projects managed by traditional relationship. When the relationship quality indicators were used to measure the effect of owner–contractor relationship, more convincing results emerged. Based on 100 respondents, Meng (2011) concludes that schedule performance can be improved by joint working; cost performance can be improved through open and effective communication, clear and fair risk allocation, regular performance measurement, and no-blame culture; and quality defects can be reduced through effective problem solving mechanisms.

Building on Meng's findings, our focus is on investigating the essential ingredients of owner–contractor collaborative relationships, and not on the effect of different levels of relationships on the project performance. Extant literature suggests two different types of
Sorting out the essence of owner–contractor collaboration

relationship in projects: *adversarial* and *collaborative* (Cheung et al., 2009; Humphreys et al., 2003; Smyth and Pryke, 2008b). It is clear that an adversarial relationship is undesirable and assumed to lead to short-term, opportunistic behavior and confrontational interactions between owner and contractor. A collaborative relationship, on the other hand is desirable and generally characterized by commitment, cooperation, and connectedness of owner and contractor striving for a common goal. However, collaborative relationships may also take a range of approaches such as *strategic alliances, project partnering, project alliancing*, and *supply chain management* (BSI, 2010; Bygballe et al., 2010; Xue et al., 2010); *relational contracting* (Gil, 2009; Rahman and Kumaraswamy, 2005, 2008); and *integrated teamwork* (Baiden and Price, 2011; Baiden et al., 2006; Bosch-Rekveldt et al., 2011; Kumaraswamy and Rahman, 2006; Thomas and Thomas, 2005). We therefore define owner–contractor collaborative relationship in a project as the behavioral interaction between owner and contractor working together for the purpose of achieving specific project and business objectives by effective utilization of each party’s specific resources and capabilities based on shared values and norms.

Based on a review of related literature, we found an extensive list of elements or components of collaborative relationships. We further identified six key categories emerging from literature, namely: (i) teamwork, (ii) relational attitudes, (iii) capability, (iv) team integration, (v) joint working, and (vi) contract. These six categories are chosen arbitrarily to reflect different conceptual angles on what constitutes collaborative relationships. These categories are not meant to classify different types of relationships (as the terms such as partnering, alliance, or strategic alliance do) but are considered as high order factors of the elements of collaborative relationship. The six categories will be further detailed in the next six paragraphs.

### 4.2.1. Teamworking

The role of teams to the success of organizations is well documented in the management literature (Ilgen et al., 2005; Mathieu et al., 2008; Stewart, 2010). In project context, teamwork can be defined as the extent to which members in a team work together on the basis of synergies in their interactions (Baiden and Price, 2011; Hoegl and Gemuenden, 2001; Tannenbaum et al., 1992). The effect of teamwork to collaborative relationship is well recognized in the project management research (Baiden and Price, 2011; Chan et al., 2004; Cheung et al., 2009; Hoegl and Gemuenden, 2001; Jefferies et al., 1999; Kumaraswamy and Rahman, 2006). Cheung et al. (2009) found that good teamwork spirits is one of the important drivers for the contracting parties to adopt cooperative behavior. In a series of empirical studies, Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl and Parboteeah, 2006; Hoegl and Parboteeah, 2007; Hoegl and Weinkauf, 2005; Hoegl et al., 2004) show that ‘teamwork quality’ significantly contributes to the success of innovative projects. Building upon prior empirical studies we identified a number of common elements of teamwork: team identity or cohesion, shared vision, information/knowledge sharing,
team member’s affective trust, attitude towards diversity in problem solving, and reflection and self-assessment.

### 4.2.2. Relational attitudes

Different attitudes and mindsets exist within each party prior to any relationship between the two parties and are brought into the relationship. As the two parties interact, a set of relational norms, factors, or routines are co-developed specific to govern their relationship (Poppo and Zenger, 2002; Poppo et al., 2008; Rahman and Kumaraswamy, 2008; Spekman et al., 1998). In this study, we position relational attitudes as a high order concept reflecting the following relational norms and aspects between owner and contractor: inter-organizational trust alongside organizational cultural fit, open communication, long-term orientation, and top management commitment. Inter-organizational trust and open communication is evidenced to improve buyer–supplier relationships (Poppo and Zenger, 2002; Ring and van de Ven, 1994; Zaheer et al., 1998) and project performance (Pinto et al., 2009). While long term orientation (Ahola, 2009; Ganesan, 1994), organizational cultural fit and top management commitment (Black et al., 2000; Rahman and Kumaraswamy, 2008) also have been identified as critical success factors for collaborative relationship.

### 4.2.3. Capability

In projects, capability refers to both the owner’s and contractor’s project management capability (Turner, 2009), technical capability in a specific area (Rahman and Kumaraswamy, 2008), financial strength (Black et al., 2000), and perceived organizational reputation (Kadefors et al., 2007; Pesämaa et al., 2009). It is widely recognized that the contractor’s capabilities are the basic requirement for delivering a successful project. Therefore, current project procurement procedures are designed to select the best capable contractor from the market pool (Morris and Pinto, 2007; Pesämaa et al., 2009; Pryke, 2009; Turner, 2003; Walker and Hampson, 2003). However, with increasing project complexities, owner (in-house) capabilities also become crucial to ensure project performance (Berends, 2007; Miller and Lessard, 2000; Rahman and Kumaraswamy, 2008).

### 4.2.4. Team integration

Team integration often refers to a collection of practices, methods and behaviors that promote a favorable environment where information and knowledge are exchanged freely among the parties (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011; Dietrich et al., 2010; Merrow, 2011). Team integration has common features: (1) creation of a single integrated project team, (2) seamless operation without organizational boundary, (3) unrestricted cross-sharing of information, (4) equitable relation and respect for all, and (5) collective responsibility for all project outcomes (Baiden and Price, 2011). The investigation by Bosch-Rekveldt et al. (2011) on 5 projects suggests that integrated teams are more open to share information and knowledge and are therefore more effective in anticipating changes in the highly dynamic project environment.
4.2.5. Joint working

Instead of confronting each other, a collaborative relationship supposedly enables the parties to make joint efforts for managing the project tasks. Joint working is generally reflected by: (1) joint decision making (Chan et al., 2004); (2) joint problem solving and dispute handling (Baiden and Price, 2011; Black et al., 2000; Chan et al., 2004; Rahman and Kumaraswamy, 2008); (3) joint risk management (Bosch-Rekveldt, 2011; Rahman and Kumaraswamy, 2002; Rahman and Kumaraswamy, 2004a) and (4) joint effort for continuous improvement (Black et al., 2000; Chan et al., 2004; Meng, 2011; Rahman and Kumaraswamy, 2008).

4.2.6. Contract

Literature categorizes contracts and their key aspects such as remuneration scheme, incentives and risk sharing mechanism in a broad range of terms. The type and scope of a contract is typically chosen by the owner, depending on the nature of the works, availability of own resources, availability of contractors, project value drivers, and required competences. Generally, a contract specifies roles, responsibilities, remuneration scheme, payment terms and phases, incentive scheme, distribution of risk, and dispute resolution, and conflict settlement (Turner, 2003; Turner and Simister, 2001; von Branconi and Loch, 2004). So far, the views on the effectiveness of incentive based and partnering contracts on owner–contractor working relationships compared to lump-sum contracts are contradictory. On the one hand, partnering contracts are considered more collaborative than lump-sum based contracts (e.g.:Bayliss et al., 2004; Larson, 1995). On the other hand, it is suggested that partnering does not always eliminate the underlying adversarial attitude (Bresnen and Marshall, 2002; Ng et al., 2002). Merrow (2011, p.292) reinforces this view that “designers of alliances also thought that they would get the best features of lump-sum contract with none of the draw backs. [...] what we actually end up with [is] the worst features of lump-sum contracts combined with the worst features of reimbursable contracts”.

It is important to note here that there are interrelationships between some conceptual categories. Extant literature suggests that teamworking reflects the effects of relational attitudes, team integration, and joint working. For example, Baiden and Price (2011) suggest that team integration can help improve teamwork effectiveness, however, they also recognize that team integration is not the only supporting factor to teamwork effectiveness. Their study shows that “different levels of integration can result in the same levels of teamwork effectiveness” (p.135). Practicing team integration is only one factor among others, whether or not teamworking can be achieved further depends on the inherent mechanisms of teamworking. We therefore consider the categories separately because each category represents a key area of a collaborative relationship. Moreover, because our focus is to gain insights from the practitioners' on how to improve the working relationship between owner and contractor in the execution phase, we opt for comprehensiveness to
allow us to select elements of collaborative relationship – as complete as possible – meaningful to the practitioners.

4.3. Methods

Taking a view that “projects are about state of mind” of the project practitioners (Winch and Maytorena, 2011, p.360), this study focuses on the practitioners' subjectivity. By subjectivity we mean that a practitioner's perception stems from his/her “internal frame of reference” that was casted through the experience of carrying role in different situations (McKeown and Thomas, 1988). A person's frame of reference also includes a person's belief that guides his/her own behavior and decision making (Cross, 2005). We apply a systematic analysis of the project practitioners' subjectivity through application of Q-methodology. Q-methodology is an inverted technique of factor analysis (R-method), invented by psychologist–physicist William Stephenson in the 1930s (Stephenson, 1953) as the basis for a scientific approach to human subjectivity. The method can be used in any research field where subjectivity is at issue, including attitude measurement (Stephenson, 1953, 1965). Fundamentally it is a discursive, constructivist approach that combines a strong qualitative dimension with the powerful quantitative tool (Stenner et al., 2008). Mainly due to the work of Brown (1980) and McKeown and Thomas (1988), who further developed the principles and procedures of Q-sorting, the Q-methodology has more recently found its way to a wide variety of research areas.

4.3.1. Q-methodology approach

In contrast to R-methodology (which is based on surveys and multivariate factor analysis), Q-methodology identifies respondents' responses within the context of the valuation of all statements presented (Ten Klooster et al., 2008). The instrument for data collection is mainly a set of statements (the Q-set) derived from a population of issues (concourse) around the topic of interest. The respondents (the P-set) consist of a number of well-informed individuals that are purposively selected according to the prior assumption on the possible diversity of opinions related to the issue in question. The data collection process or Q-sorting is performed in a way that the respondents are asked to rank-order the Q-set according to their subjective viewpoint (McKeown and Thomas, 1988). The Q-factor analysis is then performed on Q-sorting data to reveal similarities/dissimilarities of a limited sets of viewpoints.

Q-factor analysis is an inversion of the conventional by-item factor analysis (Stephenson, 1965). In comparison with standard R-factor analysis, Q-factor analysis correlates persons instead of test items (i.e. by-person factor analysis). The matrix of correlations reflects share preferences (likes and dislikes or agree and disagree) between individuals respondents. Low correlations between two persons indicate that they do not share a common point of view. On the other hand, significant correlations among respondents exist indicates the presence of common viewpoints or factors. Q-methodology is aimed at constructing and
understanding of the people’s viewpoints (Brown, 1980; Cross, 2005; Ten Klooster et al., 2008; Van Exel and de Graaf, 2005). In a study applying Q-methodology, a small sample of respondents is sufficient and selected to represent the breadth of opinion in a target population (Brown, 1980, 1996).

This study was conducted in four steps. Firstly, by formulating Q-samples (samples of population of opinion), the actual research instrument and the basis of any Q methodological study. Secondly, by conducting Q-sorting sessions with samples of respondents. Thirdly, by factor analyzing all Q-sorts data to reveal the distinct perspectives. Ultimately, the results of factor analysis were interpreted to reconstruct and make sense of the revealed distinct practitioners' perspectives on ways to improve owner–contractor relationship.

### 4.3.2. Q-samples

The raw material of Q-samples originated from various opinions regarding factors or aspects for improving owner–contractor relationship. We collected various statements from 10 interviews with senior practitioners (project directors and senior project managers), popular articles from websites and blogs of project management and contracting professionals (e.g.: The Project Management Network and Commitment Matters blog), popular literature (e.g.: ACA, 1999; CII, 2011; KPMG, 2010; Merrow, 2011), and journal articles (e.g.: Ahola, 2009; Bosch-Rekveldt, 2011; Bresnen, 2007; Chan et al., 2012; Meng, 2011; Smyth and Pryke, 2008a).

The collection of statements was edited and then categorized. Complex statements were broken down so that each addressed a single issue but broad and clear enough to be interpreted in slightly different ways by different people; similar statements were grouped and combined. After 7 iterative discussions, we compiled 115 statements. All statements were arbitrarily selected in accordance to six categories of collaborative relationship ingredients as discussed in Section 2: (i) teamworking (TW); (ii) relational attitudes (RAT); (iii) capabilities (CAP); (iv) team integration (TIN); (v) joint working (JOW); and (vi) contractual aspects (CTR). For each category a broadly representative statements was selected leading to a Q-set of 55 statements (see Appendix 4-1). To ensure operability of the instrument, we conducted a pilot Q-sorting test with 3 project management scholars resulting in minor editorial adjustments to the final statements.

### 4.3.3. Q-sorting

As the nature of working relationship involves different roles of practitioners and firms, we identified a number of respondents based on their roles in projects (project director, project manager, project engineer) and their firms positions (owner and contractor). Potential respondents were then approached by email or telephone to be sure they were willing to participate and were exposed to the working relationship with either owner or contractor.
Project practitioners who met the selection criteria and agreed to participate were invited to 60–90 minute face-to-face meetings. Each participant was asked to perform Q-sorting. Respondents were asked to rank-order all 55 statements (printed on cards) in an ordinal scale from −5 (most disagree) via 0 (neutral) to +5 (most agree) and whereby the guiding question was: “in order to improve owner–contractor relationship it is important that ...”. They were asked to sort the statements in relation to each other. Respondents put the cards on the forced normal distribution that was printed on a sheet of paper as show in Figure 4-1.

![Q-sort score board](image)

Figure 4-1. Q-sort score board

Immediately after finishing Q-sorting, the participants were interviewed. During this post-sorting interview, the participants were asked some personal background questions about their career, education, and working experience. They were also invited to describe their latest completed project characteristics like project definition, contract type, performance with regard to budget, schedule and quality, and critical incidents occurred. These questions were presumed relevant for supporting qualitative interpretation of the participants' Q-sorting.

### 4.3.4. Q-factor analysis

To reveal factors, that is, the distinct ways in which the statements were rank-ordered, Q-sorts data from 30 respondents were factor analyzed using PQMethod version 2.33 (Schmolck, 2012). We chose principal component analysis and Varimax rotation methods to extract and rotate factors. For each resulting factor (i.e. each different perspective for improving owner–contractor relationship), an array of Z-scores (Z-SC) was computed based on the Q-sort scores of the respondents loading on that factor and using their correlation coefficient with the factor as weight. An idealized Q-sort was reconstructed for each factor.
in which all 55 statements were recoded to idealized Q-sort value (Q-SV) ranging from +5 to −5 according to their Z-scores ranks. Each factor was analyzed and interpreted based on the characterizing and distinguishing statements and the corresponding respondents who defined the factor. A statement is characterizing if its position is in the outer columns of the idealized Q-sort of the factor (see Figure 4-1) and distinguishing if the position is statistically significantly different from its position in the idealized Q sorts of all other factors. Complementing the interpretation of factors, the defining respondents’ narrative explanations are quoted as additional insights.

4.4. Results

4.4.1. Characteristics of respondents

A total of 30 practitioners (see Appendix 4-2) from 19 different companies were included as Q-sorters, i.e. 15 owner practitioners represented 9 different owner companies and 15 contractor practitioners represented 10 different engineering contractor companies. The practitioners were balanced between owner and contractor sides based on their positions. On the owner side, we included 4 project directors, 10 project managers, and 1 project engineer as the respondents; and on the contractor side 3 project directors, 10 project managers, and 2 project engineers. The practitioners’ years of experience in projects were relatively comparable. The average years of practitioners’ experience was 22.9 years ranging from 3 to 40 years.

The diversity of practitioners’ experience was based on their last projects contract type and location. Of the 30 practitioners, 19 were involved in their last projects based EPC (Engineering, Procurement, and Construction) lump sum contract while the other 11 practitioners were involved in different contract types ranging from EPCm (Engineering, Procurement, and Construction management) unit rate (3), EPCm convertible lump sum (2), project alliance/partnering (4), to long-term alliance (2). In terms of the location of their last project, 20 practitioners conducted their projects in Europe and the rests were in Asia (3), Australia (1), Russia (1), and South America (1). Note that, the practitioners’ last projects’ contract type and location were relatively unbalanced. Typically, this is not important for this study since Q methodology focuses on representativeness of the population of opinions instead of population of people (Brown, 1980; McKeown and Thomas, 1988).

4.4.2. Q-factor analysis

To determine the number of meaningful factors, i.e. the number of meaningful and distinct practitioner perspectives on ways to improve owner-contractor relationships, we analyzed the results of different consecutive factor rotations on two- to seven-factor solutions. For each factor solution, the following rules were applied to accept the solution (Brown, 1980):

Each acceptable factor should be defined by at least two significant Q sorts, whereby:
(i) A Q-sort \( x \) is loaded significantly at \( p < .05 \) on a factor \( y \) if its factor loading, \( f_{xy} > 0.27 \) (calculated from \( \frac{1.96}{\sqrt{N}} \); where \( N = 55 \), number of statement); and

(ii) Its highest square factor loading explains more than half of the common variance, \( f_{xy}^2 > h_x^2/2 \); where \( h_x^2 \) is the sum of the square factor loadings of the Q-sort \( x \).

<table>
<thead>
<tr>
<th>Table 4-1. Characteristics of consecutive factor solutions</th>
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<tr>
<td>Factor</td>
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<td>CEV</td>
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<tr>
<td>Acceptable factors</td>
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<tr>
<td>Defining sorts</td>
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</table>

Source: compiled from consecutive Q-factor analysis using Principal Component Analysis and Varimax rotation; CEV = cumulative explained variance.

The result in Table 4-1 indicates that our data supports a maximum of 5 factors. Factor loadings of six- and seven-factor solutions resulted in only 5 acceptable factors (defined by at least two Q-sorts). The cumulative explained variance (CEV) of four- and five-factor solutions is 55% and 60% respectively. Furthermore, the number of defining sorts for four- and five-factor solutions is respectively 24 and 23 sorts respectively. This means four- and five-factor solutions are relatively indifferent.

After interpreting the content characteristics of the factors in three- to five-factor solutions, we identified four stable distinct factors. The cumulative explained variance of 55% from four-factor solutions is also comparable to other Q-methodology studies (Ten Klooster et al., 2008; Van Exel, 2011). The factor loadings of four-factor solution are given in Appendix 4-3.

4.4.3. Practitioners’ perspectives

To reveal the characteristics of practitioners’ perspectives we used the results of factor analysis from four factor solution (see Appendix 4-1). Firstly, quantitative outputs of Q-factor analysis, factor arrays were used to identify characterizing and distinguishing statements for each factor. Whenever we highlighted a statement, we included its identification number and corresponding Q-score value and placed it between parentheses. Furthermore, reflexive explanations from the corresponding defining respondents (R#, # denotes the respondent’s identification code) were quoted to enhance our understanding on each perspective.

4.4.3.1 Perspective 1 (shared team responsibility)

The first perspective labeled as shared team responsibility accounts for 18% of the explained variance. Nine practitioners (2 owner project directors, 2 owner project managers, 3 contractor project directors, and 2 contractor project managers) have a common view with the array of statements for this perspective. Figure 4-2 shows the factor scores of the characterizing statements for this perspective; the distinguishing statements of this perspective – the statements which corresponding factor scores distinct between this perspective and the others – are also highlighted.
These practitioners particularly emphasize that shared team responsibility is imperative to improve owner–contractor relationship, i.e. all the project team members should share a common set of objectives (2, +5) but stay open minded on contentious issues and even conflicting opinions (38, −5), and embrace social interaction (30, −4). Reflections from defining respondents encapsulate this core belief:

“Common objectives bind people and through this, people are prepared to accept their responsibilities and confirm what they want to achieve. In the end you will get the best out of them” (R2 and R13). “It will encourage people to take care of others to solve problems, taking it as individual and team responsibilities show your reciprocity in the relationship” (R23). “You need to have the same direction while allowing some differences to exist. Share, accept and be open about differences” (R25). “You need to embrace differences in opinions for a constructive discussion and mutuality” (R3, R23, and R28).

**Figure 4-2. Perspective 1: defining and distinguishing statements**
According to these practitioners, project teams with shared responsibility, should regularly evaluate each other's roles and responsibilities (11, +3), accept joint responsibilities for the team's achievement (15, +3), and personally engage the team members to the project goals (51, +3). To ensure such shared responsibility, both owner and contractor at firm level should embrace relational attitudes such as no blaming each other but focus on finding solutions when problems occur (28, +4), open and honest communication (44, +4), and acknowledge cultural differences (6, +3). The defining respondents argue this:

“When you run into problems and any potential disputes, you need to solve it as one party and focus on what you can do best” (R10, R19, and R25). “Active communication without hidden agenda on both sides will be the basis for trust and improving the relationship” (R10, R25, and R26). “Project team is almost always multi-cultural (organizational and people), acknowledging this enables people to understand each other and in turn creates openness and honesty” (R23, R25, and R28).

Practitioners with this perspective also firmly believe that owner's strong financial capacity (10, −4) has nothing to do with the working relationship. “It is a given condition from selection process, you do not need this” (R2, R10, and R13). They particularly disagree that owner's (55, −3) as well as contractor's senior management leadership (8, −1) will improve the relationship. “In projects, leadership should be shown by the project manager; senior management does not need to be visible to people in the project team” (R23). They also reject the need to have owner's internal alignment (25, −3). “Owner's internal alignment is part of the business, only matters in the early stage and is not relevant during execution” (R10 and R13).

Interestingly, although not unique to this perspective is the use of a contract as the basis to manage the project activities (5, −3), and explicit incentive schemes (21, −3) might be hampering instead of improving the relationship. “In fact, in a real relationship you do not need a contract” (R10 and R19). “Incentive schemes should not be the main driver; instead making people work together should be based on respect” (R2 and R28).

4.4.3.2 Perspective 2 (execution focused team)

The second perspective labeled as execution focused team accounts for the 12% of explained variance and is defined by six practitioners (1 owner project director, 2 owner project managers, 2 contractor project managers, and 1 project engineer). As shown in Figure 4-3 these practitioners underpin the project execution team with strong senior management leadership from both contractor and owner as the way to improve owner–contractor relationship. As in perspective 1, they firmly believe that everyone in the project team should trust each other (43, +5), share a common set of objectives (2, +4), embrace social interaction (30, −5) and be open minded on contentious issues and even conflicting opinions (38, −4) but keep the team work in order within organizational and hierarchical boundary (27, −4).
Unlike perspective 1, they underline the importance of passionate display of senior management leadership from contractor (8, +4) to establish the right working culture. These practitioners give a different meaning to the project team as it are mainly the contractor’s people who actually do the work. They quite strongly believe that contractor’s confidence on the owner’s reliability and trustworthiness (3, +3), specifying targeted performance in the contract (35, +3), reward and recognition to people’s performance and behavior (37, +3), and passionate display of leadership from the owner’s senior management (55, +3) are important means to support the project team. Reflections from defining respondents encapsulate this core belief:

“The relationship works on trust and trust grows on transparency just like a marriage (R12 and R24). “Shared objectives is the basis for couple structure, you always explain every problem with your counter-part” (R12 and R16). “Social interaction or celebration is necessary to build trust and you need this to motivate people” (R12, R16, and R30). “Tensions can be helpful and at the same time you need a structure and clarity because you have to work with many people and complex works” (R6, R12, R24, and R30).
“Basically it is people who do the project; you need leadership from both sides to provide structure and necessary resources to the project team” (R16 and R17).

Unlike other perspectives, they particularly disagree that contractor’s early involvement (12, −3) and owner’s effort in FED (front-end development) (13, −3) will have a positive effect on the relationship. They argue that “the early stage of a project requires a different set of attitudes and skills which are different from [execution] contractor”(R16). “It is nice to have contractor involvement early on and owners doing sufficient front-end development, but we can always start from scratch and build it along the way” (R12 and R30). Their strong rejection of contractor’s long-term orientation (42, +3) further illuminates this perspective as execution-oriented view.

4.4.3.3 Perspective 3 (joint capability and structure)

The third perspective labeled joint capability and structure accounts for 12% of the explained variance and is defined by 5 practitioners (2 owner project managers and 3 contractor project managers). Practitioners with this perspective particularly emphasize the joint capabilities and structured approach to improve the working relationship. As shown in Figure 4-4, they specifically emphasize owner’s efforts in front-end development (13, +5) and owner’s sufficient competent personnel (45, +4). Structure and hierarchy (27, −5) should, in fact, in place to govern the relationship. Conflicting opinions in the project team should be nurtured (38, −4) because it is important to understand the underlying reason of the differences. Specifying roles and responsibilities in the contract (20, +4) will strongly help to clarify the project governance structure.

The underlying arguments of this core belief are expressed in the following reflections:

“Good front-end means a success at the start and this is what owner must put sufficient effort in. The owner has the knowledge about the assets and this knowledge must be made available to the project. The owner with the help of contractor can prepare these in advance” (R8 and R9). “To some degree a project team is just like a military team” (R15). Without boundary and hierarchy, the structure is missing and therefore there is no basis for cooperation and decision making process” (R7 and R9). “Structure comes with a framework to clarify high level tasks, responsibilities, and authority” (R8). “[However], there must be room for conflicts; cherish, understand, solve and decide; it offers an opportunity to create a strong bond and colorful team” (R4, R8 and R9).

In line with the above reasons, these practitioners particularly believe in the importance of contractor’s early involvement in the front-end development (12, +3) and contractor’s project management capability (18, +3). They also perceive that risks have to be managed jointly (40, +3), trust within the project team (43, +3) should be nurtured, and social interaction should not be restricted (30, −3). Moreover, integrating the owner’s and the contractor’s key personnel into one single team (33, +2) will further enhance the working relationship.
The need to have a proper project team and relationship structure is found by these practitioners to govern the relationship with certainty but does not need compatible working procedures (16, −4). “Compatible systems and procedures are absolutely unnecessary because there are many ways to link your tasks” (R7). “In fact, system and procedure must be established based on the project requirements” (R8). With such an approach, future offers from the owner (34, −3) and from the contractor (41, −3) are irrelevant since no certainty can be secured. Similar to other perspectives, explicit incentive scheme (21, −3) is perceived negatively as “nothing to do with the relationship” (R7) and “it can even be harmful because it distracts people from their work” (R15).

4.4.3.4 Perspective 4 (senior leadership pair)

The fourth perspective labeled as senior leadership pair accounts for 13% of the explained variance and is defined by 4 practitioners (2 owner project managers and 2 contractor project managers). The practitioners with this perspective uniquely underline the visibility of the leadership pair to determine the best formation of the project team and to shape the
collaborative working culture. Figure 4-5 shows characterizing and distinguishing statements of this perspective. This core belief emerges from the importance of consistent display of passionate leadership from owner’s (55, +5) and contractor’s senior management (8, +4). Similar to other perspectives, they emphasize trust (43, +4) and social interaction (30, −4) within the project team. The following reflections illustrate the core idea of this perspective:

“Senior management of both parties must focus on the best formation of the project team so the required conditions for the project team are optimal” (R1). This [leadership pair] provides vision and determines the culture of the whole project organization from both sides, what you get is the team members are also being passionate and intrinsically motivated” (R5 and R20). “At the end it is the people who work together and make a project, you need mutual trust” (R5 and R20).

Next, similar to other practitioners, they quite strongly believe in the need to establish the right relational attitudes, mainly with a high level of awareness on cultural differences between organization and people (6, +3), no blaming each other but focus on finding solution
when problems occur (28, +3), and open and honest communication (44, +3). They also consider the importance of contractor’s early involvement (12, +3). These supporting perceptions are reflected as follows:

“Acknowledging cultural differences means you focus to achieve the project goals. No blaming supports openness and in turn develops trustworthiness among parties and people in the project team” (R21). “You must have an agreement on both sides, if you do not talk openly about a problem, it might already be too late” (R20). “Each team has its strengths and weaknesses, you have to be open about it” (R5 and R21), “it is difficult but you must, to be trustworthy” (R20).

Like other practitioners, the practitioners who share this perspective consider that using a contract as the basis to manage the project activities (5, −3) might be counter-productive to the relationship because “you cannot define everything in the contract” (R21). They also disagree that using a contract to specify explicit incentive scheme (21, −4), performance (33, −3) and risks (9, −3) can improve the working relationship. Particularly an explicit incentive scheme is perceived to be “only relevant for senior management” (R5) and “has nothing to do with the people who actually perform the works” (R5 and R21). Furthermore, they strongly believe that owner’s strong financial capacity (10, −5) has nothing to do with the working relationship. “More money does not mean more passion, besides that the owner can let us know if they cannot pay as much as we ask” (R20 and R21).

4.4.4. Rank of statements across perspectives

To get an overall rank of statements across four perspectives, we averaged the Z-scores of each statement on four perspectives. Figure 4-6 highlights ranks of top (most positive) 15 and bottom (most negative) 15 statements according to the mean Z-scores.

On the top 15 statements, affective trust within project team (43, from +1.55), open and honest communication (44, from +1.23), shared objectives (2, +1.22), and no-blame culture (28, +1.11) ranked the top 4 and thus perceived as key ingredients to an effective relationship. Next statements are related to capability such as contractor’s project management capability (18, +0.78), competent personnel of contractor (54, +0.60) and owner (45, +0.57). According to the practitioners, sufficient contractor’s capability is “a precondition to a strong project team, mix of people who know what they do”.

Next statements are related to senior management such as owner’s (55, +0.73) and contractor’s (8, +0.64) senior management leadership, senior management involvement in handling conflicts (47, +0.72), and owner’s (1, +0.51) and contractor’s (36, +0.70) senior management support. In reflection, the practitioners consider the importance of senior management role in providing “proper and sufficient resources are a good start for good relationship”. Finally, the rest of the statements, contractor’s trust (3, +0.69), joint risk management (40, +0.62), recognition and rewards (37, +0.55), and take on the next ranks.
Joint risk management is acknowledged as “a crucial daily job and by doing it jointly the project team will get the bigger picture” to perform. Recognition and rewards are considered important to “make people feel being respected and motivated on their achievement”.

**Figure 4-6. Top 15 and bottom 15 statements across perspectives**
On the bottom 15 statements, *restrictive social interaction* (30, −2.21), *no conflicting opinions* (38, −1.71), and *no structure and hierarchy* (27, −1.64) rank at the bottom three. During post-sorting interviews, the practitioners perceived social interactions, conflicts, and structure as elements that persist in the relationship and should not be overlooked. In other words, the reverse of these statements are perceived as important to the relationships.

Next, compatible working procedures (16, −1.44) and *owner’s financial capacity* (10, −1.34), most contractual functions, i.e.: *explicit incentive scheme* (21, −1.24), *contract as the basis to manage project activities* (5, −0.95), *contract for problem solving* (24, −0.75) contract for specifying risks (9, −0.68) and *scope of work* (14, −0.46), *owner’s future reward* (34, −0.70), *contractor’s future offer* (41, −0.53), *contractor’s long-term orientation* (42, −0.43), and *owner’s internal alignment* (25, −0.41) are considered to be relatively negative or at least irrelevant to the relationship.

In their reflection, for example, *owner’s financial capacity* is considered as precondition to every owner to start a project. While *future offer and reward* are understood as long-term relationship but considered irrelevant to current project-based practice to the owner, “Every new project should always start over without any preferences to a particular contractor. Such things are only relevant when we are talking about a program”. In one-off projects this means “just talk and a fake relationship”. Also regarding the use of contract for specifying problem solving procedure and risks, the practitioners reflect as follows: “In true relationship, once you signed the contract, you put it in the drawer. If things go wrong and you refer to the contract to solve the problems, you will lose the relationship. Contract is a document; risks are dynamic and not one-off definitions that need to be managed beyond the contract. You could never prescribe how to solve a problem and how to mitigate risks in a contract”.

### 4.5. Discussion

In this study we selected 30 Dutch practitioners on the basis of company (owner or contractor) and role (project director, project manager, and project engineer). Furthermore, three additional pieces of background information were used: educational background, years of experience in projects and their most recent contract type. Eventually, the practitioners’ background information did not turn out to be relevant in any of the distinguished perspectives.

#### 4.5.1. Four perspectives to improve owner–contractor relationships

Each of the perspectives discussed here is based on a particular view within which six conceptual categories were understood by the practitioners. Table 4-2 summarizes the link between the six conceptual categories and the four perspectives.
<table>
<thead>
<tr>
<th><strong>Table 4-2. Linking conceptual categories to the practitioners’ perspectives</strong></th>
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<tbody>
<tr>
<td><strong>Shared team responsibility</strong></td>
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<tr>
<td><strong>Teamworking</strong></td>
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<td><strong>Relational attitudes</strong></td>
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<td><strong>Capability</strong></td>
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## Table 4-2. Continued

<table>
<thead>
<tr>
<th>Team Integration</th>
<th>Execution focused team</th>
<th>Joint capability and structure</th>
<th>Senior leadership pair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shared team responsibility</strong></td>
<td><em><em>Structure and hierarchy</em> (-2)</em>* are necessary for check-and-balance mechanism. It does not matter whether contractor is involved early or not (0).</td>
<td><em><em>Structure and hierarchy</em> (-4)</em>* on different levels are very important to avoid chaos and to support decision making processes. Contractor does not need to be involved in the front end development (-3).</td>
<td><em><em>Structure and hierarchy</em> (-5)</em>* are crucial to establish stability of tasks, responsibilities, and authorities as well as decision making process. Contractor’s early involvement is important to integrate the project team (+3).</td>
</tr>
<tr>
<td><strong>Joint working</strong></td>
<td><em><em>Structure and hierarchy</em> (-4)</em>* on different levels are very important to avoid chaos and to support decision making processes. Contractor does not need to be involved in the front end development (-3).</td>
<td><em><em>Structure and hierarchy</em> (-5)</em>* are crucial to establish stability of tasks, responsibilities, and authorities as well as decision making process. Contractor’s early involvement is important to integrate the project team (+3).</td>
<td><em><em>Structure and hierarchy</em> (-1)</em>* can avoid chaos. Contractor’s early involvement is helpful to set the required team culture (+3).</td>
</tr>
<tr>
<td><strong>Contractual functions</strong></td>
<td><strong>It is useful to practice joint performance management (+2), joint risk management (+2), and recognition and rewards program (+2).</strong></td>
<td><strong>It is important to have recognition and rewards program (+3). Joint performance management (+1) are useful but not always necessary.</strong></td>
<td><strong>It is important to practice joint risk management (+3). Joint performance management (+1) are useful but not always necessary.</strong></td>
</tr>
</tbody>
</table>

Note: numbers between brackets indicate the relative ranks of conceptual categories for each perspective based on the mean Z-scores of corresponding statements; numbers between parentheses indicate Q-sort value of corresponding statements; *originally formulated as negative statements.
The shared team responsibility perspective is built on a view that owner-contractor relationship can be improved by focusing on the forming and governing of effective teamwork. The core argument of this perspective is placed on teamwork so that key personnel from both sides personally engaged towards a common vision, collectively feel responsible, support and trust each other. Consciously pre-established relational attitudes (such as no blame culture, open and honest communication, and mutual respect) at the inter-firm level are perceived as more effective to govern the working relationship. To this perspective, leadership is only meaningful when it is displayed by the project manager who is responsible in day-to-day project activities and not by senior management. Moreover, this perspective considers joint working such as performance management, joint risk management, and recognition and rewards program as positive practices to support the teamwork. Team integration, in particular, horizontal and vertical structures also can be helpful for check-and-balance mechanisms and clarify the team members’ roles and responsibilities. However, too much relying on contract might be harmful. Contract is an absolute necessity in business/commercial sense but not an effective instrument for managing the working relationship. The same attribution also applies to capability factor where both owner’s and contractor’s project management capabilities, technical capabilities, and personnel competencies are perceived as key pre-requisite (given factors) but not sufficient to ensure effective teamwork.

The execution focused team perspective is built on a view that owner-contractor relationship can be improved by teamwork that is built upon trust and common vision. The effectiveness of the teamwork is, however, primarily driven by the contractor with the focus on project execution. To this perspective, both parties need to establish a proper set of relational attitudes. Unlike the previous perspective that rejects the role of senior management; senior management leadership and support are perceived important to secure necessary resources for the project. Moreover, it is also considered that the owner needs to acknowledge contractor’s trust and commercial interest. Within team integration factor, horizontal and vertical structures are perceived as important feature for check-and-balance mechanisms and clarify the team members’ roles and responsibilities. However, early contractor’s involvement in the front-end phase is perceived unnecessary and potentially complicates what comes later in execution phase (any changes or extra works). For the sake of the focus on execution, contract is of importance to teamwork to set the performance target. Regarding joint working, only recognition and rewards program is considered useful. Similarly for capability factor, only contractor’s capability factors are considered relevant to the working relationship.

The joint capability and structure perspective underlines the formation of the project team at the front-end of the project as the core elements of owner-contractor collaborative relationship. This also implies the importance of capability integration. Both owner’s and contractor’s capabilities are considered critical to a successful relationship. Such a joint capability developed from the owner’s effort in front end development and owner’s
sufficient competent personnel as well as contractor’s capability. *Team integration* further enhances the owner’s initial effort through contractor’s early involvement and alignment of subcontractors. Structure and hierarchy are considered crucial to establish stability of tasks, responsibilities, and authorities as well as decision making process. To this perspective, *teamworking* is still perceived as important aspect as the project team should trust each other and share a common vision. A set of *relational attitudes* such as no blame culture, openness and honesty, and senior management leadership and support are useful but not always necessary. *Contract* plays an important role solely to structure the responsibilities of the parties. Only joint risk management is considered as important *joint working* practice.

Finally, the *senior leadership pair perspective* emphasizes *relational attitudes*, particularly senior management leadership pair to the formation of the project team and shaping the right *teamworking* culture. To this perspective, full alignment at senior management level is perceived as the key factor to set the desired collaborative atmosphere on the project team. Such a collaborative atmosphere should be based on teamworking, in particular, mutual trust and other relational attitudes such as trust respect of differences, no blame culture, and open and honest communication. Some *team integration* practices (such as contractor’s early involvement) and *capability* factor (such as owner’s effort in front-end development) are also perceived important to set the required condition for collaboration. Comparable to shared team responsibility perspective, both *joint working* and *contract* are considered to be of relatively least important to the working relationship.

What light do the results of this study shed on the owner-contractor collaborative relationships? All four perspectives affirm the value of teamworking, relational attitudes, team integration, and capability although there is clear disagreement between perspective 3 and other perspectives particularly about capability factor (perspective 3 advocates capability as of primarily importance and other perspectives place it as supporting factor). A closer look into its meaningful elements shows that the sharpest difference seems to be in whether or not quality of a project’s front end development and team formation as the result of the owner’s early effort and contractor’s early involvement has major positive influence on the working relationship. This difference may be elucidated by Sanderson’s (2012) notion of *farsightedness* within which actors should prepare for the future. Perspective 3 seems to be comparable to Sanderson’s *Type B farsightedness* that the future is perceived as uncertain but with predictable pattern and therefore a project’s plan alongside the project team and its working relationship should be prepared “right from the start” to anticipate turbulences emerging later during execution. Other three perspectives (1, 2, and 4) are analogous to Sanderson’s *Type C farsightedness* that projects inherently involve “processes of social construction and characterized by diverse and competing cultures and rationalities [therefore] a shared culture and governance mechanisms [are needed] to encourage collaborative behavior” (p.437). These perspectives move further beyond current forms of governance (pre-designed collaborative contracts or practices) and suggest alternative governing mechanisms as combinations of elements of teamworking and
relational attitudes. Perspective 1 and 2 emphasize more on teamworking (like shared vision, social interaction, trust, personal engagement) while perspective 4 emphasize more on relational attitudes (particularly senior management leadership and commitment).

4.5.2. What do we learn?

It is no surprise that the key relationship elements we identified in this study overlap with the ‘principles’ and key success factors of relational contracting (Rahman and Kumaraswamy, 2008) and construction partnering (Aarseth et al., 2012; Black et al., 2000; Chan et al., 2004; Davis and Walker, 2008). If we compare our study results with two different empirical studies on the success factors of construction partnering of different timeline, a convergent pattern could be shown in Table 4-3. One study is Black’s et al. (2000) investigation on the success factors of project partnering based on 78 respondents from UK construction industry. Another study is conducted by Rahman and Kumaraswamy (2008) on the factors for facilitating teamwork relationship based on 80 respondents from Hong Kong construction industry.

Table 4-3. Comparing top-10 rank of relationship elements with prior studies

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>team’s affective trust</td>
<td>client’s top management support</td>
<td>mutual trust</td>
</tr>
<tr>
<td>2</td>
<td>open and honest communication</td>
<td>top management support of all parties</td>
<td>effective communication</td>
</tr>
<tr>
<td>3</td>
<td>shared objectives</td>
<td>mutual trust among all parties</td>
<td>commitment from senior management</td>
</tr>
<tr>
<td>4</td>
<td>no blame culture</td>
<td>open communication among all parties</td>
<td>clear understanding</td>
</tr>
<tr>
<td>5</td>
<td>contractor’s project management capability</td>
<td>enlightened and enthusiastic client</td>
<td>acting consistent with objectives</td>
</tr>
<tr>
<td>6</td>
<td>owner’s senior management leadership</td>
<td>effective coordination among all parties</td>
<td>dedicated team</td>
</tr>
<tr>
<td>7</td>
<td>senior management involvement in conflict handling</td>
<td>teamworking and can do spirit of all parties</td>
<td>flexibility to change</td>
</tr>
<tr>
<td>8</td>
<td>contractor’s senior management support</td>
<td>long-term commitment to each other for all parties</td>
<td>commitment to quality</td>
</tr>
<tr>
<td>9</td>
<td>contractor’s trust</td>
<td>clear defined risk allocation/sharing</td>
<td>commitment to continuous improvement</td>
</tr>
<tr>
<td>10</td>
<td>contractor’s senior management leadership</td>
<td>knowledgeable client about project processes</td>
<td>long-term perspective</td>
</tr>
</tbody>
</table>

Note: 1-Based on the overall rank of factors facilitating relational contracting (Rahman and Kumaraswamy, 2008, p51); 2-Based on the overall rank of factors responsible for successful partnering (Black et al., 2000, p426).

Despite the differences in the ranking, all three studies confirm the importance of mutual trust and open communication. Another convergent result is regarding senior management roles. Whether they are described as ‘top management support’ or ‘senior management commitment’ they are all ranked relatively high. In the present study this attention is further enhanced by the focus on ‘senior management leadership’. Apparently, this collective view
corroborates the findings that the level of leadership from senior management enhances relationship among members of the project team (Baiden and Price, 2011; Chan et al., 2006; Meng, 2011; Yang et al., 2011).

Table 4-3 also shows a remarkable difference regarding the absence of ‘long-term orientation’ in the top 10 list of this study compared to the results of Black et al. (labeled as long-term commitment) and Rahman and Kumaraswamy (labeled as long-term perspective). Over time, extant literature has suggested the importance of long-term orientation in inter-firm projects (Boddy et al., 1998; Bosch-Rekveldt et al., 2011; Cheng et al., 2004; Dahlgren and Söderlund, 2001). This study, however, suggests that long-term orientation is not a top priority in existing procurement route that is characterized by one-off contracts (Beach et al., 2005). All statements portraying long-term orientation regarding owner-contractor relationship (Statement 34, 41, and 42) received neutral or negative rank-scores almost throughout. That is, most practitioners perceived long-term orientation as “good metaphor but not realistic ... if long-term relationship is desirable then it works only in the context of a program or portfolio of projects”. The practitioners perceived that if the relationship is on the basis of one-off projects, long-term orientation is of little concern.

Interestingly, the perception regarding conflicts within the project team is considered across perspectives as desirable if constructive to the relationship (see Figure 4-6). As conflicts are inherent in project organization (Turner, 2009), the practitioners emphasized on managing instead of eliminating conflicts. In their reflections, the practitioners recognized that conflicts should be managed on the basis of open and honest communication, no blame culture, and acknowledging cultural differences. This view reiterates that solving problems and conflicts are pervasive in projects due to competing cultures and rationalities (Sanderson, 2012; Van Marrewijk et al., 2008).

Notably, most contractual aspects seem to be of relatively less influential according to the practitioners. The importance of a contract to specify roles and responsibilities of the parties (20, +4) is only highly-ranked in the joint capability and structure perspective. While the contract to specify targeted performance and its key criteria (35, +3) is moderately-ranked in the execution focused team perspective. Other contractual functions, i.e.: the contract as the basis to manage the project activities (5), specifying risks (9), specifying scope of work (14), specifying explicit incentive scheme (21), specifying remuneration scheme (22), and specifying problem solving procedures (24) have received mostly negative scores across perspectives. Also what appears from Figure 4-6 and Table 4-2 suggests that working relationship cannot be fully prescribed by contract. This suggests that contract or contractual arrangements were perceived to be relatively less important than other aspects in ‘governing’ the relationship especially during execution and when external conditions changes. However, this does not eliminate the need for appropriate contractual arrangements. An appropriate contract is necessary, but not sufficient to ensure effective working relationship (Merrow, 2011).
Meng and Gallagher (2012) indicate that contractual incentives have important influence on owner-contractor working relationships. Our findings suggest that explicit financial incentives are less effective in stimulating the intended relationship behavior. In particular, most practitioners warned that too much relying on financial incentives can distract people and the project team from their work. This finding therefore supports prior findings in Sweden (Kadefors, 2004) and Hong Kong (Rahman and Kumaraswamy, 2008) construction partnering that relational attitudes and trust provide a stronger incentive than economic incentive for collaboration and the basis for effective owner and contractor relationship.

Another notable finding is that the statement all people in the project team work without organizational/ hierarchical boundary (27) is ranked negatively (from -1 to -5) across perspectives. This suggests the opposite preference and contradicts to ‘desirable seamless operation without organizational defined boundaries’ as important feature of integrated team working (Baiden and Price, 2011; Thomas and Thomas, 2005). All practitioners opposed to the concept ‘no organizational boundary or hierarchy’ as “anarchy and blurring responsibilities”. This seems to indicate an inconsistent reasoning. However, a closer view on this finding suggests that both concepts are complementing each other. Seamless operation refers to mutual adjustment and coordination between people in the project team. Meanwhile boundary and hierarchy are required to allocate tasks and responsibilities in the project team.

Furthermore, the findings further clarify how the practitioners perceived joint risk management. Across the four perspectives, joint risk management (JRM) was considered from neutral to moderately important (from 0 to +3) to improve the working relationship. It seems that this perception contradicts to a shared view that there should be (ex-ante) a clear division of responsibilities (structure) between owner and contractor. According to Rahman and Kumaraswamy (2002, 2004b), JRM is meant as ex-post contract approach to manage unforeseen risks and uncertainties” in addition to foreseen/ quantifiable risks ownership stipulated in construction contract. To the respondents, the concept of JRM was understood as “part of the way of thinking because managing a project is mostly managing risks and changes” and therefore “do it jointly to get a bigger picture”. We can see the two different but complementary functions of joint risk management and contract’s responsibilities of risks.

It seems that the practitioners’ perception regarding owner-contractor collaborative relationships are more influenced by their personal values and evolved through day-to-day experiences. On the basis of a construction partnering case study in the Netherlands, Hartmann and Marshall (2011) suggest that partnering is “an embedded practice and constructed through individuals’ social interaction to support unlearning of old routines and behavior”. In a similar vein, based on case study of one UK-based construction partnering Chan et. (2012) indicate that the actuality of ‘doing’ partnering involves sense making and informality despite the presence of formal, prescriptive partnering arrangement. The
findings of this study indicate that the practitioners do not consider formal partnering or collaborative arrangement as necessary condition as long as its ‘principles’ can be put into operation. Overall, the view of a collaborative relationship socially constructed and evolving is the winner.

4.6. Conclusion

Researchers in the field of project management increasingly recognize that pluralism is necessary to study projects practices (Söderlund, 2011). This study captured the plurality of project practitioners’ view and revealed four preferences for improving owner-contractor relationship, i.e.: shared team responsibility, execution focused team, joint capability and structure, and senior leadership pair. These four perspectives establish the relative significance of teamworking, relational attitudes, team integration, and capability over prescribed joint working procedures and contract. These four perspectives also reflect the views that pluralism is inherent in projects (Söderlund, 2011), projects are about people, their mind sets (Winch and Maytorena, 2011), and characterized by competing cultures and rationalities (Sanderson, 2012).

This study puts a greater focus on the ‘actuality of project based working and management’ (Cicmil et al., 2006, p.675) to stimulate a more reflective and developmental approach to understanding project-as-practice (Blomquist et al., 2010; Häggren and Söderholm, 2011). We answered the call for new orientation of partnering research in construction from the formal and general conceptualization to the informal and contextual constitution of collaborative working relationships (Bresnen and Marshall, 2002; Bresnen, 2007; Chan et al., 2012). The findings of this study contribute to this new orientation, specifically on what the practitioners, in the absence of formal collaborative mechanisms, perceived to be important for the actual ‘doing’ of the collaboration in projects. In the absence of formal mechanisms, the practitioners sorted out that teamworking and relational attitudes (reflected by affective trust, common vision and objectives, open and honest communication, no blame culture, constructive conflict, social interaction, and senior management commitment) are the most essential ingredients to owner-contractor collaboration. Contrary to extant literature, contractual aspects were perceived to be relatively less important for ‘governing’ the working relationship. Also unexpected, long-term orientation was perceived of relative insignificance to collaborative relationships in one-off projects.

It is important to note here that although we rely on a sample of well-informed practitioners who had been involved in many capital projects outside The Netherlands, the list of essential ingredients of collaborative working relationship in Figure 4-6 cannot be generalized to other practitioners managing capital projects in other countries. The findings presented herein neither systematically consider the practitioners’ cultural background nor their projects settings. However, the research methodology and the Q-set statements developed for this study provided a basis for investigating practitioners’ subjectivity in comparison to literature. Moreover, the methodology and findings of this reported study are expected to be of
interest to academia and project practitioners worldwide in terms of potential relational view as an alternative to formal prescriptive partnering approach for facilitating collaborative working relationship.

4.6.1. Managerial implication

It would be misleading to conclude that one perspective is better than the others or is adequate in every situation, but lessons can be learned from the different perspectives. As reflected from the ranks of elements across perspectives, owner-contractor relationships can be improved by nurturing the team’s affective trust and shared objectives, by intentionally establishing no blame culture and open and honest communication on inter-firm level, applying clear boundary and hierarchy within the project organization, and encouraging social activities. An effective relationship is, however, contingent upon situation as constructed by the project actors.

There are some notable disagreements on certain elements such as senior management leadership and contractor’s early involvement across perspectives. In practice, however, these disagreements should be considered as complementing rather than contradicting given differences in context. In the view of limited roles of contract in the relationship as perceived by the practitioners, perhaps the key message here is that appropriate contracts are necessary but not sufficient to ensure effective owner-contractor relationships. The reason for this is that contracts are designed to avoid initial ambiguity but are limited in guiding the parties to interpret problems that emerge later. Relational attitudes and teamworking are more effective on providing a platform in which problems can be resolved.

4.6.2. Limitation and further research

This study has four key limitations which make further research worthwhile. Firstly, this study has mainly focused on indicating that there are indeed different views among project practitioners on ways to improve owner-contractor relationships. The four perspectives revealed cannot be considered exhaustive representation of all practitioners’ views. Secondly, this study provided a snapshot of the project practitioners’ views how to improve their working relationship while the effect of owner-contractor relationship on the project performance was not investigated. Thirdly, we have seen contractual functions do not play significant role on owner-contractor relationship but we need to look into more detail into the influence of different contract types in project-specific context. A follow-up research to address these limitations would be to pursue a survey study with a project as an analysis unit. Key elements of owner-contractor relationship identified in this study will be used as starting point to construct the required survey instrument. Finally, some theoretical observation revealed the interdependence between culture and the nature of working relationship. We will extend this in the future research, particularly in different project-specific situations involving owners and contractors from different countries.
References


Ahola, T., 2009. Efficiency in project networks: the role of inter-organizational relationships in project implementation, Department of Industrial Engineering and Management. Helsinki University of Technology, Helsinki, Finland.


Chapter 4


Collaborative contracting in projects


<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Category</th>
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<td>Q-SV</td>
<td>Z-SC</td>
<td>Q-SV</td>
<td>Z-SC</td>
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<td>Owner's SM (senior management) provides necessary resources &amp; support</td>
<td>0.02</td>
<td>0</td>
<td>0.47</td>
<td>1</td>
<td>0.72</td>
</tr>
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<td>3</td>
<td>The contractor has confidence that owner is reliable and trustworthy</td>
<td>0.68</td>
<td>2</td>
<td>1.09</td>
<td>3</td>
<td>-0.05</td>
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<tr>
<td>4</td>
<td>The owner believes that the contractor will make its best efforts</td>
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<td>0</td>
<td>-0.27</td>
<td>0</td>
<td>-0.55</td>
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<td>6</td>
<td>Owner and contractor acknowledge and respect cultural differences</td>
<td>1.33</td>
<td>3</td>
<td>-0.09</td>
<td>0*</td>
<td>-0.69</td>
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<td>Contractor's SM displays consistent and passionate leadership</td>
<td>-0.83</td>
<td>-1**</td>
<td>1.21</td>
<td>4**</td>
<td>0.12</td>
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<td>Owner and contractor focus their efforts on delivering current project</td>
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<td>-1</td>
<td>0.69</td>
<td>1*</td>
<td>-1.16</td>
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<td>When problems occur, owner and contractor do not blame each other</td>
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<td>4**</td>
<td>1.00</td>
<td>2</td>
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<td>1.01</td>
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<td>0.95</td>
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<td>The contractor internalizes the owner's long-term goals as their own goals</td>
<td>0.54</td>
<td>1*</td>
<td>-1.03</td>
<td>-3</td>
<td>-1.02</td>
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<td>44</td>
<td>Owner &amp; contractor establish open &amp; honest communication ... project lifecycle</td>
<td>1.86</td>
<td>4</td>
<td>0.72</td>
<td>1</td>
<td>0.78</td>
</tr>
<tr>
<td>47</td>
<td>Owner's &amp; contractor's SM are proactively involved in ... escalated conflicts</td>
<td>0.88</td>
<td>2*</td>
<td>0.74</td>
<td>1*</td>
<td>0.25</td>
</tr>
<tr>
<td>53</td>
<td>The owner recognizes contractor's commercial interest</td>
<td>0.45</td>
<td>1</td>
<td>1.05</td>
<td>2*</td>
<td>0.04</td>
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<td>55</td>
<td>Owner's SM displays consistent and passionate leadership</td>
<td>-1.36</td>
<td>-3**</td>
<td>1.11</td>
<td>3</td>
<td>0.94</td>
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<td>58</td>
<td>All people in the team share a common vision and set objectives</td>
<td>2.26</td>
<td>5</td>
<td>1.95</td>
<td>4</td>
<td>0.57</td>
</tr>
<tr>
<td>11</td>
<td>The team regularly evaluates each other's roles and responsibilities</td>
<td>1.08</td>
<td>3**</td>
<td>-0.16</td>
<td>0</td>
<td>0.14</td>
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<td>All people accept joint responsibilities for the team's achievement</td>
<td>1.60</td>
<td>3**</td>
<td>-0.48</td>
<td>-1*</td>
<td>0.12</td>
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<td>30</td>
<td>As long as people perform well, social activities/events have to be limited</td>
<td>-1.90</td>
<td>-4</td>
<td>-2.57</td>
<td>-5</td>
<td>-1.37</td>
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<td>All people in the team free to share information/knowledge across boundaries</td>
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<td>1</td>
<td>-0.83</td>
<td>-2*</td>
<td>-0.15</td>
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<td>No contentious issues and conflicting opinions in the team are allowed</td>
<td>-2.17</td>
<td>-5</td>
<td>-2.03</td>
<td>-4</td>
<td>-2.28</td>
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<td>39</td>
<td>The project team's primary concern is to execute the project excellently</td>
<td>0.14</td>
<td>0</td>
<td>1.06</td>
<td>2*</td>
<td>0.41</td>
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<td>All people in the project team trust each other</td>
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<td>2</td>
<td>1.98</td>
<td>5</td>
<td>1.19</td>
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<td>46</td>
<td>The project team embraces divergent views as ... to problem solving</td>
<td>0.32</td>
<td>0</td>
<td>-0.46</td>
<td>-1</td>
<td>-0.53</td>
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<td>51</td>
<td>All people in the team work without organizational/hierarchical boundary</td>
<td>1.24</td>
<td>3**</td>
<td>0.38</td>
<td>0</td>
<td>0.24</td>
</tr>
<tr>
<td>12</td>
<td>The contractor is involved early during FED</td>
<td>-0.05</td>
<td>0**</td>
<td>-1.39</td>
<td>-3**</td>
<td>1.20</td>
</tr>
<tr>
<td>17</td>
<td>The tasks are distributed between owner and contractor rather than duplicated</td>
<td>0.12</td>
<td>0</td>
<td>-0.78</td>
<td>-2</td>
<td>-0.37</td>
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<tr>
<td>23</td>
<td>The contractor aligns sub-contractors and suppliers to the project goals</td>
<td>0.56</td>
<td>1</td>
<td>-0.34</td>
<td>-1</td>
<td>0.91</td>
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<tr>
<td>25</td>
<td>The owner aligns its internal functions such as business and operation</td>
<td>-1.28</td>
<td>-3**</td>
<td>-0.35</td>
<td>-1</td>
<td>-0.38</td>
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<td>26</td>
<td>Owner and contractor build on positive experience from previous projects</td>
<td>0.17</td>
<td>0</td>
<td>0.01</td>
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<td>-1.16</td>
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<td>All people in the team work without organizational/hierarchical boundary</td>
<td>-0.99</td>
<td>-2*</td>
<td>-2.31</td>
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<td>The team regularly exercises team building/alignment</td>
<td>0.59</td>
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</tr>
<tr>
<td>10</td>
<td>The owner has strong financial capacity</td>
<td>-1.79</td>
<td>-0.51</td>
<td>-0.72</td>
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<td>CAP</td>
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<td>The owner puts sufficient effort and resources on FED</td>
<td>-0.49</td>
<td>-1.36</td>
<td>1.96</td>
<td>0.78</td>
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<tr>
<td>18</td>
<td>The contractor has strong capability in project management</td>
<td>0.54</td>
<td>1.07</td>
<td>1.17</td>
<td>0.35</td>
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<td>The contractor has high reputation and credibility in the market</td>
<td>-1.09</td>
<td>-0.57</td>
<td>-0.40</td>
<td>-0.42</td>
<td>CAP</td>
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<tr>
<td>45</td>
<td>The owner assigns its people sufficiently and with appropriate ... and experience</td>
<td>0.55</td>
<td>1.95</td>
<td>0.87</td>
<td>0.11</td>
<td>CAP</td>
</tr>
<tr>
<td>48</td>
<td>The contractor has strong technical capability such as ...</td>
<td>0.17</td>
<td>0.75</td>
<td>0.97</td>
<td>0.12</td>
<td>CAP</td>
</tr>
<tr>
<td>49</td>
<td>The owner has strong technical capabilities</td>
<td>0.09</td>
<td>0.98</td>
<td>-0.02</td>
<td>-0.25</td>
<td>CAP</td>
</tr>
<tr>
<td>50</td>
<td>The owner has strong capability in project management</td>
<td>-0.12</td>
<td>-0.22</td>
<td>-0.28</td>
<td>-0.52</td>
<td>CAP</td>
</tr>
<tr>
<td>54</td>
<td>The contractor has highly skilled and experienced people</td>
<td>0.40</td>
<td>1.00</td>
<td>1.04</td>
<td>-0.06</td>
<td>CAP</td>
</tr>
<tr>
<td>5</td>
<td>The contract is used as the basis for managing all activities</td>
<td>-1.65</td>
<td>-0.88</td>
<td>0.11</td>
<td>-1.37</td>
<td>CON</td>
</tr>
<tr>
<td>5</td>
<td>The risks are clearly specified in the contract</td>
<td>-0.97</td>
<td>-0.35</td>
<td>-0.28</td>
<td>-1.13</td>
<td>CON</td>
</tr>
<tr>
<td>14</td>
<td>The contract specifies the statement of work as clearly as possible</td>
<td>-0.74</td>
<td>-0.36</td>
<td>0.28</td>
<td>-1.01</td>
<td>CON</td>
</tr>
<tr>
<td>20</td>
<td>The contract clearly specifies roles and responsibilities of the parties</td>
<td>-0.84</td>
<td>0.76</td>
<td>1.26</td>
<td>-0.26</td>
<td>CON</td>
</tr>
<tr>
<td>21</td>
<td>The contract includes explicit incentive schemes</td>
<td>-1.25</td>
<td>-0.15</td>
<td>-1.72</td>
<td>-1.85</td>
<td>CON</td>
</tr>
<tr>
<td>22</td>
<td>The contract specifies remuneration scheme fairly and transparently</td>
<td>-0.41</td>
<td>0.59</td>
<td>0.39</td>
<td>-0.74</td>
<td>CON</td>
</tr>
<tr>
<td>24</td>
<td>The contract includes a structured approach to problem solving</td>
<td>-0.85</td>
<td>-0.59</td>
<td>-0.54</td>
<td>-1.03</td>
<td>CON</td>
</tr>
<tr>
<td>35</td>
<td>The contract specifies targeted performance and its key criteria</td>
<td>-0.69</td>
<td>1.09</td>
<td>0.85</td>
<td>-1.31</td>
<td>CON</td>
</tr>
<tr>
<td>7</td>
<td>Owner and contractor jointly develop key measures and evaluation</td>
<td>0.65</td>
<td>0.63</td>
<td>0.37</td>
<td>-0.54</td>
<td>JOW</td>
</tr>
<tr>
<td>16</td>
<td>Owner and contractor have compatible systems and procedures</td>
<td>-0.64</td>
<td>-1.57</td>
<td>-1.79</td>
<td>-1.75</td>
<td>JOW</td>
</tr>
<tr>
<td>34</td>
<td>The owner rewards a well-performing contractor with a ... chance ... next project</td>
<td>-0.90</td>
<td>-0.27</td>
<td>-1.20</td>
<td>-0.41</td>
<td>JOW</td>
</tr>
<tr>
<td>37</td>
<td>The people's performance and behavior are recognized (non)-financially</td>
<td>0.75</td>
<td>1.10</td>
<td>-0.04</td>
<td>0.37</td>
<td>JOW</td>
</tr>
<tr>
<td>40</td>
<td>Owner and contractor jointly identify and manage the project risks</td>
<td>0.85</td>
<td>0.20</td>
<td>1.07</td>
<td>0.37</td>
<td>JOW</td>
</tr>
<tr>
<td>41</td>
<td>The contractor offers competitive solutions for a well-performing owner</td>
<td>-0.02</td>
<td>-0.58</td>
<td>-1.24</td>
<td>-0.28</td>
<td>JOW</td>
</tr>
<tr>
<td>52</td>
<td>Owner and contractor jointly develop procedures for conflicts/disputes handling</td>
<td>-0.20</td>
<td>0.00</td>
<td>-0.33</td>
<td>-0.70</td>
<td>JOW</td>
</tr>
</tbody>
</table>

Note: ** distinguishing statement, significant at p<.01; *distinguishing statement, significant at p<.05; consensus statement, does not distinguish between any pair of factors. Statements with a factor score of -5, -4, -3, +3, +4, or +5 (i.e. those ranked in three outer columns on either side of the score sheet are called characterizing for that factor. 

* RAT = relational attitude; TW = teamworking; TIN = team integration; CAP = capability; CON = contract; JOW = joint working.
## Appendix 4-2. Characteristics of Respondents

<table>
<thead>
<tr>
<th>Resp.</th>
<th>Position</th>
<th>Company</th>
<th>Total years of experience</th>
<th>Highest education</th>
<th>Latest project profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PM</td>
<td>Owner A</td>
<td>13</td>
<td>Engineering &amp; Business</td>
<td>EPC LS; Construction of rectifier substation for a light rail line (NL)</td>
</tr>
<tr>
<td>2</td>
<td>PM</td>
<td>Contractor 1</td>
<td>10</td>
<td>Electrical Engineering</td>
<td>EPC LS; Construction of rectifier substation for a light rail line (NL)</td>
</tr>
<tr>
<td>3</td>
<td>PM</td>
<td>Owner B</td>
<td>14</td>
<td>Electrical Engineering</td>
<td>EPC LS; Revamp of rectifier substation for a Metro line (NL)</td>
</tr>
<tr>
<td>4</td>
<td>PM</td>
<td>Contractor 1</td>
<td>30</td>
<td>Electrical Engineering</td>
<td>EPC LS; Revamp of rectifier substation for a Metro line (NL)</td>
</tr>
<tr>
<td>5</td>
<td>PM</td>
<td>Owner C</td>
<td>10</td>
<td>Mechanical Engineering</td>
<td>EPCm unit rate; Two consecutive refinery turnarounds (NL)</td>
</tr>
<tr>
<td>6</td>
<td>PM</td>
<td>Contractor 2</td>
<td>11</td>
<td>Mechanical Engineering</td>
<td>EPCm unit rate; Two consecutive refinery turnarounds (NL)</td>
</tr>
<tr>
<td>7</td>
<td>PM</td>
<td>Owner D</td>
<td>12</td>
<td>Industrial Engineering</td>
<td>Project alliance; Revamp of waste incineration furnaces (NL)</td>
</tr>
<tr>
<td>8</td>
<td>PM</td>
<td>Contractor 3</td>
<td>10</td>
<td>Mechanical Engineering</td>
<td>Project alliance; Revamp of waste incineration furnaces (NL)</td>
</tr>
<tr>
<td>9</td>
<td>PM</td>
<td>Owner E</td>
<td>23</td>
<td>Engineering</td>
<td>EPC LS; Relocation and construction of a chemical plant (NL)</td>
</tr>
<tr>
<td>10</td>
<td>PD</td>
<td>Owner F</td>
<td>12</td>
<td>Mechanical Engineering</td>
<td>Project partnering; Construction of a new chemical plant (DE)</td>
</tr>
<tr>
<td>11</td>
<td>PM</td>
<td>Contractor 4</td>
<td>3</td>
<td>Mechanical Engineering</td>
<td>Long-term alliance; Petrochemical plant turnarounds (EU)</td>
</tr>
<tr>
<td>12</td>
<td>PM</td>
<td>Contractor 4</td>
<td>3</td>
<td>Process Engineering</td>
<td>Long-term alliance; Modification of natural gas production units (EU)</td>
</tr>
<tr>
<td>13</td>
<td>PM</td>
<td>Owner F</td>
<td>7</td>
<td>Business &amp; Engineering</td>
<td>EPC LS; Construction of a new chemical plant (CN)</td>
</tr>
<tr>
<td>14</td>
<td>PE</td>
<td>Owner G</td>
<td>1.5</td>
<td>Mechanical Engineering</td>
<td>EPCm CLS; Construction of a pilot process intensification plant (NL)</td>
</tr>
<tr>
<td>15</td>
<td>PM</td>
<td>Contractor 5</td>
<td>3</td>
<td>Mechanical Engineering</td>
<td>PMC - EPC LS; Expansion oil storage and pipelines (EU)</td>
</tr>
<tr>
<td>16</td>
<td>PM</td>
<td>Owner G</td>
<td>12</td>
<td>Mechanical Engineering</td>
<td>EPC LS; unspecified</td>
</tr>
<tr>
<td>17</td>
<td>PD</td>
<td>Owner G</td>
<td>6</td>
<td>Mechanical Engineering</td>
<td>EPCm unit rate; Construction and expansion of chemical complex (S.E.A)</td>
</tr>
<tr>
<td>18</td>
<td>PM</td>
<td>Owner G</td>
<td>6</td>
<td>Mechanical Engineering</td>
<td>EPC LS; Construction and expansion of natural gas plant (RU)</td>
</tr>
<tr>
<td>19</td>
<td>PD</td>
<td>Owner H</td>
<td>9</td>
<td>Chemical Engineering</td>
<td>Not specified</td>
</tr>
<tr>
<td>20</td>
<td>PM</td>
<td>Contractor 6</td>
<td>7</td>
<td>Mechanical Engineer</td>
<td>Not specified</td>
</tr>
<tr>
<td>21</td>
<td>PM</td>
<td>Contractor 6</td>
<td>1</td>
<td>Mechanical Engineering</td>
<td>Not specified</td>
</tr>
<tr>
<td>22</td>
<td>PM</td>
<td>Owner G</td>
<td>9</td>
<td>Industrial Engineering</td>
<td>EPC LS; Construction of offshore oil &amp; gas platform (S.E.A)</td>
</tr>
<tr>
<td>23</td>
<td>PD</td>
<td>Contractor 7</td>
<td>13</td>
<td>Business &amp; Management</td>
<td>EPC LS; Construction of offshore drill ships (NL)</td>
</tr>
<tr>
<td>24</td>
<td>PM</td>
<td>Owner G</td>
<td>15</td>
<td>Engineering &amp; Business</td>
<td>EPCm CLS; Detail engineering design of offshore gas plant (AU)</td>
</tr>
<tr>
<td>25</td>
<td>PD</td>
<td>Contractor 8</td>
<td>4</td>
<td>Industrial Engineering</td>
<td>EPC LS; Construction of offshore wind farms (NL)</td>
</tr>
<tr>
<td>26</td>
<td>PM</td>
<td>Contractor 9</td>
<td>15</td>
<td>Mechanical Engineering</td>
<td>PMC - EPCm; Oil Refinery turnarounds (NL)</td>
</tr>
<tr>
<td>27</td>
<td>PD</td>
<td>Owner I</td>
<td>6</td>
<td>Mechanical Engineering</td>
<td>Project alliance; Petrochemical plant turnaround (NL)</td>
</tr>
<tr>
<td>28</td>
<td>PD</td>
<td>Contractor 9</td>
<td>11</td>
<td>Civil Engineering</td>
<td>EPC LS; Construction of offshore wind farms (NL)</td>
</tr>
<tr>
<td>29</td>
<td>PE</td>
<td>Contractor 8</td>
<td>1.5</td>
<td>Offshore engineering</td>
<td>EPC LS; Construction of an offshore pipe lay ship (NL)</td>
</tr>
<tr>
<td>30</td>
<td>PE</td>
<td>Contractor 10</td>
<td>3</td>
<td>Mechanical Engineering</td>
<td>EPC LS; Construction of mining facilities (S.A)</td>
</tr>
</tbody>
</table>
### Appendix 4-3. Factor Loadings for four-factor solution

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.287</td>
<td>-0.039</td>
<td>0.076</td>
<td>0.788*</td>
</tr>
<tr>
<td>2</td>
<td>0.612*</td>
<td>0.045</td>
<td>0.028</td>
<td>0.353</td>
</tr>
<tr>
<td>3</td>
<td>0.694*</td>
<td>-0.051</td>
<td>-0.138</td>
<td>0.172</td>
</tr>
<tr>
<td>4</td>
<td>0.205</td>
<td>0.234</td>
<td>0.578*</td>
<td>0.152</td>
</tr>
<tr>
<td>5</td>
<td>-0.034</td>
<td>0.169</td>
<td>0.284</td>
<td>0.683*</td>
</tr>
<tr>
<td>6</td>
<td>0.021</td>
<td>0.680**</td>
<td>0.080</td>
<td>0.015</td>
</tr>
<tr>
<td>7</td>
<td>0.030</td>
<td>0.033</td>
<td>0.777*</td>
<td>0.017</td>
</tr>
<tr>
<td>8</td>
<td>-0.019</td>
<td>0.274</td>
<td>0.567*</td>
<td>0.144</td>
</tr>
<tr>
<td>9</td>
<td>0.181</td>
<td>0.294</td>
<td>0.655*</td>
<td>0.141</td>
</tr>
<tr>
<td>10</td>
<td>0.654*</td>
<td>0.314</td>
<td>0.357</td>
<td>0.082</td>
</tr>
<tr>
<td>11</td>
<td>0.494</td>
<td>-0.169</td>
<td>0.548</td>
<td>0.293</td>
</tr>
<tr>
<td>12</td>
<td>0.145</td>
<td>0.724*</td>
<td>0.064</td>
<td>0.268</td>
</tr>
<tr>
<td>13</td>
<td>0.619*</td>
<td>0.006</td>
<td>0.254</td>
<td>0.104</td>
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<tr>
<td>14</td>
<td>0.404</td>
<td>0.248</td>
<td>0.288</td>
<td>0.468</td>
</tr>
<tr>
<td>15</td>
<td>0.132</td>
<td>0.226</td>
<td>0.555*</td>
<td>0.479</td>
</tr>
<tr>
<td>16</td>
<td>0.146</td>
<td>0.495*</td>
<td>0.149</td>
<td>-0.113</td>
</tr>
<tr>
<td>17</td>
<td>0.151</td>
<td>0.560*</td>
<td>0.263</td>
<td>0.434</td>
</tr>
<tr>
<td>18</td>
<td>0.384</td>
<td>0.402</td>
<td>0.356</td>
<td>0.205</td>
</tr>
<tr>
<td>19</td>
<td>0.675*</td>
<td>0.154</td>
<td>0.155</td>
<td>0.095</td>
</tr>
<tr>
<td>20</td>
<td>0.142</td>
<td>0.513</td>
<td>0.164</td>
<td>0.578*</td>
</tr>
<tr>
<td>21</td>
<td>0.204</td>
<td>0.060</td>
<td>0.030</td>
<td>0.520*</td>
</tr>
<tr>
<td>22</td>
<td>0.518</td>
<td>0.487</td>
<td>-0.092</td>
<td>0.481</td>
</tr>
<tr>
<td>23</td>
<td>0.682*</td>
<td>0.275</td>
<td>0.029</td>
<td>0.071</td>
</tr>
<tr>
<td>24</td>
<td>-0.017</td>
<td>0.542*</td>
<td>0.285</td>
<td>0.310</td>
</tr>
<tr>
<td>25</td>
<td>0.682*</td>
<td>0.335</td>
<td>0.203</td>
<td>0.091</td>
</tr>
<tr>
<td>26</td>
<td>0.567*</td>
<td>0.224</td>
<td>0.500</td>
<td>-0.003</td>
</tr>
<tr>
<td>27</td>
<td>0.527</td>
<td>0.067</td>
<td>0.373</td>
<td>0.419</td>
</tr>
<tr>
<td>28</td>
<td>0.656*</td>
<td>0.061</td>
<td>0.014</td>
<td>0.538</td>
</tr>
<tr>
<td>29</td>
<td>0.231</td>
<td>0.304</td>
<td>0.325</td>
<td>0.450</td>
</tr>
<tr>
<td>30</td>
<td>0.348</td>
<td>0.608*</td>
<td>0.299</td>
<td>0.124</td>
</tr>
</tbody>
</table>

** Defining Sorts: 9  6  5  4

Note:

* indicates a defining sort, i.e.: significance at the .05 level (f > 0.27) and $f^2 > h^2/2$. R20 significantly defines Factor 4 because its highest loading:

- $f_{20;4} = 0.578 > 0.27$ (significant at p < .05); and
- $f^2_{20;4} = 0.578^2 > h^2/2 = (0.142^2 + 0.513^2 + 0.164^2 + 0.578^2)/2 = 0.322$

# indicates a confounding sort, i.e.: its loadings are significant on multiple factors, shown as shaded cells. R29 is a confounding sort to Factor 2, 3, and 4 because:

- $f_{29;2} = 0.304$; $f_{29;3} = 0.325$; and $f_{29;4} = 0.45 > 0.27$ (significant at p < .05); but
- it highest loading $f^2_{20;4} = 0.45^2 = 0.203 < h^2/2 = (0.231^2 + 0.304^2 + 0.325^2 + 0.450^2)/2 = 0.227$
Chapter 5

RELATIONAL FACTORS IN OWNER–CONTRACTOR COLLABORATION: THE MEDIATING ROLE OF TEAMWORKING
Chapter 5 | Abstract

We hypothesized that teamworking quality, defined as an inter-team collaborative process, is the mediator that links the effects of three antecedents—relational attitudes (relational norms and senior management commitment), collaborative practices (team integration and joint working procedures), and teams’ joint capability (the project team’s overall competence and experience)—in improving project performance (efficiency, effectiveness, perceived satisfaction, perceived success). Using a sample of 113 capital projects, we applied partial least squares structural equation modeling to test our hypotheses. The results confirm that the three antecedents indirectly influence project performance through teamworking quality. There is no empirical evidence that these antecedents directly influence project performance: relational attitudes, teams’ joint capability, and collaboration practices do not automatically lead to a successful collaboration without day-to-day managerial intervention in teamworking processes. We also found that the parties’ expectations regarding continuing relationships, as a consequence of good project performance, are directly affected by relational attitudes.

Keywords: Capital project; Collaboration; Relational; Teamworking; Trust.

Note:

- The author of this dissertation contributed in study conceptual model, survey design, data collection, statistical analysis, interpretation of results, writing and finalizing the manuscript. The co-authors contributed in study design and review of the manuscript.
Chapter 5  Relational factors in owner—contractor collaboration:  
The mediating role of teamworking

5.1. Introduction

There is broad agreement that shortfalls in project performance are rooted in inadequate inter-firm collaboration and a lack of attention to its social dynamics (Morris, 1994; Morris and Pinto, 2004, 2007; Smyth and Pryke, 2008; Walker and Hampson, 2003). In the light of this, owners have increasingly looked to alternative ways of working with contractors. The result has been the development of formal collaborative working arrangements known as relational contracting, partnering, and alliancing, all of which are intended to align project objectives with common business goals in order to create a more cooperative and productive working atmosphere (Rahman and Kumaraswamy, 2005; Xue et al., 2010). The success of partnering or alliancing arrangements has been reported in various countries, for example, the United States (Drexler and Larson, 2000; Larson, 1995), the United Kingdom (Barlow, 2000; Black et al., 2000), Hong Kong (Bayliss et al., 2004; Chan et al., 2004, 2006), and Australia (Walker and Hampson, 2003; Yeung et al., 2009). Despite the reported successes, a number of case studies show that even though a formal partnering arrangement had been adopted, project participants often encountered practical problems, such as a lack of top management commitment, a lack of collaborative mind-set, and insufficient initial effort to establish a shared culture (Alderman and Ivory, 2007; Bresnen and Marshall, 2002; Chan et al., 2012; Smyth and Edkins, 2007).

Although there has been a significant adoption of collaborative working arrangements, we also observe a lack of managerial attention to the underlying factors and mechanisms that make people in project teams work together across the boundaries of the permanent organizations. Bresnen and Marshall (2002) highlight that current practices of project-based collaboration might put too much emphasis on formal mechanisms (such as contracts, procedures, and techniques). Such formalization often underplays the important social dimension of collaboration in practice, and the dynamics of relationships among different people within an organization and between different organizations.

In seeking the essence that makes collaboration work, another research stream has focused on identifying critical success factors (CSFs) for project-based collaboration. A number of CSFs have been suggested to influence the quality of owner–contractor collaboration, such as top management commitment (Black et al., 2000; Rahman and Kumaraswamy, 2008), team integration (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011; Suprapto et al., 2015), joint working (Black et al., 2000; Chan et al., 2004; Meng, 2012; Rahman and Kumaraswamy, 2008), owner's in-house capability (Miller and Lessard, 2000; Rahman and Kumaraswamy,
2008), and teamwork (Baiden and Price, 2011; Chan et al., 2004; Cheung et al., 2009; Rahman and Kumaraswamy, 2008; Suprapto et al., 2015). While such contributions recognize the factors that contribute to owner–contractor collaboration, there is a lack of empirical studies that provide an integrative model and empirical validation of how these factors relate to each other and contribute to project performance.

Taking into account the aforementioned gaps in our knowledge, we investigated how collaboration factors influence owner–contractor collaboration quality and, in turn, project performance as the outcome of the collaboration. Adopting Mankin et al.’s (2004) conceptualization of complex collaboration, we define owner–contractor collaboration as a process in which owner and contractor jointly create norms, rules, and structures governing their teams, their working relationships, and ways to act or decide on the issues emerging during the course of a project, in order to bring about mutually satisfactory project outcomes. This definition considers two interaction levels in a collaboration process: that between two permanent organizations (owner’s and contractor’s firms) and that between two project teams (owner's and contractor's teams). The former refers to inter-firm interactions in the development of common norms, rules, and structures to govern the project teams. The latter refers to inter-team interactions within the project teams in performing their collective actions.

In line with Smyth and Pryke’s (Pryke and Smyth, 2006; Smyth and Pryke, 2008) view that the way in which people work together in teams largely determines the effectiveness and efficiency of project execution, we focused on inter-team collaborative processes. We use the term teamworking quality as a measure of inter-team collaborative processes. We adopted the idea and conceptualization of teamwork from Salas et al. (2005) and of teamwork quality from Hoegl and Gemuenden (2001). Salas et al. (2005) define teamwork as “a set of interrelated thoughts, actions, and feelings of each team member that are needed to function as a team and that combine to facilitate coordinated, adaptive performance and task objectives resulting in value-added outcomes” (p. 562). The definition implies the multidimensional nature of the functioning of teams. Based on an extensive literature study, Salas et al. propose eight components of teamwork, namely team leadership, mutual performance monitoring, backup behavior, adaptability, team orientation, shared mental models, mutual trust, and closed-loop communication. Hoegl and Gemuenden (2001) propose, and empirically establish, teamwork quality, defined as “a measure of collaboration in teams” through six facets capturing the internal performance measures of task-related and social interaction within teams, that is, communication, coordination, balance of member contributions, mutual support, effort, and cohesion (p. 436). Salas et al.’s eight components and Hoegl and Gemuenden’s six facets overlap in terms of idea and meaning, with the exception of mutual trust. Relating the works of Hoegl and Gemuenden (2001) and Salas et al. (2005), we define teamworking quality as a set of underlying mechanisms reflecting the task-related and social interactions between the owner's team and the contractor's team in executing a project. The mechanisms include five task-related
interactions—communication, coordination, balanced contribution, aligned effort, and mutual support—and two social interactions, cohesion and affective trust.

- **Communication** is the extent to which a team and its members are able to inform the other team and share their ideas with it both openly (without hiding important information) and effectively (the information exchanged can be articulated as intended). The quality of communication is reflected in the sufficiency, structure, openness, and timeliness of the information exchange between teams and team members (Dietrich et al., 2010; Hoegl and Gemuenden, 2001; Salas et al., 2005).

- **Coordination** is the process of synchronizing and aligning the activities in sequence and timing between one team in relation to the other team and to the overall project activities (LePine et al., 2008). The quality of coordination refers to the degree of shared understanding of goals and the synchronization of tasks between teams (Hoegl and Gemuenden, 2001).

- **Cohesion** is the sense of “we-ness” between individuals, or individuals’ willingness to work together with members of different teams to achieve a common goal (Cartwright, 1968; Cohen and Bailey, 1997). Hoegl and Gemuenden (2001) argue that an adequate level of cohesion is necessary to maintain individuals in a team and to engage in collaboration, and thus to build the basis for high teamworking quality.

- **Balanced contribution** is the extent to which the teams and its members contribute their knowledge and expertise to the teams' tasks balanced in accordance with their specific potential (Hoegl and Gemuenden, 2001). Everyone does not necessarily bring in the same amount of ideas but should not be restricted in contributing relevant knowledge and expertise.

- **Aligned effort** is the priority and intensity of efforts made by one team in relation to the other team and accepting the work norms underlying these (Hoegl and Gemuenden, 2001).

- **Mutual support** is the degree to which two teams support each other to solve problems that emerged in their interdependent tasks. Mutual support is reflected in such behaviors as mutual respect, support, and co-development of team members' ideas and contributions to anticipate unforeseen incidents (Ahola, 2009; Hoegl and Gemuenden, 2001; Salas et al., 2008).

- **Affective trust** is the shared belief among members of different teams to willingly accept vulnerability based on positive expectations of each other’s team. Affective trust between teams is reflected in perceived interdependency, credibility, integrity, fairness, care, and non-opportunistic behavior toward each other (McAllister, 1995; Pinto et al., 2009).
Following the conceptual model of Dietrich et al. (2010) and the input–mediator–outcome (IMO) framework from team effectiveness literature (Ilgen et al., 2005; Marks et al., 2001; Mathieu et al., 2008), we hypothesized that teamworking quality is the mediator linking the effects of collaboration antecedents to the consequences, project performance, and perceived relationship continuity, as shown in Figure 5-1. A model like this has never been considered before. Considering Müller and Jugdev’s (2012) suggestion to broaden the measures of project success, we extend the definition of project performance as \textit{efficiency} (i.e., cost and schedule performance), \textit{effectiveness} (i.e., quality of project output, operability, and safety), \textit{perceived satisfaction}, \textit{perceived owner’s success}, and \textit{perceived contractor’s success}. On top of that we are also interested to study the longevity of the relationships. For that, we introduce the perceived relationship continuity reflecting \textit{the parties’ expectation, given the results of the current project, to continue their relationships in the future.}

![Figure 5-1. Research model](image)

Antecedents Mediator Consequences

\textbf{H1:} c’ \text{, } \text{H2:} c’ \text{, } \text{H3:} c’ \text{.}

\begin{align*}
\text{H4:} & \text{ } X_1 \rightarrow M \rightarrow Y_1 = a_1b_1 ; \\
\text{H5:} & \text{ } X_2 \rightarrow M \rightarrow Y_1 = a_2b_1 ; \\
\text{H6:} & \text{ } X_3 \rightarrow M \rightarrow Y_1 = a_3b_1 ; \\
\text{H7:} & \text{ } X_1 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 = a_1b_1b_3 ; \\
\text{H8:} & \text{ } X_2 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 = a_2b_1b_3 ; \\
\text{H9:} & \text{ } X_3 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 = a_3b_1b_3 \\
\end{align*}

Using the categorization put forward by Suprapto et al. (2015), we position the aforementioned CSFs as collaborative antecedents and distinguish them into three higher-order constructs, namely relational attitudes, teams’ joint capability, and collaborative practices. In our view, these constructs describe the antecedents of collaborative processes best. Relational attitudes refer to the \textit{norms and commitment developed and shared by the senior management from both the owner and the contractor to govern their project-specific relationship}. Collaborative practices refer to a \textit{set of practices used by the owner’s and the contractor’s personnel in the project to structure and enhance their collaborative processes.}
The mediating role of teamworking

Teams' joint capability refers to the overall competences and experience levels of the owner's and the contractor's project teams.

The conceptual model focuses on two pathways through which collaboration antecedents affect the consequences, in particular, to what extent the antecedents (relational attitudes, collaborative practices, and joint capability) (1) directly affect project performance and perceived relationship continuity, and (2) indirectly affect project performance through teamworking quality, and indirectly affect perceived relationship continuity through teamworking quality and project performance. With the increased understanding of the underlying mechanisms of teamworking through which relational attitudes, collaborative practices, and project teams' capability affect project performance, we attempt to advance research in project-based collaboration from a CSF approach toward an integrative model. Such an integrative model helps extend our collective understanding of factors that influence project-based collaboration and the extent of their contribution to improving project performance.

The paper is structured as follows. Firstly, we specify our hypothetical constructs and derive a set of hypotheses for empirical testing. Subsequently, we discuss the methodology, the sample, the method, and the measures, before reporting the results. Next, we discuss some interesting findings. We conclude this paper with theoretical and practical implications.

5.2. Hypotheses

5.2.1. Collaborative antecedents and project performance

5.2.1.1. Relational attitudes

In any inter-organizational relationship, each party has different attitudes or mindsets prior to the relationship, and these are brought into that relationship. As the two organizations interact, a set of relational norms, factors, or routines are co-developed specifically to govern their relationship (Poppo and Zenger, 2002; Poppo et al., 2008; Rahman and Kumaraswamy, 2008; Spekman and Carraway, 2006). In a project context, relational attitudes involve inter-organizational trust, fairness, and transparency, and a no-blame culture and the commitment of senior management to support the project teams (Cheung et al., 2006; Rahman and Kumaraswamy, 2008; Suprapto et al., 2015). In a buyer–supplier relationship, inter-organizational trust is widely regarded as the key determinant of project performance (Meng, 2012; Pinto et al., 2009; Smyth et al., 2010). Meng (2012) finds some significant positive correlations between cost performance and communication openness, as well as between cost performance and the presence of a no-blame culture. Finally, senior management commitment has also been identified as a critical success factor for a collaborative relationship (Carolynn et al., 2000; Rahman and Kumaraswamy, 2008; Suprapto et al., 2015; Young and Poon, 2013).
In this study, we positioned relational attitudes as a higher-order construct composed of relational norms and senior management commitment interfacing the relationship between two parties at the permanent organizational level. We hypothesized that:

**H1.** Relational attitudes have a positive influence on project performance.

### 5.2.1.2. Collaborative practices

Collaborative practices refer to a collection of practices implemented by an owner and a contractor to promote collaborative structure and processes between parties. We distinguish two types of practices: team integration and joint working. Team integration is a set of practices and methods that promote a favorable environment in which information and knowledge are exchanged freely among the members of a team (Baiden and Price, 2011; Bosch-Rekveldt et al., 2011; Dietrich et al., 2010; Merrow, 2011). Team integration is commonly characterized by the formation of a single integrated project team, goal settings and alignment, and regular team-building activities (Bosch-Rekveldt et al., 2011; Kadefors, 2004). The investigation by Bosch-Rekveldt et al. (2011) of five engineering projects suggest that integrated teams are more open to sharing information and knowledge, and are therefore more effective in anticipating changes in the highly dynamic project environment.

Joint working captures the extent to which the parties combine efforts in managing the project tasks. Joint working is generally reflected in (1) joint decision making (Chan et al., 2004); (2) joint problem solving and dispute handling (Baiden and Price, 2011; Black et al., 2000; Chan et al., 2004; Rahman and Kumaraswamy, 2008); (3) joint risk management (Bosch-Rekveldt, 2011; Rahman and Kumaraswamy, 2002, 2004a), and (4) joint effort toward continuous improvement (Black et al., 2000; Chan et al., 2004; Meng, 2012; Rahman and Kumaraswamy, 2008). Taking these two prescriptive constructs, we hypothesized that:

**H2.** Collaborative practices have a positive influence on project performance.

### 5.2.1.3. Project teams' joint capability

Project teams' joint capability refers to both the owner's and the contractor's project team's competences in and experiences of project management (Turner, 2009) and specific technical disciplines (Rahman and Kumaraswamy, 2008). It is widely recognized that the contractor's team's capability is the basic requirement for delivering a successful project. Therefore, the current project procurement procedures are designed to select the most capable contractor from the market pool (Morris and Pinto, 2007; Pesāmaa et al., 2009; Pryke, 2009; Turner, 2003; Walker and Hampson, 2003). With increasing project complexities, however, the capability of the owner's (in-house) team also becomes crucial to project performance (Berends, 2007; Miller and Lessard, 2000; Rahman and Kumaraswamy, 2008). Given the extant literature, we hypothesized that:

**H3.** The capability of the owner's and contractor's joint team has a positive influence on project performance.
5.2.2. The mediating role of teamworking

As mentioned, we adopt the input–mediator–outcome structure to distinguish the different roles of factors that influence teams' internal performance and outcome. Input factors can be both internal aspects characterizing the team—like personality, competencies and diversity—and supporting aspects—like team training, structure, technology, and leadership (Mathieu et al., 2008). Inputs are transformed into outcomes through mediating mechanisms, i.e.: teamwork processes such as the communication, coordination, and cooperation (Salas et al., 2005, 2008; Tannenbaum et al., 1992) or emergent states such as trust and cohesion (Mathieu et al., 2008). The outcome may reflect both the team performance behavior and output (Kozlowski and Bell, 2003; Salas et al., 2008).

In a project context, teamworking reflects the actual interactional activities between team members on the basis of synergies (Baiden and Price, 2011; Hoegl and Gemuenden, 2001; Tannenbaum et al., 1992). The influence of teamworking on project performance is reasonably well established in the project management research (Baiden and Price, 2011; Chan et al., 2004; Cheung et al., 2009; Hoegl and Gemuenden, 2001; Jefferies et al., 1999; Kumaraswamy and Rahman, 2006; Müller and Jugdev, 2012). Yang et al. (2011) indicate the significant influence of teamwork—operationalized as team communication, collaboration, and cohesiveness—on the performance of capital projects in Taiwan. In a series of empirical studies, Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl and Parboteeah, 2006, 2007; Hoegl and Weinkauf, 2005; Hoegl et al., 2004) show that teamwork quality contributes significantly to the success of innovative projects.

Linking the effects of collaborative antecedents to project performance, we hypothesized that:

**H4.** Teamworking quality mediates the positive effect of relational attitudes on project performance.

**H5.** Teamworking quality mediates the positive effect of collaborative practices on project performance.

**H6.** Teamworking quality mediates the positive effect of joint team's capability on project performance.

5.2.3. Perceived relationship continuity

An important consequence of good project performance is the potential to continue the relationship. Extant literature suggests that formal long-term relationships are difficult to realize given the existing procurement tradition followed in capital projects (Bygballe et al., 2010; Gadde and Dubois, 2010). This is also a result of the one-off nature of capital projects (Cox and Ireland, 2006; Cox and Thompson, 1997). However, a successful project may lead both parties to explore potential future relationships and serve as a basis for longer term relationships, at least, as the preferred partners. We therefore hypothesized that:
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H7. Teamworking quality and project performance mediate the positive effect of relational attitudes on perceived relationship continuity.

H8. Teamworking quality and project performance mediate the positive effect of collaborative practices on perceived relationship continuity.

H9. Teamworking quality and project performance mediate the positive effect of joint team’s capability on perceived relationship continuity.

5.3. Methodology

The conceptual model and hypotheses presented in this paper imply a positivist approach, that is, the results were obtained through deductive reasoning and objective measurement (Trochim, 2000). All constructs are based on theory. Both the operationalization of the key constructs and the data we sought to obtain from the respondents are inherently biased by diverse cultures, experiences, world views, and preferences. To achieve objectivity, we triangulated the main constructs from multiple measurement indicators. We consequently used structural equation modeling to estimate multiple latent constructs while also minimizing the measurement errors.

5.3.1. Sample and data collection

This study was performed within the Dutch Process Industry Competence Network, which brings together more than 120 organizations from the entire value chain in the Dutch process industry, including asset owners, engineering and construction firms, suppliers, consulting firms, universities and research institutions. Through the contact persons of the member companies, we selected and invited 450 project managers to complete an online questionnaire in the period October–December 2013. The response rate was 26.4% (119 completed questionnaires). After cleansing the responses that had more than 15% missing values, we had 113 respondents.

Of the 113 respondents, 15% had been working in projects for 1–5 years, 6% for 6–10 years, 15% for 11–15 years, and 64% for more than 15 years. The respondents were project directors (19.5%), project managers (46%), team leaders/managers (24.8%), functional managers (8%), and project sponsor board members (1.8%). With regard to the company’s role, 41.6% of the respondents represented owner companies, and 46% represented engineering and construction contractors; 6% were project management consultants and 8% were subcontractors. In terms of industry, the majority of the projects were in oil, gas, and petrochemicals (60.4%); the rest were in civil construction (8%), infrastructure, power, and utilities (10.6%), food and consumer products (7.1%), electronics, ICT, and semiconductors (3.5%), pharmaceuticals (2.7%), and manufacturing (2.7%). In terms of project costs, 10.6% were up to €1 million, 30.1% were €1–10 million, 25.7% were €10–100 million, 24.8% were €100–1000 million, and 8.8% were more than €1 billion. The set of respondents therefore
varied widely in type of industry, type and size of projects, and type of respondents, which ruled out bias.

There were 187 missing values that represent 1.45% of the total number of values in the dataset. To determine an appropriate missing values treatment method, it is necessary to identify the pattern of missing values (Hair et al., 2010). Following Hair et al.’s guideline, we performed Little’s test (Little and Rubin, 2002) to determine whether the missing values in the dataset were missing completely at random (MCAR). The test indicates that the null hypothesis that the pattern of missing values is MCAR cannot be rejected ($X^2 = 4066.93; df = 3963; sig = .122$). Because there is no systematic pattern in the missing values, data imputation method is the most appropriate remedy (Hair et al., 2010). We then applied the regression imputation method to replace the missing values in the dataset.

Because the data was collected from a single source, there is a possibility of common method variance that may influence some hypothesized relationships between constructs in the research model. To test the presence of common method variance, we applied Harman’s single-factor test approach (Podsakoff and Organ, 1986). We performed exploratory factor analysis with principal axis method to extract factors without rotation. The first extracted factor accounts for 29% of the overall variance. This suggests that no common source of bias in the empirical data can be attributed to a single source (Podsakoff and Organ, 1986).

5.3.2. Method

We applied partial least square structural equation modeling (PLS-SEM) to empirically test the hypotheses. PLS-SEM was especially appropriate for this study for several reasons. In general, there are two types of causal modeling approach: CB-SEM (covariance-based structural equation modeling) and PLS-SEM (Hair et al., 2013a,b). The latter is aimed at maximizing the explained variance of the endogenous latent constructs, and the former is based on a global optimization criterion to assess overall model fit. CB-SEM is more suitable for testing well-established and complex theories due to a lack of a global optimization criterion (Hair et al., 2013a,b). However, PLS-SEM is more advantageous when analyzing research models that are in an exploratory stage or are an extension of existing structural theory (Reinartz et al., 2009). Different constructs described in this study’s research model have been discussed in previous research concerning the performance of project-based collaboration. However, no empirical research has investigated both the statistical interrelationships between these constructs and their effects on project performance as a comprehensive model. Thus, our model is not yet well-established in previous research, which makes PLS-SEM the appropriate approach for empirically examining it.

Secondly, PLS-SEM allows the researcher to more easily use both reflective and formative measurement scales; CB-SEM has less flexibility to accommodate different modes of measurement in a single analytical model (Becker et al., 2012; Hair et al., 2013b; Ringle et al., 2009). Furthermore, with PLS-SEM we were able to include second-order latent
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constructs as second-order formative with first-order reflective constructs (aggregate mode). Through PLS-SEM, we were able to minimize measurement model misspecification, which resulted in a more parsimonious model (Diamantopoulos and Winklhofe, 2001; Diamantopoulos et al., 2008).

Thirdly, for samples of a limited size the PLS-SEM is more suitable (Hair et al., 2013a). According to Reinartz et al.'s (2009) simulation study “the statistical power the PLS-SEM is always larger than or equal to that of CBSEM [...] for a sample size as small as 100” (p.341). This is especially relevant for this study, as our final sample size was 113 observations. A post-hoc power test confirmed that the statistical power was above the commonly accepted threshold of 0.8 (Hair et al., 2013a), enhancing the confidence in the findings.

5.3.3. Measures

To ensure the predictive validity for all the key construct measurements, multiple-item measures with a 5-point response scale ranging from 1 (e.g.: not at all) to 5 (e.g.: completely) were used (Diamantopoulos et al., 2012). All indicators are listed in full in Appendix 5-1. The measures for each construct are described as follows.

Relational attitudes were operationalized as a second-order formative construct incorporating two first-order reflective constructs: senior management commitment and relational norms. The indicators for assessing senior management commitment were developed by Suprapto et al. (2015). Three items were used to assess the intensity of both the owner's and the contractor's senior management leadership, commitment to provide necessary support and resources, and involvement in resolving potential conflicts when needed. The indicators for assessing relational norms were adapted from Suprapto et al. (2015) and Meng (Meng, 2012; Meng et al., 2011). Six items were used to assess the intention of both the owner and the contractor to adopt a no-blame culture and be open and honest, owner's trust toward contractor's goodwill, owner's recognition of contractor's commercial interest, contractor's confidence regarding owner's support, and contractor's enthusiasm for achieving owner's objectives.

Collaborative practices were operationalized as a second-order formative construct of two first-order reflective constructs: team integration and joint working. Team integration represents the practice of integrating two teams (of owner and contractor) into a single team aligned by common goals (Baiden and Price, 2011; Baiden et al., 2006; Rahman and Kumaraswamy, 2008; Suprapto et al., 2015). Four indicators were adapted from Suprapto et al. (2015) to measure the extent that team integration was actually practiced in terms of formal integrated project team, team building, alignment of owner's internal stakeholders, and alignment of subcontractors and suppliers. Joint working refers to a set of working procedures to guide the project teams to work jointly (Meng, 2012; Meng et al., 2011; Rahman and Kumaraswamy, 2008; Suprapto et al., 2015). Six indicators were adapted from Suprapto et al. (2015), Meng (2012), and Rahman and Kumaraswamy (2008) to measure the
extent of the implementation of joint decision making, joint performance management, rewards program, joint risk management, joint conflicts/disputes resolution, and continuous improvement.

Project teams' joint capability was operationalized as a second-order formative construct of two first-order reflective constructs: owner’s team’s capability and contractor's team’s capability. We asked respondents to rate the levels of experience and competences of the owner's and the contractor's project managers and team members. All of these indicators were derived from Suprapto et al. (2014) and Bosch-Rekveldt (2011).

We adapted the concept of teamworking quality from Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl and Parboteeah, 2007; Hoegl et al., 2004). Teamworking quality was operationalized as a second-order formative construct incorporating seven facets of first-order reflective constructs, namely cohesion, communication, coordination, balanced contribution, aligned effort, mutual support, and affective trust. We included teams' affective trust because it is strongly associated with other constructs of teamworking, while also considered a significant predictor of project performance (Lau and Rowlinson, 2011; Pinto et al., 2009; Silva et al., 2012; Smyth and Edkins, 2007). In total, we included 32 items to measure teamworking quality: Eight items were adapted from Pinto et al.'s (2009) integrity trust to measure affective trust between teams, and 24 indicators were adapted from Hoegl and Gemuenden (2001) to measure communication (5 indicators), coordination (4 indicators), cohesion (6 indicators), balanced contribution (3 indicators), mutual support (3 indicators), and aligned effort (3 indicators).

Project performance was operationalized as a formative construct. We adapted five indicators developed by Hoegl and Gemuenden (2001) and Pinto et al. (2009) to assess how good the project results were upon completion in order to capture the project efficiency and effectiveness. These indicators are cost, schedule, quality, safety, and operability performance. Following Müller and Jugdev's (2012) observation that the success of a project is a matter of the ‘beholders’ subjectivity, we also asked respondents to assess the extent to which the project was driven by five drivers—namely cost, schedule, quality, safety, and operability—on a 5-point scale ranging from 1 (not at all) to 5 (completely). We then used the data as the weights of corresponding efficiency and effectiveness measures and calculated an index of performance. In addition to this index, we also included three distinct indicators (Hoegl and Gemuenden, 2001; Pinto et al., 2009): perceived satisfaction with the overall results, perceived owner’s business success, and perceived contractor's commercial success.

Relationship continuity was operationalized as a reflective construct with four indicators adapted from Ganesan (1994). The respondents were asked to indicate the likelihood that both parties would develop or maintain a long-term relationship, given the results of the current project.
Finally, we included five control variables—namely *front-end definition*, *prior relationship duration*, *project total cost*, *project duration*, and *project complexity*—because they may have had an impact on the key constructs. Front-end definition was based on four indicators regarding the clarity or quality of the project, that is, goals and objectives, scope, basic engineering design, and execution plan (Bosch-Rekveldt, 2011). Prior relationship duration captured the duration in years of previous formal or informal relationships between owner and contractor, excluding the current project. Project total cost was operationalized as a 5-point ordinal scale calculated from logarithmic transformation of actual total cost in millions of euros. Project duration recorded the actual completion duration in years. Finally, project complexity was derived from Bosch-Rekveldt (2011) regarding the challenges in terms of technology, organization, and external conditions.

5.4. Results

We used SmartPLS 2.0 (Ringle et al., 2005) to estimate the measurement models and the structural models. Following recent PLS-SEM guidelines (Chin, 2010; Hair et al., 2013a,b), the reliability and validity of measurement models was thoroughly assessed prior to the evaluation and interpretation of the structural models.

5.4.1. Measurement models

All first-order latent constructs (except project performance and project complexity) were treated as reflective constructs. The assessment of the measurement models for reflective construct in PLS-SEM is based on individual indicator reliability, internal consistency reliability, convergent validity, and discriminant validity (Hair et al., 2013a,b). Individual item reliability is considered adequate when an indicator has a factor loading that is larger than 0.707 on its construct. In this study, 55 of the 63 indicators for 15 reflective constructs have factor loadings above 0.707 (see Appendix 5-1). Eight indicators exhibit loadings below 0.707; after removing them, the remaining 55 indicators' loadings are maintained above 0.707. The final set of 55 indicators met sufficient levels of reliability. All of the 15 reflective constructs have composite reliability values above the threshold 0.707 (from 0.830 to 0.913) indicating sufficient internal consistency reliability (see Appendix 5-1). Likewise, all AVE (average variance extracted) values are ranging from 0.550 to 0.739 which are above the threshold 0.50, supporting the convergent validity of all constructs (see Appendix 5-1). To assess the discriminant validity of the reflective constructs, we applied the Fornell and Larcker (1981) criterion (see Appendix 5-3). The analysis shows that the square roots of AVE of all reflective constructs (the diagonal elements) are larger than their intercorrelations (the off-diagonal elements), thus exhibiting discriminant validity.

To assess the measurement model for the formative construct project performance, we followed Hair et al.‘s (2013a) recommendation by (1) examining multicollinearity among its indicators to identify potential redundancy among indicators, and (2) assessing the statistical significance and the relevance of the indicator. Unlike reflective indicators, which are
interchangeable, high correlations and therefore multicollinearity among indicators in formative measurement models should be avoided. Hair et al. (2013a) recommend a value of variance inflation factor (VIF) below 5, or a tolerance \((TOL = 1/VIF)\) above 0.20, as non-critical level of multicollinearity. We obtained the average VIF values of the four formative indicators through multiple regressions. The VIF values of all indicators ranged from 1.31 to 1.64 (below the threshold value of 5); thus, multicollinearity was not an issue. The statistical significance of a formative indicator is expressed by the significance of its relative contribution or its weight difference from zero. However, a non-significant indicator should be retained if it is a relevant indicator, that is, if its loading is at least 0.5 (Hair et al., 2013a). Of all four indicators, only perceived owner’s success has a non-significant weight. However, because its loading is 0.693 and above the threshold value, we kept this indicator (see Appendix 5-2).

We followed Becker et al.’s (2012) recommendation to estimate the measurement models of the four second-order formative constructs (relational attitudes, collaborative practices, joint capability, and teamworking). We applied repeated indicator approach with mode A for the second-order constructs, and inner path weighting scheme for the PLS-SEM algorithm. The assessment of second-order constructs is based on the criteria applied to first-order formative constructs, but with the weights or loadings obtained from the relations between higher-order construct and lower-order constructs. Using multiple regressions, we found that the average VIF values of the lower-order constructs range from 1.00 to 2.67. Multicollinearity is therefore not an issue between the first-order and corresponding second-order constructs. After running bootstrapping of 5000 subsamples, we obtained the result that all first-order constructs’ weights on their second-order constructs are significant (see Figure 5-2).

The assessment of measurement models confirmed that all the construct measures except project complexity are reliable and valid. We could not establish project complexity construct as either a reflective or a formative construct. We therefore treated it as a single-item construct by averaging its indicators into a single score.

5.4.2. Structural models

Table 5-1 presents the discriminant validity and a multicollinearity assessment of our main constructs. The square root of AVE (on-diagonal elements) of all reflective constructs, front-end definition, and relationship continuity, are larger than their inter-correlations (the lower off-diagonal elements), thus exhibiting discriminant validity. Because our research model involves four to six simultaneous exogenous constructs in predicting different endogenous constructs, potential multicollinearity among these exogenous constructs should be avoided (Hair et al., 2013a). The VIF values of all constructs shown in the upper off-diagonal in Table 5-1 range from 1.53 to 2.47; thus, multicollinearity was not an issue between exogenous constructs in the structural models.
We performed a two-step analysis to provide a detailed picture of the testing of all hypotheses. In the first step, we focused on the full PLS-SEM structural model to estimate direct path coefficients between all constructs (hypotheses \(H_1\), \(H_2\), and \(H_3\); see Figure 5-2 and Table 5-2). The significance of all path coefficients was assessed through bootstrapping with 113 cases, 5000 subsamples, and no sign changes option (Hair et al., 2013a,b). In step 2, we performed statistical mediation analysis (Hayes, 2013; Hayes and Scharkow, 2012) to assess the indirect effects of three antecedents on project performance through teamworking quality (hypotheses \(H_4\), \(H_5\), and \(H_6\); see Table 5-3), and the indirect effects of three antecedents on perceived relationship continuity through teamworking quality and project performance (hypotheses \(H_7\), \(H_8\), and \(H_9\); see Table 5-4).

The main criteria for assessing the structural model are the coefficient of determination \(R^2\) and the predictive relevance \(Q^2\). As shown in Figure 5-2, the structural model accounts for 67.4% of the variance in teamworking quality, 51.5% of the variance in project performance, and 50.1% of the variance in perceived relationship continuity. The \(R^2\) values proof the model’s predictive accuracy. Applying the blindfolding procedure (Henseler et al., 2009) to the structural model results in the \(Q^2\) values of 0.671, 0.514, and 0.536 for teamworking quality, project performance, and perceived relationship continuity, respectively. With all \(Q^2\) values above zero, the predictive relevance of the structural model is met. It is evidence that the structural model has a significant level of predictive validity on project performance.
Collaborative contracting in projects

Collaborative practices

Affective trust

Figure 5-2. Full structural model with first-order constructs. Note: *p < .05 (t > 1.96); ** p < .01 (t > 2.58); ***p < .001 (t > 3.29); ns = not significant; only significant control variables (front-end definition and project complexity) are shown.
### Table 5-2. Structural Models

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Direct effect</th>
<th>Project performance</th>
<th>Relationship continuity</th>
<th>Total effect</th>
<th>Project performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff.</td>
<td>SE</td>
<td>p</td>
<td>Coeff.</td>
<td>SE</td>
</tr>
<tr>
<td>Relational attitudes</td>
<td>Teamworking quality</td>
<td>$a_1$ 0.429***</td>
<td>0.121</td>
<td>0.001</td>
<td>$H1: c'_1$ 0.102</td>
<td>ns</td>
</tr>
<tr>
<td>Collaborative practices</td>
<td></td>
<td>$a_2$ 0.230**</td>
<td>0.074</td>
<td>0.002</td>
<td>$H2: c'_2$ -0.015</td>
<td>ns</td>
</tr>
<tr>
<td>Project team joint capability</td>
<td></td>
<td>$a_3$ 0.197*</td>
<td>0.097</td>
<td>0.044</td>
<td>$H3: c'_3$ 0.101</td>
<td>ns</td>
</tr>
<tr>
<td>Teamworking quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control variables:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front-end definition</td>
<td>$f_1$ 0.100 ns</td>
<td>0.081</td>
<td>0.220</td>
<td></td>
<td>$g'_1$ 0.341***</td>
<td>0.089</td>
</tr>
<tr>
<td>Project duration</td>
<td>$f_2$ -0.096 ns</td>
<td>0.054</td>
<td>0.149</td>
<td></td>
<td>$g'_2$ -0.035</td>
<td>0.136</td>
</tr>
<tr>
<td>Prior relationship duration</td>
<td>$f_3$ 0.048 ns</td>
<td>0.057</td>
<td>0.634</td>
<td></td>
<td>$g'_3$ -0.105</td>
<td>0.068</td>
</tr>
<tr>
<td>Project complexity</td>
<td>$f_4$ 0.114 ns</td>
<td>0.079</td>
<td>0.112</td>
<td></td>
<td>$g'_4$ 0.004</td>
<td>0.088</td>
</tr>
<tr>
<td>Project total cost</td>
<td>$f_5$ 0.035 ns</td>
<td>0.061</td>
<td>0.901</td>
<td></td>
<td>$g'_5$ 0.002</td>
<td>0.098</td>
</tr>
<tr>
<td>Predictive relevance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$R^2 = 0.674$, $Q^2 = 0.671$</td>
<td></td>
</tr>
<tr>
<td>F-test</td>
<td>$F(8,104) = 41.078$, $p &lt; .001$</td>
<td></td>
<td></td>
<td></td>
<td>$F(9,103) = 14.695$, $p &lt; .001$</td>
<td></td>
</tr>
</tbody>
</table>

Note: ***sig. at p<0.001; **sig. at p<0.01; *sig. at p<0.05; ns = not significant; based on bootstrapping of 5,000 subsamples.
5.4.2.1. The direct effects of collaborative antecedents

The results given in Figure 5-2 and Table 5-2 indicate that relational attitudes, collaborative practices, and teams’ joint capability do not directly affect project performance ($c_1' = 0.102, p = 0.403; c_2' = -0.015, p = 0.878; \text{and } c_3' = 0.101, p = 0.274$). Thus, hypotheses H1, H2, and H3 are not supported. In contrast, we found that relational attitudes ($a_1 = 0.429, p \leq 0.001$), collaborative practices ($a_2 = 0.230, p \leq 0.01$), and project teams’ joint capability ($a_3 = 0.197, p \leq 0.05$) have positive effects on teamworking quality. Controlling for effects of the three antecedents, teamworking quality significantly increases project performance ($b_1 = 0.329, p \leq 0.01$). Project performance, in turn, significantly increases perceived relationship continuity ($b_3 = 0.356, p \leq 0.01$). Independent of its effects through project performance, teamworking quality does not have a significant direct effect on perceived relationship continuity ($b_2 = 0.085, p = 0.211$).

Table 5-2 also shows the effects of five control variables (front-end definition, project duration, prior relationship duration, project total cost, and project complexity). Only front-end definition has a significant and positive effect on project performance ($g_1' = 0.341, p \leq 0.001$).

5.4.2.2. Mediation of teamworking quality

To formally test the mediating role of teamworking quality, we focused on the statistical inference of the indirect effects of the three antecedents on project performance through teamworking quality. A recommended approach for testing indirect effect is bootstrapping, which is a nonparametric resampling procedure that does not impose the assumption of normality on the sampling distribution (Hair et al., 2013a; Hayes, 2013).

We used bias-corrected bootstrapping of 5000 subsamples to calculate the indirect effects of relational attitudes, collaborative practices, and joint capability on project performance through teamworking quality as shown in Table 5-3. With all 95% bias-corrected bootstrap confidence intervals (BCB-CI) above zero, the results provide empirical evidence that teamworking quality significantly mediates the positive effects on project performance of relational attitudes ($a_1b_1 = 0.141, BCB-CI = 0.049$ to $0.336$), collaborative practices ($a_2b_1 = 0.075$ sig. $0.022$ to $0.161$), and joint capability ($a_3b_1 = 0.065$ sig. $0.007$ to $0.173$).
0.075, \( BCB-Cl = 0.022 \) to \( 0.161 \), and project teams’ joint capability \( (a_3b_2 = 0.065, BCB-Cl = 0.007 \) to \( 0.173 \)). Hypotheses \( H4, H5, \) and \( H6 \) are therefore empirically substantiated.

Table 5-3 also shows the total effects of relational attitudes, collaborative practices, and teams’ joint capability on project performance, calculated as the sum of the corresponding direct and indirect effects, of the antecedents. Of the three antecedents, only relational attitudes have a significant total effect, \( c_1 = 0.243 (p \leq 0.05) \) as the sum of its direct effect, \( c_1' = 0.102 \) and its indirect effect, \( a_1b_1 = 0.141 \).

### 5.4.2.3. Mediation of teamworking quality and project performance

To empirically establish the mediation of teamworking quality and project performance linking the effects of antecedents on perceived relationship continuity, we applied Hayes' (2013) regression-based mediation analysis with two mediators operating in series. We used bias-corrected bootstrapping of 5000 subsamples to calculate the indirect effects of relational attitudes, collaborative practices, and joint capability on perceived relationship continuity through teamworking quality and project performance as shown in Table 5-4.

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Total effect</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>95% BCB-Cl†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff. p</td>
<td>Coeff. p</td>
<td>Point estimate</td>
<td>Lower Upper</td>
</tr>
<tr>
<td>Relational attitudes</td>
<td>( d_1 ) 0.580*** 0.000</td>
<td>( d_1' ) 0.457** 0.005</td>
<td>Total indirect effects</td>
<td>0.123 ns -0.030 0.310</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (ind1) X_1 \rightarrow M \rightarrow Y_2 )</td>
<td>( a_1b_2 ) 0.037 ns -0.140 0.204</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (Ind2) X_1 \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( c_1'b_3 ) 0.036 ns -0.035 0.147</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( H7: (Ind3) X_1 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( a_1b_1b_3 ) 0.050 sig. 0.015 0.148</td>
</tr>
<tr>
<td>Collaborative practices</td>
<td>( d_2 ) -0.133 ns 0.172</td>
<td>( d_2' ) -0.174 ns 0.056</td>
<td>Total indirect effects</td>
<td>0.041 ns -0.078 0.151</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (ind1) X_2 \rightarrow M \rightarrow Y_2 )</td>
<td>( a_2b_2 ) 0.020 ns -0.079 0.102</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (Ind2) X_2 \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( c_2'b_3 ) -0.006 ns -0.087 0.066</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( H8: (Ind3) X_2 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( a_2b_1b_3 ) 0.027 sig. 0.006 0.076</td>
</tr>
<tr>
<td>Joint teams’ capability</td>
<td>( d_3 ) 0.125 ns 0.225</td>
<td>( d_3' ) 0.049 ns 0.614</td>
<td>Total indirect effects</td>
<td>0.076 ns -0.016 0.201</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (ind1) X_3 \rightarrow M \rightarrow Y_2 )</td>
<td>( a_3b_2 ) 0.017 ns -0.046 0.116</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( (Ind2) X_3 \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( c_3'b_3 ) 0.036 ns -0.018 0.132</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( H9: (Ind3) X_3 \rightarrow M \rightarrow Y_1 \rightarrow Y_2 )</td>
<td>( a_3b_1b_3 ) 0.023 sig. 0.003 0.074</td>
</tr>
</tbody>
</table>

Note: ***sig. at \( p<0.001 \); **sig. at \( p<0.01 \); *sig. at \( p<0.05 \); sig. = significant; ns=not significant based on \( ^95\% \) BCB-Cl (bias-corrected bootstrapping confidence interval) of 5,000 subsamples.
There are three pathways along which the antecedents indirectly affect perceived relationship continuity: \((Ind1)\) via teamworking quality, \((Ind2)\) via project performance, and \((Ind3)\) via teamworking and then project performance. Of the three pathways, only the third \((Ind3)\) is significant across all antecedents. This is evidence that teamworking quality together with project performance mediates the positive effects on perceived relationship continuity of relational attitudes \((a_1b_1b_3 = 0.050, \text{BCB-Cl} = 0.015 \text{ to } 0.148)\), collaborative practices \((a_2b_1b_3 = 0.027, \text{BCB-Cl} = 0.006 \text{ to } 0.076)\), and project teams' joint capability \((a_3b_1b_3 = 0.023, \text{BCB-Cl} = 0.003 \text{ to } 0.074)\), with all 95% \textit{bias-corrected bootstrap confidence intervals} (BCB-Cl) above zero. Hypotheses \textbf{H7}, \textbf{H8}, and \textbf{H9} are therefore empirically substantiated.

Two other findings shown in Table 5-4 are worth mentioning. Firstly, relational attitudes have a substantially larger direct effect \((d_1' = 0.457, \ p \leq 0.01)\) on perceived relationship continuity relative to its indirect effects through teamworking quality and project performance \((a_1b_1b_3 = 0.050)\). Secondly, project complexity negatively affects perceived relationship continuity \((h_4' = -0.148, \ p \leq 0.05)\), implying that more complex projects are associated with lower perceived relationship continuity, regardless of the influence of other aspects.

\textbf{5.4.2.4. The relative effects of first-order constructs}

Figure 5-2 shows an overall view of the complete path analysis. The results show the significant effects of all first-order constructs on their corresponding second-order constructs. Relational norms have a relatively stronger effect (0.754) than senior management commitment (0.362) in determining the degree of relational attitudes. Team integration and joint working contribute equally to collaborative practices (0.532 and 0.562, respectively). With respect to the teams' joint capability, the contractor's team has a slightly larger effect (0.638) than the owner's team (0.583). Among the dimensions of teamworking quality, affective trust (0.288) has the largest effect, followed by communication (0.177), coordination (0.173), cohesion (0.158), mutual support (0.146), balanced contribution (0.132), and aligned effort (0.119).

We used all significant path coefficients to calculate the individual effects of the dimensions (first-order constructs) of collaboration antecedents on project performance (the cross-product of the weights and direct effects or paths to project performance). The results show that relational norms (0.106) rank first, followed by senior management commitment (0.051) and then joint working procedures (0.043), contractor's team's capability (0.041), team integration practices (0.040), and owner's team's capability (0.038).

\textbf{5.5. Discussion}

The aim of this study was to establish whether teamworking quality is the mediator that links the effects of collaboration antecedents to project performance. We did so by applying PLS-SEM and statistical mediation analysis. This study thus heeded the calls from other
scholars to broaden our theoretical understanding of the nature of owner–contractor collaboration and its effect on project performance (Alderman and Ivory, 2007; Bresnen, 2007; Chan et al., 2012; Dietrich et al., 2010; Müller and Jugdev, 2012; Rahman and Kumaraswamy, 2004b).

Regarding the first three hypotheses, we expected relational attitudes (H1), collaborative practices (H2), and project teams' joint capability (H3) to have positive direct effects on project performance. The results, however, do not support any of these hypotheses. We also expected that teamworking quality mediates the positive effects on project performance of relational attitudes (H4), collaborative practices (H5), and project teams' joint capability (H6). The statistical tests of indirect effects (Table 5-3) provide empirical evidence that relational attitudes, collaborative practices, and project teams' joint capability significantly affect teamworking quality and in turn affect project performance. Taken together, all antecedents, when controlling for each other, affect project performance only through teamworking quality. This means that teams' joint capability, formal adoption of collaborative practices, and shared relational attitudes do not automatically lead to a successful project without day-to-day managerial intervention in teamworking processes. A formal collaborative arrangement is often taken for granted by senior management and project managers who do not pay real attention to the actual processes that should be performed, understood, and internalized by the project teams. This insight explains why formal collaborative arrangements pose some paradoxes, as they often fail to deliver their expected result (Alderman and Ivory, 2007; Bresnen, 2007; Bresnen and Marshall, 2002; Chan et al., 2012).

Of the three antecedents, only relational attitudes had a significant total effect on project performance. This result demands a plausible theoretical explanation. It could be that the differences in the level of collaborative practice and joint capability just do not matter much to project performance relative to the differences in relational attitudes. Another explanation specific to collaborative practices is that project teams need to spend a considerable amount of energy, time, and support performing such activities as team building, alignment, or joint risk management. Quite often, the potential impact of these practices is hindered by ‘formalization’, with little attention paid to building interpersonal relationships (Bresnen and Marshall, 2002) and a lack of willingness from senior management to get involved (Alderman and Ivory, 2007; Chan et al., 2006; Ng et al., 2002).

As a direct consequence of delivering satisfactory project performance, owner and contractor may expect to continue their relationship in future. We hypothesized that relational attitudes (H7), collaborative practices (H8), and project teams' joint capability (H9) positively contribute to the parties' perceived relationship continuity through teamworking quality and project performance. The results in Table 5-4 confirm these hypotheses.
Interestingly, independent of their effects on teamworking and project performance, we found that relational attitudes have substantially larger direct effects on perceived relationship continuity. More specifically, the increase in relational attitudes is much more influential than the project teams' achievement on the current project (the manifested teamworking and realized project performance) to increase the parties' expectations regarding continuing their relationship. This result emphasizes the inherent nature of project teams as temporary organizations (Söderlund, 2011; Winch, 2014). Positive collaborative experiences and lessons learnt by project teams might help, but they make a limited contribution to shaping their firms' expectations for the future. After completing a project, the teams will be dissolved and the core members of the teams will rarely work together in a future project. This condition inevitably creates a discontinuity in the relationship between owner and contractor. Shared relational attitudes such as trust, respect, and commitment on the other hand, are embedded in the memory of senior management representing the permanent organizations and are therefore more stable and enduring (Laan et al., 2011; Zaheer et al., 1998).

Apart from the main antecedents (relational attitudes, collaborative practices, and joint capability) and the mediator (teamworking quality), we included five control variables to rule out confounders or spurious associations with plausible other mechanisms. The results presented in Table 5-2 show that the mediating role of teamworking is not due to a spurious association between antecedents and other mechanisms that are also correlated to teamworking. The results also show a significant direct effect of the control variable front-end definition (operationalized in terms of clarity of project goals, clarity of scope definition, quality of basic design, and quality of project execution plan) on project performance. This implies that, all other things being equal, the maturity of project definition resulting from front-end development (also known as front-end loading; FEL) indeed improves project performance. This finding also confirms previous research findings that the extent of front-end development activities has a strong influence on project performance (Bosch-Rekveldt, 2011; Merrow, 2011). Lack of maturity in project definition prior to project execution proved to be responsible for the failure of major projects (Flyvbjerg, 2011).

5.6. Conclusions

The results of this study suggest that project teams' capability, the formal application of collaborative practices, and shared relational attitudes do not automatically lead to a successful project without day-to-day managerial attention to teamworking processes. Without this attention, project teams often face difficulty in implementing formal collaborative arrangements into their daily practice (Alderman and Ivory, 2007; Bresnen, 2007; Bresnen and Marshall, 2002; Chan et al., 2012). This study thus corroborates the literature that has posited the positive effects of relational contracting on teamworking (Anvuur and Kumaraswamy, 2007; Rahman and Kumaraswamy, 2008; Yang et al., 2011) and
the positive effects of teamworking on project performance (Baiden and Price, 2011; Dietrich et al., 2010; Hoegl and Gemuenden, 2001; Yang et al., 2011).

Literature on project-based collaborative practices often prescribes relational contracting, that is, a flexible approach focusing on soft and people aspects as well as the integration of owner's and contractor's teams to optimize project outcomes (McLennan and Scott, 2002; Rahman and Kumaraswamy, 2004b, 2008). The soft and people aspects emphasized in relational contracting are mutual commitment, trust, and the recognition of win–win attitudes, while integration implies the application of proven practices and techniques (Cheung et al., 2005). Our findings signify the influence of relational contracting principles. Both relational attitudes (soft and people aspects) and collaborative practices (proven practices and techniques) contribute positively to teamworking quality and in turn to project performance. Furthermore, the relatively stronger effects of relational attitudes compared to collaborative practices on project performance, suggest that the focus on soft and people aspects is more influential than the formal application of supporting practices and techniques (Bresnen and Marshall, 2002; Smyth and Pryke, 2008).

We also found that a successful project-based collaboration may create a positive opportunity beyond the individual project, as it positively affects the parties' expectations regarding continuing their relationship. Interestingly, relational attitudes have much more positive direct effects on the parties' perceived relationship continuity than the indirect effects through teamworking quality and project performance. This suggests that the opportunity for future relationships is also strongly determined by the extent of the relational norms built and the commitment retained between the two permanent organizations.

5.6.1. Managerial implications

Our results have three implications for the senior management and project managers of both owners and contractors regarding the development and execution of capital projects. Firstly, at the permanent organizational level, shared relational attitudes (characterized by mutual trust, commitment, openness, and a no-blame culture) between the senior management of both the owner and the contractor are essential for the success of a project, since they create the necessary condition for teamworking processes. Secondly, at the project organization level, apart from assembling teams that have sufficient capability, project managers from both sides also can perform collaborative practices—such as formal team integration, team building, and joint risk management—during the early phase of the project in order to initiate teamworking processes. Thirdly, to ensure effective on-going teamworking, project managers from both sides need to guarantee that communication, coordination, affective trust, cohesion, balanced contribution, aligned effort, and mutual support are manifested between teams.
Besides delivering a successful project, it is a mutual interest of both owner and contractor to establish a longer-term relationship for future projects. Shared relational attitudes between senior management at the firm's level are highly influential in shaping the parties' expectations (as perceived by project managers) regarding a future relationship. This means that to establish a longer-term relationship with a particular owner or contractor, it is crucial for the senior management from both sides to not only build their reputation through successful projects, but also maintain their relationship. Although due to the one-off nature of capital projects, this does automatically guarantee that the contractor will secure the next project, it can at least position the contractor as a preferred long-term partner in the eye of the owner.

5.6.2. Limitations and further research

This study has some limitations regarding its results and conclusions. Although the research model assumes causality, this study was based on observation without the ability to control events. The results are therefore more oriented toward prediction. Other limitations are related to the sample used in this study. Although the sample included projects from across the world, the majority (75%) were European projects. We have to admit that projects executed outside Europe might have characteristics that are different from those in Europe, given different country-specific regulations and cultures. Future studies might examine in more detail whether and, if so, how different countries or cultures moderate the effects of relational attitudes or collaborative practices on teamworking quality and project performance. Furthermore, the sample did not focus on publicly funded projects. The difference in the organizational and team settings (between public/government organization and private contractor) could induce different size effects of collaboration antecedents and/or teamworking quality on project performance. Future studies can extend our research model to public projects.

Finally, literature suggests that different contract types might have different implications for the nature of owner–contractor working relationships (Lowe, 2007; Turner, 2003). Contract types can generally be distinguished on the basis of different combinations of remuneration, incentive, and risk sharing/allocation schemes. In capital project delivery, the most common types are EPC lump-sum, EPCm reimbursable, and partnering or alliancing contracts (Merrow, 2011). So far, the influence of partnering contracts on project performance compared to EPC lump-sum or EPCm reimbursable remains equivocal. It is therefore our intention to extend the analysis to the effects of different contract types on teamworking quality and project performance.
References


The mediating role of teamworking


Collaborative contracting in projects


The mediating role of teamwork


### Appendix 5-1. Assessment of reflective measurement models

<table>
<thead>
<tr>
<th>Construct/dimension/indicators</th>
<th>Mean</th>
<th>SD</th>
<th>Loadings</th>
<th>AVE</th>
<th>CR</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Relational attitudes (2\textsuperscript{nd}-order formative construct)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. Senior management commitment (1\textsuperscript{st}-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SM committed to necessary resources and support to the team</td>
<td>3.950</td>
<td>0.879</td>
<td>0.838</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SM showed consistent and passionate leadership</td>
<td>3.630</td>
<td>0.900</td>
<td>0.892</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SM actively resolved potential conflicts when needed</td>
<td>3.660</td>
<td>0.922</td>
<td>0.836</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1.2. Relational norms (1\textsuperscript{st}-order reflective construct)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The owner acknowledged the contractor’s commercial interest.*</td>
<td>3.450</td>
<td>0.960</td>
<td>0.619</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The contractor was enthusiastic in achieving the owner’s objectives</td>
<td>3.670</td>
<td>0.910</td>
<td>0.776</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The contractor felt confident the owner is reliable and trustworthy</td>
<td>3.810</td>
<td>0.919</td>
<td>0.840</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The owner believed the contractor made its best efforts</td>
<td>3.750</td>
<td>0.885</td>
<td>0.874</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parties adopted a ‘no-blame culture’</td>
<td>3.460</td>
<td>1.018</td>
<td>0.638</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parties were open and honest in any interactions</td>
<td>3.610</td>
<td>0.876</td>
<td>0.772</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Collaborative practices (2\textsuperscript{nd}-order formative construct)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1. Team integration (1\textsuperscript{st}-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal integrated project team</td>
<td>3.180</td>
<td>1.156</td>
<td>0.737</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal setting and alignment with subcontractors and suppliers</td>
<td>3.480</td>
<td>0.920</td>
<td>0.736</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal setting and alignment with owner’s representatives</td>
<td>3.640</td>
<td>0.909</td>
<td>0.785</td>
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<tr>
<td>Regular team building and alignment meetings</td>
<td>3.270</td>
<td>1.110</td>
<td>0.707</td>
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</tr>
<tr>
<td><strong>2.2. Joint working (1\textsuperscript{st}-order reflective construct)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Joint decision making</td>
<td>3.320</td>
<td>0.863</td>
<td>0.791</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Joint performance management</td>
<td>3.090</td>
<td>0.996</td>
<td>0.751</td>
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<tr>
<td>Rewards program for the teams and individuals*</td>
<td>2.450</td>
<td>1.169</td>
<td>0.657</td>
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<tr>
<td>Joint risk management</td>
<td>2.970</td>
<td>1.066</td>
<td>0.762</td>
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<tr>
<td>Joint conflicts/disputes resolution</td>
<td>3.320</td>
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<td>Continuous improvement*</td>
<td>3.110</td>
<td>1.030</td>
<td>0.648</td>
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<td><strong>3. Joint capability (2\textsuperscript{nd}-order formative construct)</strong></td>
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<tr>
<td>3.1. Owner’s team’s capability (1\textsuperscript{st}-order reflective construct)</td>
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</tr>
<tr>
<td>Experience of owner’s project manager</td>
<td>3.940</td>
<td>0.816</td>
<td>0.793</td>
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</tr>
<tr>
<td>Competence of owner’s project manager</td>
<td>3.860</td>
<td>0.913</td>
<td>0.806</td>
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<tr>
<td>Experience of owner’s team members</td>
<td>3.530</td>
<td>0.861</td>
<td>0.785</td>
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<tr>
<td>Competences of owner’s team members</td>
<td>3.530</td>
<td>0.859</td>
<td>0.839</td>
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<tr>
<td><strong>3.2. Contractor’s team’s capability (1\textsuperscript{st}-order reflective construct)</strong></td>
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</tr>
<tr>
<td>Experience of contractor’s project manager</td>
<td>3.760</td>
<td>0.753</td>
<td>0.793</td>
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<td>Competence of contractor’s project manager</td>
<td>3.700</td>
<td>0.837</td>
<td>0.788</td>
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<tr>
<td>Experience of contractor’s team members</td>
<td>3.570</td>
<td>0.782</td>
<td>0.808</td>
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<tr>
<td>Competence of contractor’s team members</td>
<td>3.600</td>
<td>0.811</td>
<td>0.812</td>
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<tr>
<td><strong>4. Relationship continuity (reflective construct)</strong></td>
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<tr>
<td>Our experiences in this project would be useful in future project</td>
<td>3.880</td>
<td>1.029</td>
<td>0.775</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are willing to work with each other beyond this project</td>
<td>3.820</td>
<td>1.119</td>
<td>0.898</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We are concerned with both companies’ future interests</td>
<td>3.290</td>
<td>1.120</td>
<td>0.827</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We would like to develop or maintain a long-term relationship</td>
<td>3.670</td>
<td>1.163</td>
<td>0.872</td>
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<tr>
<td><strong>5. Front-end definition (reflective construct)</strong></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Clarity of the project goals and objectives</td>
<td>3.820</td>
<td>0.928</td>
<td>0.811</td>
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<td></td>
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<tr>
<td>Clarity of the project scope</td>
<td>3.550</td>
<td>1.069</td>
<td>0.797</td>
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<tr>
<td>Quality of the project basic engineering design</td>
<td>3.500</td>
<td>0.920</td>
<td>0.747</td>
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<tr>
<td>Quality of the project execution plan</td>
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<td>0.909</td>
<td>0.809</td>
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### Appendix 5-1. Continued

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<th>Construct/dimension/indicators</th>
<th>Mean</th>
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<th>Loadings</th>
<th>AVE</th>
<th>CR</th>
<th>α</th>
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<tbody>
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<td><strong>6. Teamworking quality</strong></td>
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<tr>
<td>(2nd-order formative construct)</td>
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<td>6.1. Communication</td>
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<tr>
<td>(1st-order reflective construct)</td>
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<tr>
<td>There was routine communication between the teams*</td>
<td>3.680</td>
<td>0.811</td>
<td>0.749</td>
<td>0.891</td>
<td>0.842</td>
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<tr>
<td>Both teams communicated directly with each other</td>
<td>3.640</td>
<td>0.759</td>
<td>0.784</td>
<td>0.890</td>
<td>0.838</td>
<td></td>
</tr>
<tr>
<td>Project-relevant information was shared openly by both teams</td>
<td>3.540</td>
<td>0.866</td>
<td>0.800</td>
<td>0.889</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td>Whenever a problem was detected, it was immediately communicated</td>
<td>3.500</td>
<td>0.851</td>
<td>0.835</td>
<td>0.890</td>
<td>0.843</td>
<td></td>
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<tr>
<td>Both teams were satisfied with the usefulness of the information shared</td>
<td>3.350</td>
<td>0.832</td>
<td>0.773</td>
<td>0.890</td>
<td>0.843</td>
<td></td>
</tr>
<tr>
<td><strong>6.2. Coordination</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The work done on tasks within the project was synchronized</td>
<td>3.400</td>
<td>0.864</td>
<td>0.719</td>
<td>0.893</td>
<td>0.844</td>
<td></td>
</tr>
<tr>
<td>There were comprehended goals for tasks between the teams</td>
<td>3.640</td>
<td>0.759</td>
<td>0.792</td>
<td>0.886</td>
<td>0.846</td>
<td></td>
</tr>
<tr>
<td>The goals for tasks were accepted by both teams</td>
<td>3.600</td>
<td>0.792</td>
<td>0.823</td>
<td>0.890</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td>There was no conflict between teams regarding tasks and goals</td>
<td>3.370</td>
<td>0.956</td>
<td>0.770</td>
<td>0.890</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td><strong>6.3. Cohesion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core team-members were personally engaged to this project</td>
<td>3.890</td>
<td>0.724</td>
<td>0.817</td>
<td>0.891</td>
<td>0.844</td>
<td></td>
</tr>
<tr>
<td>Core team-members were integrated as one team</td>
<td>3.850</td>
<td>0.784</td>
<td>0.823</td>
<td>0.891</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td>There were personal conflicts among core team-members*</td>
<td>3.400</td>
<td>0.864</td>
<td>0.719</td>
<td>0.893</td>
<td>0.844</td>
<td></td>
</tr>
<tr>
<td>There were personal bonds among core team-members*</td>
<td>3.640</td>
<td>0.759</td>
<td>0.792</td>
<td>0.886</td>
<td>0.846</td>
<td></td>
</tr>
<tr>
<td>Core team-members felt proud to be part of the teams</td>
<td>3.290</td>
<td>0.917</td>
<td>0.770</td>
<td>0.890</td>
<td>0.850</td>
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<tr>
<td>Core team-members felt responsible to maintain the relationships</td>
<td>3.370</td>
<td>0.956</td>
<td>0.770</td>
<td>0.890</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td><strong>6.4. Balanced contribution</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams recognized each other's specific strengths/weaknesses</td>
<td>3.410</td>
<td>0.730</td>
<td>0.807</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams contributed in accordance with their specific potential</td>
<td>3.750</td>
<td>0.729</td>
<td>0.862</td>
<td>0.897</td>
<td>0.851</td>
<td></td>
</tr>
<tr>
<td>There were balanced contributions that prevented conflicts</td>
<td>3.420</td>
<td>0.837</td>
<td>0.869</td>
<td>0.897</td>
<td>0.851</td>
<td></td>
</tr>
<tr>
<td><strong>6.5. Mutual support</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams supported each other as best as they could</td>
<td>3.550</td>
<td>0.876</td>
<td>0.871</td>
<td>0.897</td>
<td>0.851</td>
<td></td>
</tr>
<tr>
<td>Whenever problems occurred, they were resolved constructively</td>
<td>3.810</td>
<td>0.854</td>
<td>0.853</td>
<td>0.897</td>
<td>0.851</td>
<td></td>
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<tr>
<td>Every critical decision was made jointly by both teams</td>
<td>3.460</td>
<td>0.945</td>
<td>0.772</td>
<td>0.897</td>
<td>0.851</td>
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<tr>
<td><strong>6.6. Aligned effort</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every team made this project their highest priority</td>
<td>3.660</td>
<td>0.958</td>
<td>0.866</td>
<td>0.897</td>
<td>0.851</td>
<td></td>
</tr>
<tr>
<td>Both teams put their best effort into this project</td>
<td>3.890</td>
<td>0.724</td>
<td>0.888</td>
<td>0.897</td>
<td>0.851</td>
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<tr>
<td>There was no conflict regarding the effort between teams</td>
<td>3.490</td>
<td>0.940</td>
<td>0.824</td>
<td>0.897</td>
<td>0.851</td>
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<tr>
<td><strong>6.7. Affective trust</strong></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(1st-order reflective construct)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams were comfortable being dependent on each other</td>
<td>3.350</td>
<td>0.832</td>
<td>0.738</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams kept their promises</td>
<td>3.460</td>
<td>0.856</td>
<td>0.777</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams had high levels of integrity</td>
<td>3.750</td>
<td>0.865</td>
<td>0.827</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams were fair to each other</td>
<td>3.690</td>
<td>0.877</td>
<td>0.853</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams looked out for the interests of each other’s company</td>
<td>3.350</td>
<td>0.843</td>
<td>0.798</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams could rely on each other not to take advantage</td>
<td>3.500</td>
<td>0.851</td>
<td>0.785</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>There was no hidden agenda between the teams*</td>
<td>3.500</td>
<td>1.017</td>
<td>0.633</td>
<td>0.894</td>
<td>0.847</td>
<td></td>
</tr>
<tr>
<td>Both teams would not have intentionally hurt each other*</td>
<td>3.860</td>
<td>1.109</td>
<td>0.695</td>
<td>0.894</td>
<td>0.847</td>
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</tbody>
</table>

Note: AVE = average variance extracted; CR = composite reliability; α = Cronbach alpha; *removed from the final measurement models because the loadings below the threshold value of 0.700.
Appendix 5-2. Assessment of formative measurement models and other measures

<table>
<thead>
<tr>
<th>Construct/dimension/indicators</th>
<th>Mean</th>
<th>SD</th>
<th>Loadings</th>
<th>Weights</th>
<th>p-value*</th>
<th>VIF</th>
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<tbody>
<tr>
<td>7. Project performance (formative construct)</td>
<td>3.416</td>
<td>0.734</td>
<td>0.752</td>
<td>0.399</td>
<td>&lt; 0.01</td>
<td>1.512</td>
</tr>
<tr>
<td>Weighted index of schedule, cost, quality, safety, and operability</td>
<td>3.099</td>
<td>0.729</td>
<td>0.752</td>
<td>0.399</td>
<td>&lt; 0.01</td>
<td>1.512</td>
</tr>
<tr>
<td>This project made a positive impact on the owner’s business</td>
<td>4.050</td>
<td>0.885</td>
<td>0.693</td>
<td>0.129</td>
<td>ns</td>
<td>1.637</td>
</tr>
<tr>
<td>This project was a commercial success for the contractor</td>
<td>3.400</td>
<td>1.175</td>
<td>0.779</td>
<td>0.394</td>
<td>&lt; 0.01</td>
<td>1.570</td>
</tr>
<tr>
<td>Both parties were satisfied with the project outcomes</td>
<td>3.750</td>
<td>1.035</td>
<td>0.865</td>
<td>0.343</td>
<td>&lt; 0.01</td>
<td>1.309</td>
</tr>
<tr>
<td>8. Project complexity (aggregate index)*</td>
<td>2.637</td>
<td>0.581</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The experience with the main technology was lacking</td>
<td>2.330</td>
<td>1.235</td>
<td>0.194</td>
<td>0.145</td>
<td>ns</td>
<td>1.155</td>
</tr>
<tr>
<td>The country’s regulations and politics were challenging</td>
<td>2.520</td>
<td>1.268</td>
<td>0.916</td>
<td>0.922</td>
<td>&lt; 0.05</td>
<td>1.094</td>
</tr>
<tr>
<td>The market situation (like exchange rate, ...) was highly unstable</td>
<td>2.350</td>
<td>1.066</td>
<td>0.167</td>
<td>-0.057</td>
<td>ns</td>
<td>1.104</td>
</tr>
<tr>
<td>The project site (location) was challenging or difficult to access</td>
<td>2.520</td>
<td>1.310</td>
<td>0.219</td>
<td>-0.128</td>
<td>ns</td>
<td>1.048</td>
</tr>
<tr>
<td>The pressure from external stakeholders was high</td>
<td>3.500</td>
<td>0.968</td>
<td>0.394</td>
<td>0.420</td>
<td>ns</td>
<td>1.104</td>
</tr>
<tr>
<td>9. Project total cost, ordinal from 1 (&lt;= 1 million) to 5 (&gt;=1 billion)</td>
<td>2.910</td>
<td>1.154</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>10. Prior relationship duration, in years</td>
<td>8.787</td>
<td>10.05</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11. Project duration, in years</td>
<td>2.427</td>
<td>1.356</td>
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</tr>
</tbody>
</table>

Note: *p-value of the indicator’s weights; *treated as single item construct by averaging all indicators because four out of five indicators failed to meet the criteria of formative indicators, i.e.: significant weights or its loadings above 0.50.
### Appendix 5-3. Discriminant validity assessment of 1st-order reflective constructs

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
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Note: The diagonal elements (in bold) are the square root of the AVEs; non-diagonal elements are latent variable correlations; AVE values are N/A (not applicable) to $^a$single item construct and $^b$formative construct.
Chapter 6

HOW DO CONTRACT TYPES AND INCENTIVES MATTER TO PROJECT PERFORMANCE?
Chapter 6 | Abstract

How collaborative contracts and contractual incentives might influence project performance remains equivocal. We hypothesized that their effects on project performance are mediated by owner–contractor collaboration, measured in terms of relational attitudes (relational norms and senior management commitment) and teamworking quality (inter-team collaborative processes). Using PLS-SEM, we analyzed a sample of 113 capital projects. The results suggest that through better relational attitudes and teamworking quality, projects with a partnering/alliance contract are likely to perform better than those with lump-sum and reimbursable contracts. Likewise, the projects with incentive contracts are likely to perform better than those without incentives through better relational attitudes and teamworking quality. There were no differences in project performance directly associated with different contract types and contractual incentives. Taken together, a partnering/alliance contract and incentive contracts do not necessarily result directly into better project performance but through relational attitudes and how they play out into actual teamworking behavior.

Keywords: Capital project; Collaboration; Contract; Incentive; Relational; Teamwork; Trust.

Note:
- The author of this dissertation contributed in study conceptual model, survey design, data collection, statistical analysis, interpretation of results, writing and finalizing the manuscript. The co-authors contributed in interpretation of results and review of the manuscript.
Chapter 6 How do contract types and incentives matter to project performance?

6.1. Introduction

There is a wide agreement that the choice of contract types should be contingent upon various circumstances such as product and/or process uncertainty, desired allocation of risk, owner in-house capability, and market conditions (Merrow, 2011; Turner and Simister, 2001; Walker and Rowlinson, 2008). A proper contract type is chosen to encourage the owner and contractor to work rationally together to achieve the best outcomes in accordance to their common objectives and within the expected risk (Morris and Pinto, 2007; PMI, 2008; Smith, 2002; Turner, 2009; Walker and Rowlinson, 2008). However, two separate empirical studies at different times by CII (1986) and IPA (2010) suggest that there is no clear or direct relationship between the contract type and project performance. CII suggests that regardless the choice of contract type, the real issues that affect the project cost performance are associated with the alignment between owner and contractor and their agreement in allocating and managing risk. In a similar vein, IPA suggests that any contract type can deliver success or failure because contract is a second-order concern. One contract type may work well for some owners but fail for others because different contract types bring different difficulties and situations.

In this study we focused on three basic types of contracts underlying the relationship between owner and contractor in the execution of capital projects: lump-sum or fixed price, reimbursable, and partnering/alliancing (Smith, 2002; Turner and Simister, 2001; Turner, 2003). A lump-sum contract is a contract where the contractor is paid a fixed amount for the whole scope of works defined in the contract. A reimbursable contract, commonly called cost reimbursable contract is a contract where the owner reimburses the contractor for all costs, reasonably incurred and directly associated with the amount of work done for the project; plus a certain fee (fixed fee or percentage fee) and/or an incentive fee (Berends, 2006; Merrow, 2011). A partnering/alliance contract is an extension to reimbursable contract where the owner and the contractors (often including specialist contractors and key suppliers) jointly establish the target out-turn cost and share the gain and/or pain resulting from the actual cost (Meng and Gallagher, 2012; Ross, 2003; Turner, 2003).

What is the potential influence of different contract types (partnering/alliance versus lump-sum versus reimbursable) on the nature of the relationship between owner and contractor? On one extreme, the lump-sum contract demands less owner intervention (or less involvement) and therefore offers more flexibility and less administrative burden to the contractor in executing a project (Berends, 2006; Lowe, 2007). But it also has some
perceived drawbacks. A lump-sum contract is often considered to create an adversarial relationship between the parties in dealing with changes of circumstances during the project execution (Smith, 2002; Turner and Simister, 2001). The reimbursable contract, in contrast, implies that more owner involvement and support can be expected and thus less barriers to building a collaborative relationship and an integrated team (Berends, 2006; Smith, 2002). But a reimbursable contract also has some drawbacks from the one party’s perspective toward the other party (Berends, 2006; Smith, 2002). The contractor often perceives that the owner will be more demanding for achieving target cost and schedule. On the other side, the owner perceives that the contractor will come up with additional work and thereby increase costs over what was initially estimated. In the end, lump sum and reimbursable contracts have a quite similar implication on owner-contractor collaboration (Müller and Turner, 2005).

On the other extreme, a partnering/alliance contract focuses on the ‘principles’ of relational contract to change project participants’ attitudes from being short-term and adversarial toward a more collaborative mind-set and behavior (Cowan and Davis, 2003; Larson, 1995; Macbeth, 1994; Naoum, 2003; Ross, 2003; Thompson and Sanders, 1998). A partnering/alliance contract is often advocated to be more collaborative than lump-sum or reimbursable contract (Davis and Walker, 2008; Thompson and Sanders, 1998; Turner and Simister, 2001; Turner, 2003).

Several in-depth case studies of partnering/alliance practices, however, reveal that this contract type does not always eliminate the underlying adversarial attitudes. Lack of top management commitment, lack of collaborative mind-set, and insufficient initial effort to establish shared culture remain in practice (Aarseth, Andersen, Ahola and Jergeas, 2012; Alderman and Ivory, 2007; Bresnen and Marshall, 2002; Chan, Johansen and Moor, 2012; Smyth and Edkins, 2007). Contemplating the practical difficulties of partnering/alliance projects, it is questionable whether a partnering/alliance contract is better than other contract types. Merrow (2011) coins a controversial view on the role of alliance contracts, “…, even if everything possible has been done to prepare the project (industrial megaprojects)… Alliance contracts … do nothing to help us understand who is responsible for what” (p.293). This contradiction provokes an important research question, to what extent do different contract types actually enact different quality of collaborative relationship between owner and contractor and in turn affect project performance?

This paper adopts Suprapto, Bakker and Mooi’s (2015a) conceptualization of owner-contractor collaborative relationship as a set of norms and the manifested interactional processes by which the project parties (owner and contractor) jointly act and decide on the issues emerging during the course of a project in order to bring mutually satisfactory project outcomes. Owner-contractor collaborative relationship includes two dimensions: (1) relational attitudes; and (2) teamworking quality. Relational attitudes refer to norms and commitment developed and shared by the senior management from both owner and
contractor to govern their project-specific relationship. The essential elements of relational attitudes include fairness, inter-organizational trust, transparency, and no blame culture alongside the commitment of senior management to support the project teams (Cheung, Yiu and Chim, 2006; Rahman and Kumaraswamy, 2008; Suprapto, Bakker, Mooi and Moree, 2015b). Building on the works of Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl, Weinkauf and Gemuenden, 2004; Hoegl and Parboteeah, 2007), Salas, Sims and Burke (2005), and Pinto, Slevin and English (2009), Suprapto et al. (2015a) define teamworking as a set of underlying mechanisms reflecting the task-related and social interactions between owner team and contractor team in executing a project. They operationalize teamworking quality as a higher-order construct capturing the quality of inter-team interactions and including 5 facets of task-related interactions: communication, coordination, balanced contribution, aligned effort, and mutual support; and 2 facets of social interactions: cohesion and affective trust.

The positive effects of relational attitudes and teamworking quality on project performance (in terms of efficiency, effectiveness, perceived satisfaction, and perceived success) has been empirically substantiated whereas relational attitudes indirectly influence project performance through teamworking quality (Suprapto et al., 2015a). Extending Suprapto et al.’s research model, we addressed the research question by examining the effects of contract types (partnering/alliance, reimbursable, and lump-sum) and contractual incentives on project performance through two mechanisms: (i) directly and (ii) indirectly through the mediation of relational attitudes and teamworking quality.

By quantifying such direct and indirect effects, this paper attempts to make three contributions. First, we extend the scope of analysis by considering the ex-post effects of contract types and incentives on the quality of owner-contractor relationships and project performance that have been assumed ex-ante and lacking empirical support. Second, by moving beyond the direct effects, this study is the first to assess potential indirect effects of contract types and incentives on project performance through the parties’ relational attitudes and their inter-teamworking quality. Third, the findings provide explanation to which contract type is better than the others toward project performance and what mechanisms are underlying it.

The paper is structured as follows. Section 2 presents the theoretical background on the relationships between contract types, contractual incentives, relationship quality, and project performance. Section 3 describes the research methodology used to test the hypotheses. Section 4 presents the results and finally Section 5 discusses the implications and future research directions.
6.2. Conceptual framework

6.2.1. Collaborative contracting in engineering and construction projects

Literature on inter-organizational relationships and alliances often distinguish governance modes in terms of equity and non-equity (or contractual based) alliances (Gulati, 1995) in the context of R&D alliances (Feller, Parhankangas, Smeds and Jaatinen, 2013), buyer-supplier (Zaheer, McEvily and Perrone, 1998), and new business ventures (Faems, Looy, Janssens and Vlaar, 2012). In capital projects, one-off creations of complex physical assets, the relationships between the owners and the contractors are generally, if not always, on contractual basis. Contract types known and used within engineering and construction industry like lump-sum, reimbursable, and partnering/alliance are the more specific forms of non-equity alliances.

Conceptually, the choice of contract type depends upon a number of factors known ex-ante: initial trust and commitment that emerged from a prior relationship (Gulati, 1995; Poppo, Zhou and Ryu, 2008), perceived risks and uncertainty as a function of scope definition (Gopal, Sivaramakrishnan, Krishnan and Mukhopadhyay, 2003; Smith, 2002; Turner and Simister, 2001; Turner, 2003), and external factors like regulatory challenges, market volatility, and difficulties due to location (Berends, 2007; Merrow, 2011). A contract in project context is *ex-ante* designed to align the owner’s and contractor’s goal (Turner, 2003). However, the inherent complexity, scope and scale, and the long time duration make capital projects susceptible to future uncertainties and turbulence (Drexler and Larson, 2000; Hartmann and Bresnen, 2011; Miller and Lessard, 2000; Sanderson, 2012). As a consequence, any new risks and unforeseen events may arise as the project progresses which in turn cause potential disputes and breakdown of the relationship. To cope with such threats, the parties need to build stronger, more collaborative and more flexible relationships on the basis of consciously designed *ex-post* governance mechanisms (Miller and Lessard, 2000; Sanderson, 2012; Turner, 2003; Winch and Maytorena, 2011).

Prior studies in project-based collaboration, however, also reveal that the presumed governability is often not realized to the extent expected (Bresnen and Marshall, 2002; Alderman and Ivory, 2007; Gill, 2009). Relationships in projects also involve problems associated with competing cultures and rationalities in day-to-day practice among project team members. This in turn necessitates “relational contracting” emphasizing on ongoing adaptations, reciprocity and interdependence, avoidance of detrimental behavior, mutual trust, and communication openness between the parties and the teams (Gil, 2009; McLennan and Scott, 2002; Müller and Turner, 2005; Smyth and Pryke, 2008).

Building on the aforementioned literature, we assume that the function of a contract in capital projects is to serve as legally binding, enforceable, and reciprocal commitment governing the collaboration between owner and contractor (Turner, 2003; Berends, 2014).
How do contract types and incentives matter to project performance?

We focus on the ex-post governing effect (after contract award) of the choice of contract type on the owner-contractor collaboration and the project performance.

We consider two related concepts: relational attitudes and teamworking quality specified by Suprapto et al. (2015a) as the basis for defining owner-contractor collaboration. Suprapto et al. conceptualize and empirically validate relational attitudes and teamworking quality as two higher order constructs that capture the complex nature of owner and contractor collaborative relationship at inter-firm and inter-team levels respectively. The underlying concept of the relational attitudes is that when an owner and a contractor work collaboratively in a project, the relationship between the two firms is characterized by a high degree of reciprocal attitudes such as mutual trust and respect, commitment and leadership, no blame culture, and communication openness between senior management from both sides (Meng, 2011; Pinto et al., 2009; Rahman and Kumaraswamy, 2008; Smyth, Gustafsson and Ganskau, 2010; Suprapto et al., 2015b; Young and Poon, 2013). At the project team level, highly collaborative teams display behaviors related to seven facets of teamworking quality. Team members in teams with high teamworking quality openly communicate relevant information, continuously coordinate their activities, contribute their knowledge and expertise to their full potential, mutually support each other in anticipating unforeseen events, and align their efforts to expected priority (Hoegl and Gemuenden, 2001; Suprapto et al., 2015a). Teams with high teamworking quality also possess cohesiveness (‘we-ness’) (Hoegl and Gemuenden, 2001; Suprapto et al., 2015a) and affective trust among team-members (Pinto et al., 2009; Suprapto et al., 2015a).

6.2.2. Contract types, incentives, and collaborative relationship

Project management scholars distinguish contract types into traditional contracts (like lump-sum and reimbursable contracts), and relational contracts (like partnering or alliance). Under a lump-sum contract, the owner assumes certainty of the project scope in terms of the functionality and performance specifications. The contractor is expected to implement the best solution and method of delivery to meet the specified functionality and performance specifications (Smith, 2002; Turner, 2003). Because all project activities and the associated risks are expected to be managed by the contractor, the owner has less direct need to follow up on project progress assuming the project proceeds according to the defined scope (Berends, 2007; Müller and Turner, 2005). This leads to the decrease in the owner’s involvement in the project leading to limited information exchange and coordination (Merrow, 2011; Müller and Turner, 2005).

A reimbursable contract including the variants like cost plus a fixed or percentage fee, assumes the project definition is more uncertain (Berends, 2006; IPA, 2010; Merrow, 2011; Turner, 20). Under a reimbursable contract, the contractor is paid for his efforts with all risks taken by the owner (Smith, 2002; Turner, 2003; Müller and Turner, 2005). It is often perceived by the owner that the contractor is attracted to over-supply to gain more profit (Müller and Turner, 2005). This encourages the owner to assign a much larger team to
perform extensive control and monitoring over the progress and quality of the contractor’s work (Berends, 2007; Merrow, 2011). The close interaction between owner team and contractor team during the course of the project, however, does not necessarily mean a better collaboration (Müller and Turner, 2005).

A partnering/alliance contract is a particular form of reimbursable contract where the goals of the contractor are aligned to those of the owner through target cost and a gain-sharing (in alliance contract this includes pain-sharing; Ross, 2003) mechanism (Bennet and Peace, 2006; Scott, 2001; Thomas and Thomas, 2005). Partnering/alliance contract is built on relational contracting aiming to facilitate owner-contractor collaboration with a common set of goals, norms of trust and respect, and clear procedures for joint risk management and dispute resolution (Beach, Webster and Campbell, 2005; Larson, 1995; Naoum, 2003; Scott, 2001). With a partnering/alliance contract, the collaboration between owner and contractor can be further enhanced through a joint project governance board and integrated project team to ensure effective teamwork to achieve better project results (Beach et al., 2005; Davis and Walker, 2008; McLennan and Scott, 2002; Ross, 2003).

Linking the characteristics of contract types to the owner-contractor collaborative relationships, we proposed that different contract types may influence the senior management from both owner and contractor to develop and share a different degree of relational attitudes (relational norms and commitment) in order to govern their relationship ex-post during the project execution.

**H1.** *Partnering/alliance contracts for projects are likely to display better relational attitudes toward collaboration than (a) lump-sum or (b) reimbursable contracts.*

Likewise different contract types imply different degree of teamworking (task-related and social interactions) between owner team and contractor team when performing inter-dependent tasks. Controlling for the effect of relational attitudes, we hypothesized:

**H2.** *Partnering/alliance contracts for projects are likely to display better teamworking quality than (a) lump-sum or (b) reimbursable contracts.*

Independent of the remuneration schemes, incentive provisions can be incorporated into any contract. There are four types of incentive schemes: (a) cost incentives, (b) schedule incentives, (c) performance incentives, and (d) safety incentives (Bubshait, 2003; Herten and Peeters, 1986). It is also not uncommon to have multiple-incentives, where two or more of these incentives are combined into the same contract (Lowe, 2007). Within industrial project practitioners, Bubshait (2003) finds a general agreement among respondents on the effectiveness of incentive contracts in encouraging the contractor performance. Based on a case study of three collaborative projects with differing contracting strategies, Berends (2006) also reached the same conclusion that incentive schemes enhanced the alignment of owner and contractor objectives. Similarly, Meng and Gallagher (2012) find that the use of incentive schemes can increase the contractor’s awareness of improvement, which in turn
leads to much greater emphasis on the collaborative working relationship. Building on the aforementioned studies’ findings, we hypothesized:

**H3.** Incentive-based contracts for projects are likely to display better relational attitudes toward collaboration than non-incentive contracts.

**H4.** Incentive-based contracts for projects are likely to display better teamworking quality than non-incentive contracts.

### 6.2.3. Contract types, incentives, and project performance

It is often suggested that a more collaborative contract, i.e.: partnering/alliance contract leads to better construction performance than traditional contracts like lump-sum or reimbursable contract (Bennet and Peace, 2006; ECI, 2003; Thompson and Sanders, 1998). However, upon a sample of 318 industrial megaprojects, Merrow (2011) shows that the success of projects executed with alliance contract was not better than those with lump-sum or reimbursable contract. A survey study by Meng and Gallagher (2012) in the UK construction firms also suggests that the performance (in terms cost, schedule, and quality) of construction projects did not significantly associate with contract types (ranging from fixed price to cost plus fee).

Analyzing the historical development of the UK defense procurement, Parker and Hartley (1997) posit that a partnering/alliance contract does not necessarily lead to superior results compared to traditional contracting. Likewise, a number of case studies suggest that a partnering/alliance contract does not always eliminate the underlying adversarial attitude between owner and contractor (Aarseth et al., 2012; Alderman and Ivory, 2007; Bresnen and Marshall, 2002; Chan et al., 2012; Ng, Rose, Mak and Chen, 2002). In line with this view, Lowe (2007) posits that the performance of a project depends upon the relationships between the parties and not by and large on the contract. Some scholars argue that different contract types have a different consequence on the degree of owner and contractor collaboration which ultimately might influence project performance (Berends, 2007; Meng, 2011; Müller and Turner, 2005). Müller and Turner (2005), for example, postulate that lump-sum and reimbursable contracts, compared to partnering/alliance contract, tend to create a situation in which the owner and the contractor do not consider the need to align their interests. As a result the owner-contractor collaboration becomes limited and eventually leads to lower project performance. Recent study by Suprapto et al., (2015a) has empirically substantiated the positive effect of the owner-contractor collaboration, in terms of relational attitudes and teamworking quality, on project performance. Hence, it is arguable that the performance of the projects executed with partnering/alliance contract is likely to be better than those with lump-sum or reimbursable contract as the parties are able to work together more collaboratively. We hypothesized:
**H5.** Partnering/alliance contracts for projects, through the more positive relational attitudes and teamworking quality, are likely to perform better than (a) lump-sum or (b) reimbursable contracts.

Contrary to a common belief that incentive schemes might have positive effect (Berends, 2006; Bubshait, 2003; Herten and Peeters, 1986), Merrow (2011) finds that contractual incentives do not have any effects on project success. The success rate of projects with incentives, although not statistically significant, was lower than those without incentives. The assumption that there is a great deal of financial gain (incentives) to be saved through efficient execution is a flawed idea. Merrow argues that execution is about to achieve the targeted value (cost and schedule) that has been created and not to create new value. But it would be a mistake to believe that incentives must always have a negative effect on performance or make that the contractor cannot be motivated by both additional financial rewards and interest in the work itself. It might be that the use of incentive schemes does not directly affect project performance, but at a minimum, they can work under certain circumstances. Explicit incentive schemes are designed to align the financial interests of the contractor with those of the project goals (Berends, 2006; Bubshait, 2003; Meng and Gallagher, 2012). Because achieving the project goals better is also improving their commercial success (better profit), the contractor is more motivated to focus their effort in managing and controlling factors that influence the team productivity which is critical for achieving project duration and/or project cost (Bubshait, 2003). In the end, the effect of contractual incentive on project performance can be explained by this indirect mechanism: the aligned interests of owner and contractor ensure the attention on effective teamworking, which in turn, enhances the project performance (Meng and Gallagher, 2012). We therefore hypothesized:

**H6.** Incentive-based contracts for projects, through the more positive relational attitudes and teamworking quality, are likely to perform better than non-incentive contracts.

An integrative conceptual model shown in Figure 6-1 brings all the above hypotheses together. The conceptual model applies a mediation structure with contract types and contractual incentives as independent variables, relational attitudes and teamworking quality as serial mediators and project performance as dependent variable. We cannot justify theoretically the hypotheses regarding the direct effects of contract types and contractual incentives on project performance but we explore these direct effects in the analyses.
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6.3. Research methodology

6.3.1. Data collection

The study population consisted of practitioners who have been involved in the execution of capital projects within the Dutch Process Industry Competence Network (NAP-Netwerk). This network brings together more than 120 organizations from the entire value chain in the Dutch process industry, including asset owners, engineering and construction firms, suppliers, consulting firms, and universities/research institutions. We invited around 450 practitioners to participate in an online questionnaire during a period from October to December 2013. The response rate was 26.4% with 119 completed responses. Due to strict anonymity reason, we were unable to exercise follow-up calls to assess non-responders. As the proxy to assess potential non-response bias, we follow two methods of Lindner, Murphy and Briers (2001): (1) the comparison of early to late respondents (t-test) and (2) using ‘days to respond’ as the predator to regression equations of the main constructs. The results indicate that neither the mean difference of the constructs between early and late respondents nor the ‘days to respond’ are significantly different.

After cleansing the responses with more than 15% missing values, we have 113 responses. Among this dataset, there are 1.45% missing values of the total number of values. Little’s MCAR test (Little and Rubin, 2002) suggests that the missing values were missing completely at random ($X^2 = 4066.93; df = 3963; p = 0.122$). This suggests no hidden systematic pattern of missing values and thus any imputation method could be used (Hair., Black, Babin and
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We then applied the regression imputation method to replace the missing values in the dataset.

The sample varied widely in type of industry, type and size of projects, and type of respondents. The majority of the respondents were project directors (19.5%), project managers (46%), and team leaders/managers (24.8%) and the rest were functional managers and project board members (9.7%). With regard to the company’s role, 41.6% of the respondents represented owner companies, and 58.4% represented contractors. In terms of industry, the majority of the projects were in oil, gas, and petrochemicals (60.4%); the rest were in civil construction (8%), infrastructure, power, and utilities (10.6%), food and consumer products (7.1%), electronics, ICT, and semiconductors (3.5%), pharmaceuticals (2.7%), and manufacturing (2.7%). In terms of total project costs, 10.6% were up to €1 million, 30.1% were €1–10 million, 25.7% were €10–100 million, 24.8% were €100–1000 million, and 8.8% were more than €1 billion. Finally, in terms of contract types, 54.0% were lump-sum, 33.6% were reimbursable, and 12.4% were partnering/alliance.

6.3.2. Method

We applied partial least square structural equation modeling (PLS-SEM) to test our research model. We choose PLS-SEM in this study due to the following reasons. First, PLS-SEM is suggested over covariance-based SEM (CB-SEM) when analyzing research models that are in exploratory stage or an extension of existing structural theory (Hair, Ringle and Sarstedt, 2013b; Reinartz, Haenlein and Henseler, 2009). Because the underlying theory of our research model is still ‘less developed’, PLS-SEM is the appropriate approach. Secondly, PLS-SEM exhibits higher statistical power than CB-SEM when used in complex models with smaller sample size (Hair, Sarstedt, Pieper and Ringle, 2012; Hair, Hult, Ringle and Sarstedt, 2013a; Reinartz et al., 2009). Hair et al. (2012; 2013a) recommend a minimum sample size of 10 times the maximum number of paths aiming to endogenous constructs. This study’s sample size, 113 observations was relatively small but still above the minimum 100 samples (10 times 10 paths directed at the construct project performance). Post-hoc statistical power analysis also indicated that our sample size was above the commonly accepted threshold of 0.8 (Hair et al., 2013a). Prior investigations had also shown that the PLS-SEM algorithm remains robust for non-normal or skewed data and formative measures (Rigdon, Ringle and Sarstedt, 2010; Ringle, Götz, Wetzel and Wilson, 2009).

6.3.3. Statistical model

Because our hypotheses entail the comparison of three different contract types (lump-sum, reimbursable, and partnering/alliance contracts), there is no single path coefficient that represents contract type’s effect on the mediators or project performance. We followed Hayes and Preacher’s (2014) guideline on statistical mediation analysis with multi-categorical independent variable. The contract types can be transformed into \(k - 1\) dummy variables or 2 (\(k = 3\) is the number of contract types) dummy variables \(D_1\) and \(D_2\). \(D_1\) codes the lump-sum
contract, \(D_2\) codes the reimbursable contract, and the partnering/alliance contract serves as the reference group and receives a code of 0 on both \(D_1\) and \(D_2\). (see Figure 6-1). The double-headed arrow connecting \(D_1\) and \(D_2\) in Figure 6-1 indicates that the two variables should always be simultaneously included in the analysis. Using these codes for contract types, the mediation model can be parameterized with three equations:

\[
M_1 = i_{11} + a_{11}D_1 + a_{21}D_2 + a_{31}X_2 + e_{M_1} \tag{1}
\]

\[
M_2 = i_{12} + a_{12}D_1 + a_{22}D_2 + a_{32}X_2 + d_{21}M_1 + e_{M_2} \tag{2}
\]

\[
Y = i_2 + c'_1D_1 + c'_2D_2 + c'_3X_2 + b_1M_1 + b_2M_2 + e_Y \tag{3}
\]

for relational attitudes (\(M_1\)), teamworking quality (\(M_2\)), and project performance (\(Y\)) respectively where \(X_2\) is contractual incentive; \(i_{11}\), \(i_{12}\), and \(i_2\) are constants; \(e_{M_1}\), \(e_{M_2}\), and \(e_Y\) are error terms.

Estimation of Eq. (1) yields three coefficients quantifying differences between the contract types and incentive on relational attitudes (\(a_{11}, a_{21}\), and \(a_{31}\) or \(H_{1a}, H_{1b}\), and \(H_3\) respectively). Eq. (2) estimates three coefficients quantifying differences between the contract types and incentive on teamworking quality (\(a_{12}, a_{22}\), and \(a_{32}\) or \(H_{2a}, H_{2b}\), and \(H_4\) respectively) and one coefficient quantifying the effect of relational attitudes on teamworking quality (\(d_{21}\)). Eq. (3) estimates three coefficients quantifying the mean group differences in project performance due to contract types (\(c'_1\) and \(c'_2\)) and contractual incentive (\(c'_3\)) holding both relational attitudes and teamworking quality constant. These three coefficients, also called relative direct effects, correspond to \(H_{5a}, H_{5b}\), and \(H_6\), i.e.: the relative direct effects of reimbursable (\(c'_1\)) and partnering/alliance contract (\(c'_2\)) on project performance over lump-sum contract, and the relative direct effect of incentive-based contract on project performance over non-incentive contract (\(c'_3\)).

Eq. (3) also estimates two coefficients quantifying the effects of relational attitudes and teamworking quality on project performance (\(b_1\) and \(b_2\)) while statistically equating the groups on average on contract type. Taking into account all coefficients estimated from Eqs. (1), (2), and (3); we can estimate the relative indirect effects of contract types and incentive on project performance through relational attitudes and teamworking quality. \(H_{5a}\) corresponds to the relative indirect effect of a partnering/alliance contract on project performance over lump-sum contract through relational attitudes and teamworking quality and is captured by three specific indirect effects: \(a_{11}b_1\) (\(D_1\to M_1\to Y\)), \(a_{12}d_{21}b_2\) (\(D_1\to M_1\to M_2\to Y\)), and \(a_{23}b_2\) (\(D_2\to M_2\to Y\)). \(H_{5b}\) or the relative indirect effect of partnering/alliance contract on project performance over reimbursable contract is captured in \(a_{21}b_1\) (\(D_2\to M_1\to Y\)), \(a_{22}d_{21}b_2\) (\(D_2\to M_1\to M_2\to Y\)), and \(a_{23}b_2\) (\(D_2\to M_2\to Y\)). In a similar manner, the relative indirect effect of contractual incentive on project performance through relational attitudes and teamworking quality (\(H_6\)) is captured by \(a_{31}b_1\) (\(X_2\to M_1\to Y\)), \(a_{32}d_{21}b_2\) (\(X_2\to M_1\to M_2\to Y\)), and \(a_{33}b_2\) (\(X_2\to M_2\to Y\)).
For each independent variable \((D_1, D_2, \text{ or } X_2)\), summing up its relative direct effect and three specific indirect effects is equal to its *relative total effect* \((c_i)\) on project performance. For example, the relative total effect of partnering/alliance over lump-sum contract on project performance is \(c_i = c'_1 + a_{13}b_1 + a_{12}d_{21}b_2 + a_{12}b_2\).

### 6.3.4. Measures

Most of the key constructs were measured through *multi-item scales*. We relied on existing measurement scales that have been validated in prior research. All items were designed with responses on a five-point scale ranging from 1 (representing a zero of the trait; e.g., *not satisfied at all*) to 5 (representing a perfectly positive assessment of the trait; e.g., *completely satisfied*). All measurement items are listed in full in Appendix 6-1.

We followed Merrow’s (2011) basic forms of contract and used three categories of contracts: lump-sum, reimbursable, and partnering/alliance. Lump-sum contract includes the variants like *convertible* lump-sum and *provisional* lump-sum. Reimbursable contract also includes *unit rate* or *schedule rate* and any *cost plus contracts*. Partnering/alliance contract includes both *partnering* and *alliancing contracts*. Contractual incentive was operationalized as a categorical variable and reflects whether or not the contract includes any explicit incentive schemes.

Relational attitudes were operationalized as a higher-order construct consisting of 2 first-order reflective constructs: *senior management commitment* and *relational norms*. The measures for these constructs have been developed by Suprapto et al. (2015a) with 3 items for senior management commitment (i.e.: commitment to provide resources and support, leadership, active involvement in resolving conflict) and 5 items for relational norms (i.e.: aligned interests and objectives, mutual trust, no blame culture, and openness).

Teamworking quality was operationalized as a higher-order construct consisting of 7 first-order reflective constructs: *communication, coordination, cohesion, balanced contribution, aligned effort, mutual support*, and *affective trust*. The first 6 constructs used reflective scales adapted by Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl and Parboteeah, 2007; Hoegl et al., 2004). The affective trust construct used reflective scales adapted from Lau and Rowlinson (2011), Pinto et al. (2009), and Silva, Bradley and Sousa (2012). In total, there were 27 items to measure teamworking quality: communication (4 items), coordination (4 items), cohesion (4 items), balanced contribution (3 items), aligned effort (3 items), mutual support (3 items), and affective trust (6 items).

Project performance was operationalized as a formative construct of 4 items. The first measurement item was an index of performance reflecting project efficiency and effectiveness indicators, i.e.: *cost, schedule, quality, safety*, and *operability* performance. This index was calculated as an average value of the five indicators weighted by their relative importance in the eye of respondents. The other three distinct items were *perceived*
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satisfaction on the overall results, perceived business success to owner, and perceived commercial success to contractor (Pinto et al., 2009; Hoegl and Gemuenden, 2001).

Finally, we included five control variables: perceived front-end definition, project size, firm size, prior relationship duration, and early contractor involvement to control for potential confounders. The first three control variables are also considered as the proxy to characterize the complexity factors (Bosch-Rekveldt et al., 2011). The perceived front-end definition includes four reflective items adapted from Merrow’s (2011) front-end loading criteria: the perceived clarity of the project goals, clarity of the project scope, quality of the basic design and quality of the execution plan. The project size was measured with two reflective items, the project duration and total installed cost. The firm size was measured with two reflective items, the firm’s number of employees and annual turnover. Prior relationship duration refers to number of years in which the owner and the contractor had been working in the previous projects. Finally, the contractor’s early involvement variable reflects whether the contractor was already involved during the front-end development stage of the project.

6.4. Results

We used SmartPLS 2.0 (Ringle, Wende and Will, 2005) to estimate the measurement models and the structural models. In assessing the measurement and structural models, we followed the procedures suggested by Chin (2010) and Hair et al. (2012, 2013a, 2013b).

6.4.1. Measurement models

As indicated in section 6.3.4, our measurement models consist of two types of latent constructs, i.e.: 11 reflective constructs and 1 formative construct. Each type of construct requires different evaluation criteria. Hair et al (2013a; 2013b) recommend that all reflective constructs should be evaluated against (a) indicator reliability (indicator loadings ≥ 0.70), (b) internal consistency reliability (Cronbach’s alpha and composite reliability ≥ 0.70), (c) convergent validity (AVE – average variance extracted ≥ 0.50), and (d) discriminant validity (Fornell-Larcker criterion). For formative constructs, Hair et al. recommend to assess (a) the statistical significance or the relevance of the indicators (significant relative weight or indicator loadings ≥ 0.50), and (b) multicollinearity among indicators to identify/remove potential redundancy (variance inflation factors among indicators - VIFs < 5.0).

The assessment of the measurement models indicates that all 11 reflective constructs are completely satisfactory. First, all 41 reflective indicators reach sufficient levels of indicator reliability as all indicators’ loadings on their corresponding constructs are above 0.707 (Appendix 6-1). Second, all reflective constructs also satisfy internal consistency reliability as all constructs’ Cronbach’s alpha and composite reliability are equal and above 0.708 and 0.868 respectively (Appendix 6-1). Third, all reflective constructs achieve convergent validity as the AVE values surpass the 0.5 level (Appendix 6-1). Finally, the Fornell-Larcker criterion
analysis shows that all reflective constructs attain discriminant validity as the square roots of AVE of all reflective constructs (the diagonal elements) are larger than their inter-correlations (the off-diagonal elements) (see Appendix 6-2).

The assessment of the formative construct, project performance, indicates that 2 indicators do not have significant relative weights, however, all loadings are above 0.5 (see Appendix 6-1). Through multiple regressions, we obtained the average VIF values of the four formative indicators ranging from 1.424 to 2.503. VIF values are below the threshold value of 5 thus multicollinearity is not an issue. Overall, all 4 indicators attain the formative criteria.

6.4.1.1. Common method variance

Because the data originated from single respondents answering an online questionnaire, common method variance (CMV) might influence some hypothesized relations in the PLS path model. To test for the potential existence of common method variance, Harman’s (1976) single-factor test was conducted. The first factor accounts for only 35.4% of the overall variance, which indicates that common method variance unlikely affects the results (Podsakoff and Organ, 1986). Because this traditional test suffers some limitations, the marker variable approach (Podsakoff, MacKenzie, Lee and Podsakoff, 2003; Richardson, Simmering and Sturman, 2009; Williams, Hartman and Cavazotte, 2010) was also applied. More specifically, we applied Rönkkö and Ylitalo’s (2011) PLS marker approach. Using a marker variable with six indicators, we estimated the method variance correlation by calculating a mean of the correlations between the marker indicators and the study indicators. The mean correlation is 0.03 which is smaller than the suggested threshold of 0.05 and indicates that the common method variance has a negligible effect (Rönkkö and Ylitalo, 2011). To ensure this, we ran the baseline model both without the marker variable and with the marker variable (with paths to all endogenous constructs). A comparison of the results shows trivial differences (ranging from 0.002 to 0.021) on all path coefficients and no changes in their level of statistical significance. We therefore continued the PLS analysis without the marker variable.

6.4.1.2. Potential endogeneity bias

Like most empirical studies on inter-firm alliances in strategic management literature (Hamilton and Nickerson, 2003), our research model is analogous to the performance effect of the strategic choice model with discrete strategies (contract types) and continuous performance outcomes (the degree collaboration and project performance). The contract choice was decided by managers based on known ex-ante factors such as the perceived uncertainty, complexity, and therefore risks of the project (Berends, 2007; Lowe, 2007; Merrow, 2011; Smith, 2002), trust and norms that arise from expectation of continuity (Poppo et al., 2008) and prior relationship (Gulati, 1995; Lui and Ngo, 2004), and the parent firm’s capability (Hamilton and Nickerson, 2003). To control for these known ex-ante factors, we included in the PLS-SEM structural model five control variables: the perceived front-end
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definition, project size, firm size, prior relationship duration, and early contractor involvement. Still, senior managers’ decision on contract type is also affected by their expectation of the outcomes due to some other factors unobserved that may actually drive the outcomes. In economics and strategic management literature this is also called ‘self-selection bias’ (Antonakis, Bendahan, Jacquart and Lalive, 2010; Hamilton and Nickerson, 2003).

To check whether this endogeneity biases the accuracy of the structural model, we performed the Heckman’s (1976, 1979) two-step procedure to control for endogeneity bias (similar to the approach performed by Gopal et al., 2003). Specifically, in the first stage we applied Heckman’s probit model for predicting the binary variable contractual incentives, and Lee’s (1983) multinomial logit model for multi-categorical variable contract type. In both models we included the aforementioned control variables and five additional instrumental variables as predictors. The instrumental variables are the perceived technological risk, regulatory challenges, market volatility, location remoteness, and pressure from external stakeholder that might affect contract choice but do not directly impact the endogenous constructs (relational attitudes, teamworking quality, and project performance). We then calculated the Inverse Mills Ratio for contractual incentives (IMRIC) and contract type (IMRCT) as endogeneity bias correction variables. In the second stage, we included IMRIC and IMRCT into the structural models for predicting the endogenous constructs and applied bootstrapping to obtain the corrected standard error and coefficient estimates. The results suggest that the coefficients of the IMRIC and IMRCT for all three endogenous regression models are not significantly different from zero. Hence the potential endogeneity bias is not a concern. We continue the analyses of the PLS structural model without correcting for endogeneity bias.

6.4.2. Structural model

We performed a two-steps analysis to provide a detailed picture of all hypotheses testing. In the first step, we focused on the PLS-SEM structural model that estimates the direct path coefficients between all constructs (hypotheses 1 to 4; see Figure 6-2 and Table 6-1). Subsequently, in step 2, we performed statistical mediation analysis (Hayes, 2013; Hayes and Preacher, 2014) to assess the indirect effects of contract types and incentives on project performance mediated by relational attitudes and teamworking quality (hypotheses 5 and 6; see Table 6-2). We also included five control variables: front-end definition, project size, firm size, prior relationship duration, and early contractor involvement. The significance of all path coefficients were assessed through bootstrapping with 113 cases, 10,000 subsamples and no sign changes option (Hair et al., 2013a, 2013b).
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Figure 6-2. Structural model diagram. Note: PAL = Partnering/alliance contract; RE = Reimbursable contract; LS = Lump-sum contract; all path coefficients are unstandardized; *sig. at p < .05; **sig. at p < .01; ***sig. at p < 0.001; ns = not significant, based on bootstrapping of 10,000 subsamples; control variables are not shown in the diagram.

The main criteria to assess the structural model in the PLS-SEM are the coefficient of determination $R^2$ and the predictive relevance $Q^2$ (Henseler and Sarstedt, 2012). As shown in Figure 6-2, the structural model accounts for 33.0% of the variance in relational attitudes, 64.1% of the variance in teamworking quality, and 52.4% of the variance in project performance. These $R^2$ values substantiate the model’s predictive validity (Hair et al., 2013a, 2013b). The blindfolding procedure (Henseler, Ringle and Sinkovics, 2009) results in the $Q^2$ values of 0.540, 0.458, and 0.277 for relational attitudes, teamworking quality, and project performance respectively. Since all $Q^2$ values for endogenous constructs are positive, the structural model attains sufficient predictive relevance. The mediators, relational attitudes and teamworking quality contribute to $f^2$ effect size = 0.26, a medium to large effect size according Hair’s et al. (2013a, 2013b) guideline. It is supported that the structural model has a significant level of predictive validity on project performance.
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### Table 6-1. Unstandardized paths coefficients

<table>
<thead>
<tr>
<th>Relation</th>
<th>From</th>
<th>Relational attitudes (M₁)</th>
<th>Teamworking quality (M₂)</th>
<th>Project performance (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>coeff.</td>
<td>SE</td>
<td>p</td>
</tr>
<tr>
<td>Constant</td>
<td>i₁₁</td>
<td>1.873 ***</td>
<td>0.343</td>
<td>0.000</td>
</tr>
<tr>
<td>PAL vs. LS (D₁)</td>
<td>a₁₁</td>
<td>0.315 *</td>
<td>0.148</td>
<td>0.036</td>
</tr>
<tr>
<td>PAL vs. RE (D₂)</td>
<td>a₂₁</td>
<td>0.341 *</td>
<td>0.161</td>
<td>0.037</td>
</tr>
<tr>
<td>RE vs. LS (D₁-D₂)</td>
<td>a₁₂-a₂₁</td>
<td>-0.026 ns</td>
<td>0.118</td>
<td>0.827</td>
</tr>
<tr>
<td>Contractual Incentives (X₂)</td>
<td>a₃</td>
<td>0.225 *</td>
<td>0.111</td>
<td>0.045</td>
</tr>
<tr>
<td>Control variables:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relational attitudes (M₁)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teamworking quality (M₂)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm size</td>
<td>f₃</td>
<td>0.026 ns</td>
<td>0.039</td>
<td>0.505</td>
</tr>
<tr>
<td>Prior relationship</td>
<td>f₄</td>
<td>0.004 ns</td>
<td>0.005</td>
<td>0.391</td>
</tr>
<tr>
<td>Early contractor involvement</td>
<td>f₅</td>
<td>-0.030 ns</td>
<td>0.106</td>
<td>0.781</td>
</tr>
</tbody>
</table>

Predictive relevance
- $R^2 = 0.331$; $R^2_{adj} = 0.280$
- $R^2 = 0.641$; $R^2_{adj} = 0.610$
- $R^2 = 0.524$; $R^2_{adj} = 0.477$

Omnibus test
- $F(8,104) = 9.650, p < .001$
- $F(9,103) = 28.108, p < .001$
- $F(10,102) = 12.813, p < .001$

Note: PAL = Partnering/alliance contract; RE = Reimbursable contract; LS = Lump-sum contract; *significant at p < 0.05, **p < 0.01, ***p < 0.001 based on bootstrapping of 10,000 subsamples; ns = not significant.

*estimated separately by changing the reference category to RE.
6.4.2.1. The relative direct effects of contract types and incentives on relational attitudes and teamworking quality

The results in Figure 6-2 and Table 6-1 show that the projects with partnering/alliance contract are associated with better relational attitudes than those with lump-sum ($a_{11} = 0.315, p < 0.05$) and reimbursable contracts ($a_{21} = 0.341, p < 0.05$). However, the projects with lump-sum contract do not have better relational attitudes than those with reimbursable contract ($a_{21} - a_{11} = -0.026, p = 0.827$). Adjusting for the differences in relational attitudes, the projects with partnering/alliance contract do not differ in teamworking quality from those with lump-sum ($a_{12} = 0.125, p = 0.193$) and reimbursable contract ($a_{22} = -0.019, p = 0.856$). The results suggest that only hypothesis 1a and 1b are supported. Hypotheses 2a and 2b are not supported.

The effects of contractual incentives on relational attitudes and teamworking quality seem to follow a similar pattern. The projects with contractual incentives are significantly associated with better relational attitudes compared to those without incentive ($a_{31} = 0.225, p < 0.05$) but not different in terms of teamworking quality ($a_{32} = -0.014, p = 0.856$). Hypothesis 3 is supported and hypothesis 4 is not supported.

6.4.2.2. The relative direct effects of contract types and incentives on project performance

Although not explicitly hypothesized, we analyzed how different contract types and contractual incentives might have different direct effects on project performance controlling for relational attitudes and teamworking quality. The direct paths from two contract types and contractual incentive to project performance in Figure 6-2 and Table 6-1 suggest that the performance of projects with partnering/alliance contract is not significantly different from those with lump-sum ($c'_1 = 0.062, p = 0.666$) or reimbursable contract ($c'_2 = 0.059, p = 0.708$). Similarly, the performance of projects with lump-sum contract is not different from those with reimbursable contract ($c'_2 - c'_1 = 0.004, p = 0.973$). Also with regard to contractual incentive, the projects with incentive-based contract do not perform better than those without incentive ($c'_3 = -0.176, p = 0.109$).

6.4.2.3. The effects of relational attitudes and teamworking quality on project performance

Figure 6-2 and Table 6-1 show that after controlling for contract types and contractual incentives, relational attitudes significantly increase teamworking quality ($d_{21} = 0.574, p < 0.001$). Teamworking quality, in turn, significantly increases project performance ($b_2 = 0.460, p < 0.01$). Independent of the effects on teamworking quality, however, relational attitudes do not affect project performance ($b_1 = 0.103, p = 0.408$).

Because our model involves a mediation mechanism with two mediators, the structural model should meet the no-interaction assumption or homogeneity of regression (Hayes and Preacher, 2014), i.e.: the effects of the mediators (relational attitudes and teamworking quality) on the dependent variable (project performance) should be invariant across the
values of independent variables (contract types and contractual incentives). If the assumption is violated, any indirect effect does not accurately characterize the effects of relational attitudes and teamworking quality on project performance because these effects \((b_1\text{ and } b_2)\) are dependent on contract types or contractual incentive. To test this assumption we included six interaction terms between independent variables and mediators into the regression model to estimate project performance (Equation 3). The difference in \(R^2\) between two estimations of project performance with and without six interaction terms \((R^2 = 0.536 \text{ and } R^2 = 0.524 \text{ respectively})\) is \(\Delta R^2 = 0.012\) and non-significant \((F(6,96) = 0.421, p = 0.863)\). Thus, the homogeneity of regression assumption is maintained and any interaction effects can be ruled out. This also implies that the effects of teamworking quality and relational attitudes (through teamworking quality) on project performance are independent of contract type and contractual incentive.

6.4.2.4. The relative indirect effects of contract types and incentives on project performance mediated by relational attitudes and teamworking quality

Hypotheses 5 and 6 assume that different contract types or contractual incentives might have different relative indirect effects on project performance through their effects on relational attitudes and teamworking quality. Using PROCESS tool (Hayes, 2013; Hayes and Preacher, 2014), we estimated these relative indirect effects with 10,000 bootstrap subsamples as shown in Table 6-2. There are three specific pathways where contract types and contractual incentives may indirectly affect project performance: via \(M_1 \rightarrow Y\) (relational attitudes then project performance), via \(M_1 \rightarrow M_2 \rightarrow Y\) (relational attitudes then teamworking quality and finally to project performance), and via \(M_2 \rightarrow Y\) (teamworking quality then project performance).

The results in Table 6-2 indicate that the projects with partnering/alliance contract significantly perform better than those with lump-sum contract through the pathway \(D_1 \rightarrow M_2 \rightarrow Y\) or through better relational attitudes which in turn lead to better teamworking quality \((a_{11}d_{21}b_2 = 0.084, CI = 0.019 \text{ to } 0.222)\). Likewise, the projects with partnering/alliance contract significantly perform better than those with reimbursable contract due to the pathway \(D_2 \rightarrow M_1 \rightarrow M_2 \rightarrow Y\) or through better relational attitudes which in turn lead to better teamworking quality \((a_{21}d_{21}b_2 = 0.091, CI = 0.017 \text{ to } 0.239)\). With regard to the difference between reimbursable and lump-sum contracts, only the specific pathway through teamworking quality, \((D_2 \cdot D_2) \rightarrow M_2 \rightarrow Y\) is significant \(((a_{12}a_{22})b_2 = 0.067, CI = 0.003 \text{ to } 0.190)\).

Finally, the projects with incentive-based contracts significantly perform better than those without incentive \((a_{31}d_{21}b_2 = 0.060, CI = 0.010 \text{ to } 0.155)\) as the results of better relational attitudes which in turn lead to better teamworking quality \((X_2 \rightarrow M_1 \rightarrow M_2 \rightarrow Y)\). To sum up, hypotheses 5a, 5b, and 6 are empirically substantiated.
Table 6-2. Relative total, direct, and indirect effects of contract types and contractual incentive

<table>
<thead>
<tr>
<th></th>
<th>Relative total effect</th>
<th>Relative direct effect</th>
<th>Relative indirect effect</th>
<th>95% BCB-CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coeff.</td>
<td>SE</td>
<td>p</td>
<td>coeff.</td>
</tr>
<tr>
<td>PAL vs. LS (D₁)</td>
<td>c₁</td>
<td>0.215 ns</td>
<td>0.150</td>
<td>0.155</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total indirect effect: c₁-c'₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind1 (D₁→M₁→Y): a₁₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind2 (D₁→M₂→M₃→Y): a₁₂d₂₁b₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind3 (D₁→M₃→Y): a₁₃b₂</td>
</tr>
<tr>
<td>PAL vs. RE (D₂)</td>
<td>c₂</td>
<td>0.152 ns</td>
<td>0.159</td>
<td>0.343</td>
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<td></td>
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<td></td>
<td></td>
<td>Total indirect effect: c₂-c'₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind1 (D₂→M₁→Y): a₂₁</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind2 (D₂→M₁→M₂→Y): a₂₁d₂₁b₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind3 (D₂→M₂→Y): a₂₂b₂</td>
</tr>
<tr>
<td>RE vs. LS (D₁-D₂)</td>
<td>c₁-c₂</td>
<td>0.063 ns</td>
<td>0.129</td>
<td>0.625</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total indirect effect: (c₁-c'₁)-(c₂-c'₂)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind1 (D₂-D₁→M₁→Y): (a₁₁-a₂₁)b₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind2 (D₂→M₁→M₂→M₃→Y): (a₁₁-a₂₁)d₂₁b₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind3 (D₂→M₂→Y): (a₁₂-a₂₂)b₂</td>
</tr>
<tr>
<td>Contractual incentives (X₃)</td>
<td>c₂</td>
<td>0.115 ns</td>
<td>0.121</td>
<td>0.341</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total indirect effect: c₂-c'₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind1 (X₁→M₁→Y): a₁₁b₁</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Ind2 (X₁→M₁→M₂→Y): a₁₂d₂₁b₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ind3 (X₁→M₂→Y): a₁₃b₂</td>
</tr>
</tbody>
</table>

Note: PAL = Partnering/alliance contract; RE = Reimbursable contract; LS = Lump-sum contract; M₁ = relational attitudes; M₂ = teamworking quality; Y = project performance; *significant at p < 0.05, ** p<0.01, *** p < 0.001 based on bootstrapping of 10,000 subsamples; ns = not significant, sig. = significant based on 95% bias-corrected bootstrap confidence interval (95% BCB-CI).

* estimated separately by changing the reference category to RE.
6.5. Discussion

6.5.1. Contribution and theoretical implications

In this study we hypothesized that different contract types and contractual incentives can have different effects on project performance directly or indirectly through owner-contractor relationship quality (i.e.: relational attitudes and teamworking quality). Such a conceptual model was not considered in prior research. By analyzing the direct and indirect effects of contract types and contractual incentives on project performance, our study provides some important insights into the current literature on project contracting and collaboration.

The first important finding clarifies the effect of partnering/alliance contract compared to lump-sum and reimbursable contracts. The partnering/alliance contract, on average, is indirectly associated with better project performance compared to lump-sum or reimbursable contract through better relational attitudes and teamworking quality. This corroborates the findings of partnering and alliance studies reporting that the performance of partnering or alliance projects are strongly determined by commitment, trust, no blame culture, and openness shared by senior management representing owner and contractor; and effective teamworking (Chan et al., 2004; Chan et al., 2012; Green, 2003; Laan, Voordijk and Dewulf, 2011; Walker and Lloyd-Walker, 2015). Apart from its indirect effects through relational attitudes and teamworking quality, the direct effect of partnering/alliance contract on project performance does not differ from lump-sum and reimbursable contracts. Considering both the indirect and direct effects as the total effect (see Table 6-2), partnering/alliance projects, although not statistically significant, are likely to perform better than those with lump-sum or reimbursable contract. This finding partly contradicts Merrow’s (2011) conclusion that partnering/alliance projects tend to perform worse than those with lump-sum and reimbursable contracts. Unlike Merrow (2011), this study analyzes both indirect and direct effects of different contract types rather than on the total effect only.

The second important finding is regarding the influence of contractual incentives. There are two perspectives that appeared to be inconsistent regarding the effects of incentive-based contracts on project performance. The first perspective represented by Berends (2006; 2007) and Meng and Gallagher (2012), suggests that the use of an explicit incentive structure facilitates trust and open communication (better relational attitudes) between owner and contractor which in turn enhances the teams’ performance in executing the project management processes (better teamworking quality) and finally leads to better project performance. The second perspective reflects Merrow’s (2011) finding that the success rate of projects with incentives is actually lower than those without incentives, although not statistically significant. He concludes that the effect of incentives on project success simply occurred by chance. Our finding clarifies the above seemingly contradictory views. Firstly, incentive-based contracts are indirectly associated with better project performance relative to those without incentive through its positive effect on relational attitudes which in turn
lead to enhanced teamworking quality. This indirect mechanism supports the first perspective (Berends, 2007; Meng and Gallagher, 2012). Apart from this indirect mechanism, we also found that incentive-based contracts, although not statistically significant, have negative direct effect on project performance. When we consider both the indirect and the direct effects of contractual incentives, they are canceling each other leading to non-significant total effect on project performance (see Table 6-2). This supports the first perspective (Merrow, 2011) that contractual incentives have no effect on project performance. In summary, both perspectives are actually not contradictory.

The third important finding relates to a common belief that the relationships in projects with lump-sum contract tend to be more adversarial than those with reimbursable contract (e.g.: Smith, 2002). Although not explicitly hypothesized, we also compared the relative effect between the two contract types. The results do not provide empirical support for this notion. We found virtually no difference in the degree of relational attitudes and teamworking quality between reimbursable and lump-sum projects. This finding concurs Parker and Hartley’s (1997) view that traditional contracting does not always result in adversarial attitudes. On the other hand, we found that through better teamworking quality, projects with reimbursable contract perform better than those with lump-sum contract. This is not a surprise since a reimbursable contract entails the larger owner’s team to steer, coordinate, and support the contractor’s team toward the achievement of the project objectives (Berends, 2007; Merrow, 2011).

Last but not least, after controlling for contract types and incentives, we found that relational attitudes significantly lead to enhanced teamworking quality which in turn improves project performance. This implies that apart from the effects of contract types and incentive, the quality of owner-contractor collaboration positively contributes to project performance. This finding also illuminates the notion “no contracting approach guarantees success; most contracting approaches can succeed” (Merrow, 2011, p.253). What matters more is the ability of both parties to develop relational attitudes and translate this into real teamworking (Suprapto et al., 2015a).

6.5.2. Managerial implications

This study provides some important implications for senior management, business or contract managers, and project managers of firms who are seeking and developing appropriate contracting strategies for capital project execution.

The first implication is related to the effects of different contract types on project performance. Relative to lump-sum or reimbursable contract, partnering/alliance contract is positively associated with higher degree of relational attitudes and teamworking quality which in turn translates into better project performance. If there is freedom to select a contract type for a project, we advise senior management and/or project managers to use a partnering/alliance contract because it enhances relational attitudes leading to more
How do contract types and incentives matter to project performance?

Effective teamworking and eventually better project performance. However, managers should be aware that such a contract does not directly increase project performance on its own but indirectly through its effect on relational attitudes and then teamworking quality. Partnering/alliance and contractual incentives do have a positive influence on the project but they also come at a cost. Managers from both sides need to ensure ongoing support from senior management and translate their shared norms into effective teamworking throughout the project life cycle (see also Chan et al., 2012; Laan et al., 2011; Walker and Lloyd-Walker, 2015). Failure to do so, the project performance might not change as with other contract types.

The second implication is related to the influence of relational attitudes and teamworking quality on project performance. We found that after controlling for contract types and incentives, the quality of owner-contractor relationship (relational attitudes at inter-organizational and teamworking at team levels) significantly influences project performance. Although the results suggest that partnering/alliance contract is relatively better, in many cultures, a lump-sum contract remains the most chosen contract type followed by reimbursable contract (this study and Merrow, 2011). If a lump-sum or reimbursable contract is already predetermined for a project, we advise managers from both sides to put extra attention on developing relational attitudes and ensuring effective teamworking. Also because relational attitudes do not directly improve project performance but through teamworking quality, project managers need: (a) to secure the ongoing parent organizational support by catalyzing a joint commitment and norms of trust and respect between senior management, and (b) to ensure ongoing effectiveness of teamworking by fostering communication, coordination, cohesion, balanced contribution, mutual support, aligned effort, and affective trust.

Finally, managers need to be cautious when considering using incentive schemes. Our findings suggest that contractual incentives have significant positive indirect effect but also negative direct effect, although not statistically significant. The implication is clear, contractual incentives are no substitute for real collaborative relationship and should not be used to limit the owner’s involvement in the process of collaboration (Berends, 2014; Meng and Gallagher, 2012). Contractual incentives cannot improve performance if the managers (senior management and project managers) from both sides do not share equitable commitment, respect and trust and properly manage to articulate a direction persuasively on the extent the teams work together, contribute solutions to problems, and confront difficulties whenever they arise at.

6.5.3. Limitations and future research

This study has some limitations in its results and conclusions. The first limitation is related to the research design employed in this study. This study was observational hence could not establish the causal ordering. Our findings should not be interpreted as evidence of causality but rather as supporting a predictive scheme.
Other limitations are related to the characteristics of the data used in this study. The data was based on the respondents’ observation thus all constructs and their relations should be interpreted as the phenomenon as perceived by the practitioners. The representativeness of the sample may limit the generalizability of the findings. Although the sample includes practitioners’ reflection on projects in various countries in different continents, the majority (64%) of them were based in the Netherlands. Some projects executed in countries like Asia, Middle East, South America, and North America regions can have different characteristics given different country-specific regulations and cultures. The same limitation also applies to the project type due to the strong presence of oil, gas, and petrochemicals projects (60%) in the sample. Future studies should aim to replicate the findings with a larger sample, in different countries and project types. Another promising avenue for future study is to extend our research model by considering complexity and cultural factors as potential moderators.

Another limitation is concerning the partnering/alliance contract. This study did not distinguish partnering from ‘pure’ alliance contract. The proponents of ‘pure’ alliance argue that alliance is a legally enforceable form of relational contracting with formal charter, governance and management structures (see Ross, 2003; Walker and Hampson, 2003). Despite this limitation, we are confident that our finding remains supported for the relative advantages of alliance contract over lump-sum or reimbursable contract. Nonetheless, future studies with a larger sample could extent the analysis by further comparing the performance of alliance with partnering contract.

Finally, although our comprehensive model includes important constructs reflecting two types of relationships, relational attitudes at inter-firm level and teamworking quality at inter-team level, we were unable to include other types of relationships, for example, the relationship between the parent organization (senior management) and the corresponding team members that could potentially affect project performance. Future research should explore the effect of these other types of relationships.

6.6. Conclusions

Researchers and practitioners have acknowledged the importance of the more collaborative contracts to achieve better project performance by promoting a better working relationship between owner and contractor. However, mixed results of different contract types on project performance suggest the need for research on intermediate mechanisms linking the effects of contract types to project performance. This study applies a mediation model in which relational attitudes and teamworking quality mediate the effects of contract types and contractual incentives on project performance. The results support the notion that a partnering/alliance contract is likely to be more collaborative than a lump-sum or reimbursable contract. However, there is no evidence that a reimbursable contract is more collaborative than a lump-sum contract. Furthermore, it is supported that through better relational attitudes and teamworking quality, projects with a partnering/alliance contract are
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likely to perform better than those with lump-sum and reimbursable contracts. In the same way, projects with contractual incentives are likely to perform better than those without incentives through better relational attitudes and teamworking quality. The results also suggest the positive effects of relational attitudes and teamworking on project performance regardless of the contract types and the presence of incentives. All in all, contract types and contractual incentives per se are not the game changer but the parties’ attitudes toward collaborative relationship and how they play out throughout the project into actual teamworking behavior.
References


How do contract types and incentives matter to project performance?


Chapter 6


How do contract types and incentives matter to project performance?

## Appendix 6-1. Measurement model specification

<table>
<thead>
<tr>
<th>Constructs/ Indicators</th>
<th>Loadings</th>
<th>AVE</th>
<th>CR</th>
<th>α</th>
</tr>
</thead>
</table>
| 1. Project performance (formative construct)
  Weighted average of schedule, cost, quality, safety, and operability | 0.804 | -   | -  | -    |
  This project made a positive impact on the owner’s business | 0.593 | Weight = 0.421, p<0.01 |
  This project was a commercial success to the contractor | 0.787 | Weight = 0.119, ns  |
  Both owner and contractor were satisfied about the project outcomes | 0.855 | Weight = 0.389, p<0.01 |
| 2. Relational attitudes (2nd-order formative construct)
  2.1. Senior management commitment (1st-order reflective construct)
  Senior management committed to provide necessary resources and support | 0.843 | -   | -  | -    |
  Senior management shown consistent and passionate leadership | 0.896 | -   | -  | -    |
  Senior management actively resolved potential conflicts when needed | 0.826 | -   | -  | -    |
| 2.2. Relational norms (1st-order reflective construct)
  The contractor was enthusiastic in achieving the owner’s objectives | 0.773 | -   | -  | -    |
  The contractor felt confident that owner is reliable and trustworthy | 0.843 | -   | -  | -    |
  The owner believed the contractor made its best efforts | 0.876 | -   | -  | -    |
  Both parties adopted ‘no blame culture’ whenever problems arise | 0.830 | -   | -  | -    |
  Both parties intentionally being open and honest in any interactions | 0.769 | -   | -  | -    |
| 3. Teamworking Quality (2nd-order formative construct)
  3.1. Communication (1st-order reflective construct)
  Both teams communicated directly with each other | 0.707 | -   | -  | -    |
  Project-relevant information was shared openly by both teams | 0.882 | -   | -  | -    |
  Whenever a problem is detected, it was immediately communicated | 0.870 | -   | -  | -    |
  Both teams were satisfied with the usefulness of the information shared | 0.850 | -   | -  | -    |
| 3.2. Coordination (1st-order reflective construct)
  The work done on tasks within the project was synchronized | 0.810 | -   | -  | -    |
  There were comprehended goals for tasks between the teams | 0.872 | -   | -  | -    |
  The goals for tasks were accepted by both teams | 0.863 | -   | -  | -    |
  There was no conflict between the teams regarding tasks and goals | 0.771 | -   | -  | -    |
| 3.3. Cohesion (1st-order reflective construct)
  Core team-members were personally engaged to this project | 0.819 | -   | -  | -    |
  Core team-members were integrated as one team | 0.731 | -   | -  | -    |
  Core team-members felt proud to be part of the teams | 0.844 | -   | -  | -    |
  Core team-members felt responsible for maintaining relationships | 0.779 | -   | -  | -    |
| 3.4. Balanced contribution (1st-order reflective construct)
  Both teams recognized each other’s specific strengths/weaknesses | 0.816 | -   | -  | -    |
  Both teams contributed in accordance with their specific potential | 0.857 | -   | -  | -    |
  There were balanced contributions that prevented conflicts | 0.865 | -   | -  | -    |
| 3.5. Mutual support (1st-order reflective construct)
  Both teams supported each other as best as they could | 0.872 | -   | -  | -    |
  Whenever problems occurred, they were resolved constructively | 0.850 | -   | -  | -    |
  Every critical decision was made jointly by both teams | 0.774 | -   | -  | -    |
| 3.6. Aligned effort (1st-order reflective construct)
  Every team made this project their highest priority | 0.872 | -   | -  | -    |
  Both teams put their best effort into this project | 0.883 | -   | -  | -    |
  There was no conflict regarding the effort that one team put into | 0.822 | -   | -  | -    |
### Appendix 6-1. Measurement model specifications (continuation)

<table>
<thead>
<tr>
<th>Constructs/Indicators</th>
<th>Loadings</th>
<th>AVE</th>
<th>CR</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7. Affective trust (1st-order reflective construct)</td>
<td></td>
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</tr>
<tr>
<td>Both teams were comfortable being dependent on each other</td>
<td>0.736</td>
<td>0.635</td>
<td>0.913</td>
<td>0.885</td>
</tr>
<tr>
<td>Both teams had kept their promises</td>
<td>0.778</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams had high levels of integrity</td>
<td>0.829</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams had been fair to each other</td>
<td>0.855</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams had looked out for each other companies’ interests</td>
<td>0.797</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both teams could rely on each other to not taking advantage</td>
<td>0.781</td>
<td></td>
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<tr>
<td>4. Front-end definition (reflective construct)</td>
<td></td>
<td>0.624</td>
<td>0.869</td>
<td>0.802</td>
</tr>
<tr>
<td>Clarity of the project goals and objectives</td>
<td>0.796</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarity of the project scope</td>
<td>0.781</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of the project basic engineering design</td>
<td>0.754</td>
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<tr>
<td>Quality of the project execution plan</td>
<td>0.827</td>
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<tr>
<td>5. Project size (reflective construct)</td>
<td></td>
<td>0.767</td>
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<td>0.708</td>
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<tr>
<td>Total installed cost</td>
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<tr>
<td>Project duration</td>
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<tr>
<td>6. Firm size (reflective construct)</td>
<td></td>
<td>0.898</td>
<td>0.946</td>
<td>0.890</td>
</tr>
<tr>
<td>Number of employees</td>
<td>0.965</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual revenues</td>
<td>0.930</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: AVE = average variance extracted; CR = composite reliability; α = Cronbach’s alpha; *Formative construct, each indicator is retained if the weight is significant or the loading above the threshold 0.5; all loadings are significant at p < 0.001; ns = not significant.
### Appendix 6-2. Constructs intercorrelations and discriminant validity

<table>
<thead>
<tr>
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<th>Mean</th>
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<td>Teamworking quality ((M_2))^a</td>
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<td>9.97</td>
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<td>0.48</td>
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<td>0.07</td>
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<td>0.18</td>
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</table>

Note: N = 113; values below diagonal (in *italics*) are correlations; values on diagonal (in **bold**) are the square root of average variance extracted (AVE), not applicable (N/A) for \(^a\) higher-order formative construct, \(^b\) formative construct, and \(^c\) single item construct; PAL = Partnering/alliance contract; RE = reimbursable contract; LS = lump-sum contract.
Chapter 7

RELATIONAL CAPABILITY ASSESSMENT TOOL (RECAP): DEVELOPMENT AND VALIDATION
Chapter 7 | Abstract

Collaborative relationships between owner and contractor is the key to superior performance in capital projects. This chapter presents RElational CAPability assessment tool (RECAP) to measure the current state of the owner-contractor collaboration in projects. It includes the four most significant collaborative factors and two performance criteria which were theoretically developed and empirically tested in previous studies (see Chapter 5). All factors and criteria are organized into an assessment form, thereby providing the project practitioners with a simple yet practical tool for collecting, analyzing, and identifying specific aspects of the collaboration for improvement. To test its validity, RECAP was applied on three projects by involving six project practitioners representing three different pairs of owner and contractor. The results suggest that RECAP helps the practitioners to self-diagnose the soft and relational nature of collaboration in real-life projects over different project phases. In addition, the feedback from the participating practitioners confirms the practicality and usefulness of RECAP, particularly, for building awareness of and facilitating constructive discussions for improving relational aspects of a project toward project performance. The results also support the validity of the earlier developed conceptual and empirical model underlying RECAP.
Chapter 7 Relational capability assessment tool (RECAP): Development and validation

7.1. Introduction

Over the last two decades, project practitioners have increasingly highlighted the importance of owner-contractor collaborative relationships in ensuring the successful execution of capital projects. The influence of owner-contractor collaborative relationship on project performance is not a myth as a large body of research has provided unequivocal empirical evidence. Many scholars have studied the practice of collaborative relationship under different labels, e.g. ‘relational capability’ (Håkansson and Snehota, 1995), ‘collaborative working relationship’ (Akintoye and Main, 2007; Humphreys, Matthews and Kumaraswamy, 2003; Rahman and Kumaraswamy, 2005; Xue, Shen and Ren, 2010), and ‘relationship management’ (Meng, 2010, 2011; Rowlinson and Cheung, 2012; Smyth and Pryke, 2008).

However, despite the fact that collaborative relationship is critical to the success of projects, the ability to sustain and consistently drive the real collaborative attitudes and behavior for achieving the desired outcomes remains of enduring practical difficulty (Aarseth, Andersen, Ahola and Jergeas, 2012; Chan, Johansen and Moor, 2012; Laan, Noorderhaven, Voordijk and Dewulf, 2011). This is because a collaborative relationship (including various prescriptions like integrated project team, partnering, and alliance) requires that the people at senior management and project team level of both parties possess different attitudes and behavior than those involved in traditional arm’s length relationships (Chan et al., 2012; Lendrum, 2011; Walker and Lloyd-Walker, 2015). Our own studies reported in Chapter 4 (Suprapto, Bakker, Mooi and Moree, 2015c), Chapter 5 (Suprapto, Bakker and Mooi, 2015a), and Chapter 6 (Suprapto, Bakker, Mooi and Hertogh, 2015b) concurred that the influence of owner-contractor collaboration depends on the extent of both parties’ ability at inter-organizational level to establish relational attitudes toward collaboration (joint commitment, mutual trust, and relational norms). Moreover, the results of Chapter 5 and 6 also suggest that the ability to perform better in projects is mediated by teamworking quality consisting of five task-related (communication, coordination, balance contribution, aligned effort, and mutual support) and two behavior-related (cohesion and affective trust) interactional mechanisms between the owner’s team and the contractor’s team.

The aforementioned studies support the notion that real collaboration in capital projects requires deliberate relational attitudes between senior management and teamworking within and between project teams. However, we should also recognize the dynamic nature of collaborative relationship over the project life cycle (Drexler and Larson, 2000). As
Hartmann and Bresnen (2011) emphasize that collaborative working is a fluid concept which emerges from individual and organizational interactions. Based on an ethnographic case study they suggest that the practitioners need to abandon their “old routines and behavior” (unlearning) besides “learning new knowledge and adjusting to working processes” (p.12). These learning and unlearning processes are best understood through the practitioners’ reflection process. Practitioners deal with situations of uncertainty, instability, exceptionality, and value conflict through reflection-in-action (Schön, 1983). Practitioners do reflection-in-action by “actively adjusting their responses spontaneously in pursuit of a more collaborative exchange, actively checking on ways, ...” (Yanow and Tsoukas, 2009, p1340). Reflection gives the practitioners ability to recognize the state and source of problems thus help the practitioners in finding the way to improve the relationship.

Against this background, one important gap remains: how can the practitioners improve their collaborative relationships in real-life project practice? In other words, in what ways could owner and contractor working in a project identify and improve key specific aspects of their collaboration, so that together they can formulate specific interventions, in a constructive way to improve the ongoing (and potentially future) relationship. This implies the need for a means of assessing how well the owner and contractor and the teams are working together and how this changes over time. Building on our prior studies, we focus on translating our earlier framework and empirical model into Relational capability assessment tool (RECAP) for the project practitioners to measure the current state of their collaborative working.

Figure 7-1 shows the overall stages of this research. The RECAP stems from the earlier performed studies, i.e.: 1) the problem orientation through a case study reported in Chapter 2 and the literature review reported in Chapter 3; 2) the framework development on the basis of the literature review reported in Chapter 3 and the practitioners’ perspectives on the essence of project-based collaboration reported in Chapter 4; and 3) the empirical testing of the predictive model reported in Chapter 5 and 6. This chapter (Chapter 7) therefore focuses on the validation of RECAP. The aim of this chapter is twofold: to demonstrate the validity of RECAP for project practitioners in real-life projects and by doing so also validating the conceptual framework and empirical model underlying RECAP.

Figure 7-1. Approach to the development and validation of the RECAP

The rest of this chapter is structured as follows. First, we present RECAP. Next, we describe the validation approach by means of pilot applications. Subsequently, we present the results
of the pilot applications. Finally, we discuss the validity of RECAP and the earlier developed conceptual framework and empirical model.

7.2. Relational capability assessment tool (RECAP)

As depicted in Figure 7-1, this research started from practical problems faced in owner-contractor collaboration in projects. The review of relevant literature in Chapter 2 and 3 identified six general relationship factors (relational attitudes, teamworking, team integration, joint working procedures, owner-contractor capability, and contract functions). Later, in the Q-study in Chapter 4 (Suprapto et al., 2015c), it was shown that five of the six general factors (excluding contract functions) were perceived by 30 project practitioners as salient factors for improving owner-contractor collaborative relationships. In the survey study as reported in Chapter 5 (Suprapto et al., 2015a) and 6 (Suprapto et al., 2015b), we restructured the general factors into: i) relational attitudes which include senior management commitment and relational norms; ii) collaborative practices which include team integration and joint working procedures; iii) teamworking quality which consists of inter-team communication, coordination, balanced contribution, aligned effort, mutual support, cohesion, and affective trust; iv) front-end definition; and v) joint teams capabilities which consist of owner’s team capability and contractor’s team capability. The PLS-SEM analysis of a sample of 113 responses provided empirical support for teamworking quality and front-end definition as direct predictors to project performance. The other factors, relational attitudes, collaborative practices, and teams’ capabilities were found to be the indirect predictors to project performance through teamworking quality.

Because the purpose of RECAP is to measure relational capability in owner-contractor collaborative relationship and not on the ‘individual capability’ of each party, we excluded the need to look into teams’ capabilities in the assessment. The criteria included in RECAP are therefore categorized into 4 relational capability criteria: relational attitudes, and teamworking quality, good collaborative practices, and front-end definition; and 2 performance criteria: project performance and relationship continuity.

All criteria are not assessed directly but broken down into sub-criteria (except for the front-end definition and relationship continuity) which are then assessed through 2 to 6 indicators. Overall, RECAP consists of 17 sub-criteria (13 relational sub-criteria and 4 performance sub-criteria) and 72 indicators. All criteria, sub-criteria, and corresponding definitions are listed in Table 7-1. All indicators are given in Appendix 7-1.
Table 7-1. Criteria and sub-criteria of the relational capability assessment tool (RECAP)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Sub-criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Front-end definition</td>
<td>1. Front-end definition</td>
<td>The ability to comprehend the project scope, basic design, execution plan, and roles and responsibilities (5 indicators).</td>
</tr>
<tr>
<td>B. Collaborative practices</td>
<td>2. Team integration</td>
<td>The extent to which the owner and the contractor teams are structured and integrated as a single team with no apparent boundaries (5 indicators).</td>
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<tr>
<td></td>
<td>3. Joint working processes</td>
<td>The extent to which the owner and the contractor teams perform joint working processes (7 indicators).</td>
</tr>
<tr>
<td>C. Relational attitudes</td>
<td>4. Senior management commitment</td>
<td>How well the senior management of the owner and the contractor commit to support the collaboration (5 indicators).</td>
</tr>
<tr>
<td></td>
<td>5. Senior management trust</td>
<td>The extent of mutual trust between firms (4 indicators).</td>
</tr>
<tr>
<td></td>
<td>6. Established relational norms</td>
<td>Norms of no blame culture, win-win, and communication openness (7 indicators).</td>
</tr>
<tr>
<td>D. Teamworking quality</td>
<td>7. Communication</td>
<td>The extent of to which the teams communicate with each other effectively (4 indicators).</td>
</tr>
<tr>
<td></td>
<td>8. Coordination</td>
<td>The extent to which the teams achieve synergies in coordinating interdependent activities (3 indicators).</td>
</tr>
<tr>
<td></td>
<td>9. Balanced contribution</td>
<td>The extent to which the teams contribute their specific knowledge and expertise (3 indicators).</td>
</tr>
<tr>
<td></td>
<td>10. Aligned effort</td>
<td>The extent to which the teams align their effort (3 indicators).</td>
</tr>
<tr>
<td></td>
<td>11. Mutual support</td>
<td>The extent to which the teams help each other in achieving project goals (3 indicators).</td>
</tr>
<tr>
<td></td>
<td>12. Cohesion</td>
<td>The extent to which the teams behave as one team (4 indicators).</td>
</tr>
<tr>
<td></td>
<td>13. Affective trust</td>
<td>The extent to which the teams’ members personally trust each other (6 indicators).</td>
</tr>
<tr>
<td>E. Project performance</td>
<td>14. Efficiency</td>
<td>The extent to which the project meet the planned budget and schedule (2 indicators).</td>
</tr>
<tr>
<td></td>
<td>15. Quality</td>
<td>The extent to which the project progressed or completed safely, meeting the targeted quality, reliability, operability (4 indicators).</td>
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<td></td>
<td>16. Satisfaction</td>
<td>The perceived overall satisfaction and business or commercial success (3 indicators).</td>
</tr>
<tr>
<td>F. Relationship continuity</td>
<td>17. Relationship continuity</td>
<td>The perceived intention to continue the relationship in future (4 indicators).</td>
</tr>
</tbody>
</table>
7.3. Research approach

To validate RECAP, we selected three different projects with different project phases and performance levels. By doing so, we could test the applicability and the usefulness of RECAP under different situations. For each project, we interviewed two participants (project managers or equivalent), each representing the owner or the contractor. During an interview, the participant was handed the assessment form and asked to assess his/her current project by assigning an appropriate rating score from 1 to 5 (very poor – poor – moderate – good – very good) for all 72 indicators of the tool. After completing the assessment, the data was immediately entered into a spreadsheet template producing a number of graphs, score levels per sub-criteria and criteria. The score for each sub-criterion was calculated by averaging the scores of its indicators. Then, the score for each criterion was calculated by averaging the scores of its sub-criteria. After reviewing the assessment results, the participant was then asked to provide comments and suggestions regarding: the practicality of RECAP, the usefulness of the assessment result for managerial actions or interventions and suggestions for further improvement of RECAP.

7.4. Results

7.4.1. Pilot applications of RECAP

The pilot applications were performed in three projects, representing three different combinations of owners and contractors, project phases, and outcomes. Project Alpha is a successful project and almost completed, Project Beta is an unsuccessful project and fully completed, and Project Charlie is a project in front-end development (FED) phase and therefore the final outcome is unknown.

Using the assessment scores we performed a case-specific analysis. The score levels by criteria and sub-criteria from the owner and the contractor were compared side-by-side including the score gaps. With such an analysis, we obtain an overview of the levels of the collaboration by criteria and sub-criteria in the eyes of both sides. The score gaps can reveal potential dysfunctions in the working relationships and indicate specific areas for improvement. The details of each pilot application are discussed in the following subsections.

7.4.1.1. Project Alpha: Development of a new high-tech product

Project Alpha is a new product development project of a high-tech company (Owner A). The project took more than 3 years with around 700 FTE. The market in which the Owner A is operating is characterized by low volume and high value with high product complexity and time pressure. For the development of a new product, the owner outsourced one major part to an engineering and manufacturing company (Contractor A). At the time of the interviews, the project was almost completed. Despite the fact that the project was their first experience together, both parties indicated that they have worked collaboratively and have
delivered satisfactory results.

![Figure 7-2. Project Alpha’s score levels by criteria](image)

What do the assessment results tell us? As depicted in Figure 7-2, the overall level of the collaboration in this project was perceived quite good by Owner A as the score levels for all criteria are ranging from 3.8 to 4.2. With the exception of the project performance, Contractor A also perceived the collaboration satisfactory with the score levels ranging from 3.8 to 4.6. In general, both Owner A and Contractor A perceived the working relationship went well and the product was delivered within the agreed cost and schedule and in accordance to the targeted quality. Based on the achieved performance (as perceived by Owner A), both parties were also inclined to continue their relationship in the long-run.

Despite the satisfactory results, Figure 7-2 also indicates substantial score gaps on teamworking quality (0.7 points) and project performance (0.8 points) between Owner A and Contractor A. Owner A perceived the level of teamworking quality lower than Contractor A. On the other hand, Contractor A perceived the level of project performance lower than Owner A.

The score levels on the specific sub-criteria and associated score gaps depicted in Figure 7-3 indicate some interesting issues. Apparently, the project performance was not achieved as efficient as planned from Contractor A’s perspective (score level 2.0) in contrast to Owner A’s perspective (score level 4.0) which lead to a significant 2.0 points score gap. The overall
gap regarding teamworking quality was not as high as project performance (0.7 points); however, when we look into its sub-criteria the gaps were substantially high. Owner A’s perception was apparently lower than Contractor A with regard to the sub-criteria team communication (1.6 points), alignment of effort (1.2 points), and mutual support (0.8 points). Finally, regarding the criterion relational attitudes, the level of relational norms and senior management trust were perceived by Owner A lower than Contractor A (0.7 and 0.6 points).

![Figure 7-3. Project Alpha's score levels and gaps by sub-criteria](image)

The above assessment results indicate the usefulness of the RECAP in a successful project. The analyses also reveal some nuances about the working relationship between Owner A and Contractor A. Despite the score levels for all criteria as perceived by both parties were generally at a good level, the substantial score gaps clearly indicate the need for both parties to improve on project efficiency, team communication, alignment of effort, mutual support, relational norms, and senior management trust.

### 7.4.1.2. Project Beta: Construction of a new production unit within an existing oil refinery

Project Beta is a construction project of a new production unit within an existing oil refinery. The owner (Owner B) is an oil refinery subsidiary of an international oil company in Western Europe and the contractor (Contractor B) is an international engineering and construction
company. The project faced several scope changes and had the project managers from both sides replaced during the early execution phase. The project was completed in 2012, one year behind schedule, and exceeding the agreed budget by 24%. The facility constructed was eventually delivered within acceptable quality.

![Figure 7-4. Project Beta’s score levels by criteria](image)

The assessment scores by criteria shown in Figure 7-4 indicate that Contractor B rated almost all criteria rather lower than Owner B (except for the perceived relationship continuity). In general, both Owner B and Contractor B perceived the overall level of the collaboration in this project unsatisfactory as the score levels for all criteria are ranging from 2.7 to 3.7. Also shown in Figure 7-4, both parties’ perceptions were quite in line with respect to all criteria with the score gaps between the parties relatively low from 0.1 to 0.5 points.

In contrast to the scores by criteria, the score levels and gaps by sub-criteria shown in Figure 7-5 indicate more variability over various sub-criteria. The scores per sub-criterion under relational attitudes suggest that both Owner B and Contractor B perceived moderate level of senior management commitment (3.4 and 4.0), trust (3.3 and 2.8), and relational norms (3.6 and 3.0). This gives more insight in the details of specific misalignment in the working relationship at senior management level. The same situation also stands out from teamworking quality where the gaps were respectively 0.5, 0.7, and 1.7 points for team cohesion, balanced contribution, and team coordination. Obviously team coordination was the most problematic one as Contractor B rated it poor (2.0) while Owner B considered it
almost good (3.7).

In terms of project performance, the scores per sub-criterion varied considerably. Both sides perceived the quality of the final product quite differently, as Owner B rated it at moderate level (3.3) while Contractor B considered a good level of quality (4.0). Both Owner B and Contractor B perceived the project was poorly performed (2.0 and 1.5) in terms of efficiency (schedule and cost performance). Eventually, Owner B was moderately satisfied (3.3) but not so the Contractor B (2.5). Clearly, there are considerable differences between the two as the scores gaps were 0.5, 0.8, and 0.8 points for efficiency, quality, and satisfaction.

In summary, the above assessment results indicate the usefulness of the RECAP in a problematic project. The analyses are not only able to gauge the collaboration levels between Owner B and Contractor B in Project Beta but also most importantly can provide details about specific aspects for potential improvement, notably on relational norms, senior management trust, team coordination, team balanced contribution, and project efficiency.

7.4.1.3. Project Charlie: Construction of new refinery facilities

Project Charlie is a construction project of new refinery facilities. The owner (Owner C) is a subsidiary of a different international oil company in Western Europe and the contractor
(Contractor C) is a different international engineering and construction company. At the time of interviews, the project was in the front-end engineering and design (FEED) phase so the project outcomes are still unknown.

![Graph showing score levels by criteria](image)

Figure 7-6. Project Charlie’s score levels by criteria

The assessment results are shown in Figure 7-6 and Figure 7-7. As depicted in Figure 7-6, the overall level of the collaboration in this project was perceived satisfactorily by both Owner C and Contractor C as the score levels for all criteria are ranging from 3.7 to 5.0. Figure 7-6 also shows that Contractor C rated almost all criteria higher than Owner C (except for the project performance). Also both parties’ perceptions were quite in line with respect to all criteria with the score gaps between the parties relatively low from 0.1 to 0.7 points. The highest score gaps were on the criteria collaborative practices and perceived relationship continuity.

Consistent to the score levels by criteria, the score levels by sub-criteria shown in Figure 7-7 were also relatively high from 3.6 to 5.0. At first glance the collaboration quality and performance in this project so far are already high. When we look into the score gaps at various sub-criteria, there are some potential misalignments regarding sub-criteria team integration (0.8 points), joint working (0.7 points), team balanced contribution (1.0 point), team mutual support (0.7 points), and the perceived quality of the project results (0.8 points). Owner C rated the score levels on most of these sub-criteria (except for the perceived quality) lower than Contractor C.
Overall, the above assessment results indicate the very high score levels but at the same time there were also some considerable gaps between the two parties. Although this project is in the early phase, this assessment tool can provide the practitioners early information about the health of their relationship. The gaps revealed at various sub-criteria further help the two parties to focus on specific aspects to improve.

7.4.2. Evaluation of RECAP

After completing the assessment, the participants were immediately shown the assessment results. On the basis of their experience in using RECAP and reviewing the results we also asked the participants the following open questions:

a. **After completing this assessment tool, what is your impression regarding its practicality?**
   Why?

b. **Given the insights you can gain from this assessment, how would you use it the next time?**

c. **Would you have any suggestions to further develop this assessment tool?**

In the following, we present the participants’ responses to the above questions.
7.4.2.1. Practicality of RECAP

In general, all participants were very positive about the practicality of RECAP. They found that the assessment form was easy to use and the process was simple. Without necessarily spending substantial time to understand what the assessment is about, all participants completed the assessment in less than 45 minutes. They recognized the criteria and sub-criteria included in RECAP as critical success factors of collaboration. Furthermore, they were not only interested in using RECAP but also in understanding the underlying theoretical knowledge.

“This assessment provides insights into critical success factors for collaborative working”. “I am very interested in understanding the thoughts behind the model”. “I have a good impression and will definitely use this assessment tool especially since it links to the empirical result.”

7.4.2.2. Usefulness of the RECAP

All participants fully agreed that RECAP is very useful. When asked further how they would use it next time, the participants expressed that RECAP should be integrated in the project management process to monitor and evaluate the health of a collaborative relationship on an ongoing basis throughout a project. This exactly fits the intended purpose of RECAP.

“... to use this tool in the project management processes, particularly at the key milestones”. “... to measure the degree of collaboration during the project to see where we could improve”. “... to be used by the integrated project team as ‘health’ measurement throughout the project ... on a regular basis”.

Furthermore, the participants also recognized the usefulness of the assessment results for building awareness about the state of the working relationship. Most importantly, all participants shared a similar view that they could gain more benefits by discussing the assessment results together in an open, fair and constructive manner. Moreover, they envisioned that through periodic constructive discussions involving senior management (project sponsors) and project teams, specific aspects and actions to improve regarding the ongoing collaborative working can be addressed thoughtfully.

“... to create awareness within the team to see where we could improve”. “... together with the counterpart go over the assessment periodically”. “... to evaluate aspects of the relationship ... to predict the ongoing performance”.

Besides measuring the ongoing relationship’s health during a project, the participants also suggested RECAP can be applied in other areas. Utilizing RECAP in post-project evaluation assessment can be useful to extract lessons learned from both parties and teams. Although not specifically designed for assessing buyer-supplier relationship, one participant considered RECAP is also useful as part of the supplier performance audit. With the help of RECAP, a project manager can initiate and develop relationships with problematic suppliers.
Finally, another area of application is to assess the project organization internal effectiveness. Because RECAP was already developed into a spreadsheet template, the data from periodic assessment can easily be visualized in time-series graphs. Through time-series graphs, the ongoing health of the relationship over time can be monitored and regularly discussed for improvement. The participants were of the opinion that when applied to all projects within a company, RECAP can be used for benchmarking. The RECAP data from multiple projects can be used to compare the degree of collaborative relationship achieved in one project compared to other projects.

### 7.4.2.3. Further improvement to the RECAP

The third evaluative question was intended to obtain recommendations for improving RECAP. Most suggestions were related to the practicality and usefulness of the tool as already presented in previous sub-sections. The only unique improvement recommendation to RECAP is adding a simple overall conclusion on the basis of the achievement levels of the relationship. As an example, one participant elaborated that if the assessment shows high level of teamworking quality but low or moderate level of senior management relational attitudes, the overall conclusion could be: “Yes, you are doing okay but you have the risk of no future work”. Another recommendation is predicting the project success given the current state of the relationship.

### 7.4.3. Benchmarking feature of RECAP

Along with its anticipated usefulness, the participating practitioners discerned benchmarking as another important practical use of RECAP. Treating the responses from the participating practitioners as new data points, we illustrate how the three projects can be benchmarked against each other and with those of the survey.

Figure 7-8 shows the score ratios for Project Alpha, Beta, and Charlie on four relational capability criteria and two performance criteria. A score ratio is calculated by dividing the corresponding score level by the average score of 119 responses (obtained from 6 pilot participants and 113 survey respondents reported in Chapter 5 and 6). A score ratio of 1.0 serves as the reference point or equal to the average of all 119 responses. A score ratio above or below 1.0 means the corresponding score level is better or worse than the average. As indication to what the extent one project/ response is better or worse than the others, two lines +/- 1 SD (one standard deviation) can be used as arbitrary thresholds.

Of the three projects, Project Charlie can be considered the most collaborative as well as the top performer in the phase where it presently is. Compared to the average of 119 responses, both Owner C and Contractor C perceived most criteria very high, above 1 SD of the average. The only exceptions are for collaborative practice and relationship continuity as perceived by Owner C but they remain above the average. Project Alpha is the second most collaborative performer, as both Owner A and Contractor A perceived all criteria above the average. Finally, Project Beta is the least collaborative performer. Despite the fact that the
collaboration in Project Beta was not extremely below the -1 SD from the average, either Owner B or Contractor B perceived the performance and relationship continuity quite badly, near and below the -1 SD relative to the average.

Figure 7-8. Benchmarking three projects with survey data as reference

Figure 7-8 indicates the consistency of RECAP in the three projects compared with the survey data reported in Chapter 5 and 6. The score ratios of four relational criteria—front-end definition, collaborative practices, relational attitudes, and teamworking quality—for Project Alpha (Owner A and Contractor A) and Project Charlie (Owner C and Contractor C) were generally above the average of 119 responses. The corresponding score ratios of project performance and relationship continuity are also above the average. On the other hand, the score ratios of relational criteria for Project Beta (Owner B and Contractor B) were mainly below the average and so does the score ratios of project performance and relationship continuity.

7.5. Discussion

7.5.1. The validity of RECAP

We demonstrated the practical use of RECAP in various project phases and outcomes through pilot applications in three projects. The results suggest that RECAP can be understood and used by the participating practitioners. The score levels captured the
owner’s and the contractor’s perception regarding their relational capability and performance. The score gaps between owner and contractor assessment give a detailed idea which criteria and sub-criteria are in need of improvement and according to whom. It is important to note here that RECAP is not an objective measure of individual organizational or team performance but rather a deliberate proactive management instrument focused on measuring the inter-organizational and inter-team interactions embedded in a project. The score gaps by criteria or sub-criteria should not be interpreted as the differences between two parties in achieving the degree of collaboration individually but as the perceived differences of similar phenomena.

The feedbacks from the six participants indicate RECAP as a useful tool to facilitate a joint reflection involving the two parties in various project phases. Even during the front-end engineering and design (FEED) phase of a project (as indicated through Project Charlie), the project managers of both parties can already sit together and assess the relationship health of the project. A joint session can be used to present the assessment results and encourage a discussion to reflect on specific aspects of the working relationship where different parties or actors have divergent perceptions and meanings. This reflective process can facilitate individuals to enrich their interactions and stimulate constructive exchange of ideas and knowledge that can be translated into real collaborative behavior throughout the different project phases. Moreover, as indicated in Project Beta, the practitioners can also use RECAP to reflect on lessons learned from a completed project to be applied in future relationships and projects. Finally, RECAP could become a part of a company’s project management procedures. It can be used to periodically assess the collaboration health and performance of the projects portfolio within the company. As illustrated in Figure 7-8, the RECAP data can be utilized to benchmark one project against other projects within a company or across industry.

7.5.2. Interpreting the RECAP assessment results

One improvement recommendations to RECAP was adding features to summarize the collaborative relationships and performance of the assessed project. To illustrate how it can be incorporated we develop a capability-performance matrix adapting Rezaei and Ortt’s (2011) supply-chain relationship framework. Any owner-contractor collaboration can be mapped into four quadrants of the matrix. Figure 7-9 shows the positions of three pilot projects and associated six responses into the matrix. On the horizontal ‘capability axis’, we placed the average score of the four relational criteria (front-end definition, collaborative practices, relational attitudes, and teamworking quality). On the vertical ‘performance axis’, we placed the average score of the two performance criteria (project performance and relationship continuity). To differentiate between high and low performers, we used the average scores of 119 data points so that the matrix was divided into four quadrants.
The collaboration characteristics of a project in each of the four quadrants can be summarized as follows:

- **Q1: low capability and low performance.** It means that both the collaboration and performance were realized below the average. Such low degree of collaboration could be due to lack of ability of either party to comprehend the project definition and/or inadequate relational attitudes, collaborative practices, and management attention on team working. The project was performed below the average and the parties were likely to be dissatisfied with the project results. If the final project results indeed failed to keep up with expectation, there would be a small chance for the two parties to work together again in near future.

- **Q2: high capability and low performance.** It means that the parties had sufficient ability to comprehend the project definition, relational attitudes, collaborative practice, and attention to team working was high. The performance, either the project results or the relationship continuity, was achieved below average. If the project performance was
indeed poor, the collaboration is problematic where some aspects other than the relational capability factors might make the project performance poor.

• **Q3: high capability and high performance.** This position is the most ideal in which the collaboration and project performance were achieved above the average. The high degree of collaboration was associated with the parties’ ability to comprehend the project definition, good senior management attitudes, good application of collaboration practices, and good management attention on team working. The project was performed above the average and the parties were likely to be satisfied with the project results. In this collaborative relationship, both parties might consider themselves as potential long-term partners.

• **Q4: low capability and high performance.** This position suggests the parties were lacking in their joint effort to comprehend the project definition and in management attention on team working. Either the project performance or the relationship continuity was achieved above the average. This position indicates a situation in which some aspects other than the relational capability factors might affect the project results.

Mapping the three projects into the matrix, Project Beta takes a position in quadrant 1 (Q1), low capability and low performance as perceived by Contractor B and Owner B. The other two projects, Project Alpha and Project Charlie take the ideal position in Q3 with high capability and high performance. It is also noticeable that in spite of being in Q3, the collaboration capability and performance in Project Charlie was better than in Project Alpha.

Another important improvement recommendation was the predictive feature of RECAP. Given the known score levels of relational capability criteria, the score of levels of project performance and relationship continuity can be estimated. For simplicity, we added a simple linear regression equation with a single independent variable \(x\), the mean score of relational capability criteria. The dependent variable performance, the mean score of project performance and relationship continuity, can be estimated as

\[
y = 0.87x + 0.46
\]

Figure 7-9 also shows the three projects fall into the regions +/- 1 SD of the regression line. This indicates that the model behind RECAP has a reasonably good predictive relevance, i.e.: 46% of the variation in the performance (project performance and relationship continuity) is explained by the four relational capability criteria. This is comparable to the \(R^2\) values of the PLS-SEM model reported in Chapter 5, which were 51% for project performance and 50% for relationship continuity. Overall, the presumed relation between the input criteria (front-end definition, collaborative practices, relational attitudes, and teamworking quality) and the outcome (project performance and relationship continuity) remains supported.

### 7.6. Conclusions

Collaborative relationship is central in engineering and construction projects. Although collaborative relationship has been a topical research area in engineering and construction projects, no attempt has been reported yet to develop an assessment tool for practical use.
independent of the formal arrangements. This chapter focuses on development and validation of relational capability assessment tool (RECAP). RECAP, in essence, is developed through a series of literature and empirical studies reported in previous chapters. Through the pilot applications of three projects and interviews involving 6 project practitioners, RECAP was validated. It was shown that RECAP could be applied by the project practitioners to measure what it is supposed to measure: the soft and relational aspects of collaboration in real-life projects at different stages. The assessment results, score levels and gaps in responses between the owner and the contractor were recognized by the participants as useful to discuss specific improvement of their collaboration. In addition, positive feedback has been received from all participants on the practicality and usefulness of RECAP. Not only did they perceive RECAP as practical to measure the collaboration health but they also foresee its usefulness as instrument to building awareness and facilitating constructive discussions for improving ongoing working relationships.

A simple regression analysis using the combined data (survey data and pilot applications) illustrated that relational capability is able to explain the variation in the project performance. The subjective usefulness recognized by the participating practitioners in turn supported the stability and robustness of the earlier developed framework and rigorously tested empirical model and constructs behind RECAP. RECAP shall be useful for both measurement tool and practical application where collaborative relationship is considered as the means to improve project performance.

RECAP could be used for any projects with any contracts because the assessment criteria/sub-criteria were generic and independent of any prescription models of collaboration as long as the senior management and project managers of both sides are willing to engage in collaborative relationship. Although it was designed to assess owner-contractor relationship, it also focuses on a generic one-to-one (dyadic) relationship between two firms. We are confident it could be applied to assess various relationships such as the relationships between an owner and a main contractor, an owner and a sub-contractor, an owner and a supplier, a main contractor and a sub-contractor, and a main contractor and a supplier.
References


Appendix 7-1. Relational capability assessment form

RELATIONAL CAPABILITY ASSESSMENT FORM

Owner-contractor collaboration represents a unique capability which significantly determines project performance. The ability to collaborate in projects is embedded in the project team, which is a temporary organization that both firms (owner and contractor) establish in order to deploy their resources in projects. Relational capability in projects is the ability of the two parties, their teams and their people in aligning and integrating their knowledge, skills, and energy to perform interdependent project activities for accomplishing a better outcome.

PURPOSE

This assessment tool is created to evaluate the relational capability at inter-firm and inter-team levels. It is intended for use by a pair of owner-contractor firms working in a project. The assessment results will provide an overview regarding the achievement of specific critical success factors of collaboration in projects.

What’s in it for the participating firms? By participating in this assessment, the pair of firms will gain insights regarding their (current/past) achievement and identify specific aspects to improve in future. The assessment focuses on how well the firms ‘work together’ and not on the ‘individual performance’ of the firms. When used in an ongoing project, the two parties can formulate joint actions more constructively to achieve better project performance. This assessment also identifies for the participating firms the potential value of continuing the relationships in future.

INSTRUCTION

1. The assessment is designed to be filled-in separately by a pair of senior management representatives or project directors or equivalent position, and/or project managers representing owner and contractor. There are a total of 17 assessment aspects and some open questions. On average, it takes about 45 minutes to complete this assessment.

2. Choose a project you are currently involved in, keep in mind the situation in that project when you rate each statement.

3. Rate each statement by selecting the appropriate level of achievement or realization or performance (1 = very poor to 5 = very good). The rating you give should be based on your own perception that best describes the actual situation occurring in the project.
A. Front-end definition and collaborative practices

This section examines the extent of how well the *front-end definition* is actually understood/comprehended by the project teams and how well *collaborative practices* are actually being implemented in the current project. Collaborative practices are additional practices used to enhance the collaboration between parties (owner and contractor) and their project teams.

The words “both teams” and “we” refer to the owner and the contractor teams. Please mark “X” on the associated rating column, where: 1 = Very Poor, 2 = Poor, 3 = Moderate, 4 = Good, 5 = Very Good, NA = not applicable, DK = Do not know.

<table>
<thead>
<tr>
<th>Sub Criteria / Indicators</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>NA</th>
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<tbody>
<tr>
<td>1. Front-end definition</td>
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<td>a. The project goals, objectives, and scope are understood by the contractor team.</td>
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<td>b. The project goals, objectives, and scope are understood by the owner team.</td>
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<td>c. All functional/ high level technical requirements (<em>basic design</em>) are reviewed together by both teams.</td>
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<td>d. The <em>project execution plan</em> is reviewed together by both teams and adjusted accordingly if needed.</td>
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<td>e. There are clear <em>roles and responsibilities</em> assigned to both teams.</td>
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<td>2. Team integration</td>
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<td>f. We form an <em>integrated project team</em> (IPT) where the owner and the contractor teams are structured and integrated as a single team with no apparent boundaries.</td>
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<td>g. We perform <em>goal setting and alignment meetings</em> with sub-contractors and suppliers.</td>
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<td>h. We perform <em>goal setting and alignment meetings</em> with the owner’s business and operation representatives.</td>
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<td>i. We exercise <em>inter-team building</em> workshops to encourage collaboration via fun and excitement.</td>
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<td>j. We have <em>recognition and rewards program</em> to stimulate individual and team levels collaborative behavior.</td>
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<td>3. Joint working processes</td>
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<td>k. We jointly conduct <em>planning</em>.</td>
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<td>l. We jointly perform <em>monitoring, controlling, and reporting</em>.</td>
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<td>m. We jointly conduct <em>issue management</em>.</td>
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<td>n. We jointly <em>define and monitor</em> the achievement of key <em>performance</em> areas.</td>
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<td>o. We jointly <em>identify and monitor risks</em> and formulate a necessary <em>mitigation plan</em>.</td>
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<td>p. We have robust <em>mechanisms to resolve conflicts/disputes</em>.</td>
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<td>q. We have formal <em>procedures for joint decision making</em>.</td>
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Collaborative contracting in projects
B. Project performance and Relationship continuity

This section is concerned with the perceived current achievement of the collaboration output, the project performance. The assessment aspects include measures of efficiency, quality of output, and satisfaction, and potential continuity of the relationship in future.

Please rate the following statements reflecting the current achievement or progress of the project so far. Please mark “X” on the associated rating column, where: 1 = Very Poor, 2 = Poor, 3 = Moderate, 4 = Good, 5 = Very Good, NA = not applicable, DK = Do not know.

<table>
<thead>
<tr>
<th>Sub Criteria / Indicators</th>
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<td><strong>4. Efficiency</strong></td>
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<td>a. The project is progressing in accordance with the estimated cost so far.</td>
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<td>b. The project is progressing in accordance with the planned schedule so far.</td>
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<td><strong>5. Quality</strong></td>
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<td>c. So far, there are no significant reworks due to major defects regarding the project deliverables.</td>
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<td>d. So far, all project activities are performed or completed safely with no accidents causing severe injury.</td>
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<td>e. So far, the facility or product constructed is taken into operation reliably without major problems.</td>
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<td>f. So far, the facility or product constructed is functioning according to the specified capacity.</td>
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<td><strong>6. Satisfaction</strong></td>
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<td>g. Both owner and contractor are satisfied with the project results and outcomes so far.</td>
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<td>h. So far, this project will make a positive impact on the owner’s business.</td>
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<td>i. So far, this project will be a (commercial) success to the contractor.</td>
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<td><strong>7. Relationship continuity</strong></td>
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<td>j. Beyond this project, we will likely work with each other in future with the same partners.</td>
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<td>k. The relationship experience we gain so far will be useful in future project(s) even with different partners.</td>
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<td>l. Because of collaboration in this project, we gain benefits that enable us to compete more competitively.</td>
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<td>m. This collaborative relationship makes our companies’ able to develop unique capabilities (truly innovative products/solutions).</td>
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C. Relational attitudes

This section is concerned with how well the senior management of both parties (the owner and the contractor) commits to support the collaboration, taking into account the degree of trust and interactional norms to bring together the necessary resources into a project.

The words “senior management” refers to high level managers or executives representing a company with the authority to make a final decision about a project. Please mark “X” on the associated rating column, where: 1 = Very Poor, 2 = Poor, 3 = Moderate, 4 = Good, 5 = Very Good, NA = not applicable, DK = Do not know.

<table>
<thead>
<tr>
<th>Sub Criteria / Indicators</th>
<th>1</th>
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<td>8. Senior management commitment</td>
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<td>a. Senior management of the owner commits to provide necessary resources and support to the project teams.</td>
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<td>b. Senior management of the contractor commits to provide necessary resources and support to the project teams.</td>
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<td>c. Senior management of the owner shows consistent and passionate leadership.</td>
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<td>d. Senior management of the contractor shows consistent and passionate leadership.</td>
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<td>e. Senior management of both parties actively work together to resolve potential conflicts when needed.</td>
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<td>9. Senior management trust</td>
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<td>f. There is an atmosphere of mutual trust between senior management of both parties.</td>
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<td>g. There is a mutual enthusiasm from senior management of both parties in achieving the project goals.</td>
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<td>h. Senior management of both parties has confidence in each other to do what is right.</td>
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<td>i. Senior management of both parties keeps their promises truthfully.</td>
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<td>10. Established relational norms</td>
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<td>j. The owner intentionally adopts ‘no blame culture’ when problems arise.</td>
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<tr>
<td>k. The contractor intentionally adopts ‘no blame culture’ when problems arise.</td>
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<td>l. The owner is intentionally open and honest in any interactions with no hidden agendas.</td>
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<td>m. The contractor is intentionally open and honest in any interactions with no hidden agendas.</td>
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<td>n. The owner strives for business outcomes whereby both parties either win or both parties lose.</td>
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<td>o. The contractor strives for business outcomes whereby both parties either win or both parties lose.</td>
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<td>p. Both parties agree to have an equal say in any critical decisions that matter to both parties.</td>
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Chapter 7

D. Inter-teamworking

This section is intended to assess how the owner’s team and the contractor’s team work together in a project across their company’s boundaries. Inter-teamworking reflects how two collaborating teams communicate with each other effectively, achieve synergies in coordinating interdependent activities, equally contribute their specific knowledge and expertise, align their effort, help each other in achieving project goals, behave as one team, and personally trust each other. The words “both teams” and “the teams” refer to the owner’s core team and the contractor’s core team. Either team can be represented by at least one person (team leader or manager or representative). Imagine the interaction between these two teams when you rate the following statements.

Please mark “X” on the associated rating column, where: 1 = Very Poor, 2 = Poor, 3 = Moderate, 4 = Good, 5 = Very Good, NA = not applicable, DK = Do not know.

<table>
<thead>
<tr>
<th>Sub Criteria / Indicators</th>
<th>1</th>
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<td><strong>11. Communication</strong></td>
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<td>a. Both teams communicate directly with each other.</td>
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<td>b. Project-relevant information is shared openly by both teams.</td>
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<td>c. Whenever a problem is detected, it is immediately and honestly communicated to the other team.</td>
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<td>d. Both teams are satisfied with the usefulness of the information shared by other team.</td>
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<td><strong>12. Coordination</strong></td>
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<td>e. The work done in the teams is closely synchronized between the teams.</td>
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<td>f. There is a clear linkage between the teams for their interdependent tasks.</td>
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<td>g. There is no redundancy regarding the work done between both teams.</td>
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<td><strong>13. Balanced contribution</strong></td>
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<td>h. Both teams recognize the specific strengths and weaknesses of each team’s competences.</td>
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<tr>
<td>i. Both teams are contributing their knowledge/expertise in accordance with their full potential.</td>
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<td>j. There is a balanced contribution of ideas between the teams.</td>
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<td><strong>14. Mutual support</strong></td>
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<td>k. Both teams help each other as well as they could.</td>
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<td>l. Whenever problems occurred, they are resolved constructively.</td>
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<td>m. Every critical decision is made together by both teams.</td>
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<td><strong>15. Aligned effort</strong></td>
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<td>n. Both teams give this project the priority it needs.</td>
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<td>o. Both teams put their best effort into this project.</td>
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<td>p. There is no conflict regarding the effort that each team put into this project.</td>
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### Sub Criteria / Indicators

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<th>16. Cohesion</th>
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<tr>
<td>q. Members of both teams are personally engaged to this project.</td>
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<td>r. Members of both teams are integrated as one team.</td>
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<td>s. Members of both teams feel proud to be part of the project team.</td>
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<td>t. Members of both teams feel responsible for maintaining the relationships within the project team.</td>
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<th>17. Affective trust</th>
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<td>u. Both teams are comfortable being dependent on each other.</td>
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<td>v. Both teams keep their promises.</td>
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<td>w. Both teams work with high levels of integrity.</td>
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<td>x. Both teams are fair to each other.</td>
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<td>y. Both teams look out for the interests of both companies.</td>
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<td>z. Both teams can rely on each other for not taking advantage of the other team’s weaknesses.</td>
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__This is the end of the assessment, thank you for the cooperation.__
Appendix 7-2. Assessment Procedure

An extensive and periodic assessment can involve 3 different levels of actors (senior management, project management, and project team levels) to provide a more comprehensive picture than the pilot assessment did as illustrated in section 3 and 4.

1. **Prepare the assessment**
   Preparing the assessment scope and sponsorship is the first important thing to do *(step 1a)*. Specific goals of the assessment should be defined properly together with the sponsor from both parties. Just like the project in which the relationship is to be assessed, the purpose of sponsorship is basically to ensure that the whole assessment is sufficiently supported and facilitated by the senior management or project managers from both parties. Subsequent to the establishment of the assessment scope and required sponsorship, the assessment form is prepared and adjusted if necessary *(step 1b)*.

2. **Conduct the assessment and interview**
   Prior to conducting the assessment *(step 2a)*, with the introduction of the sponsor a group of people from both owner and contractor is selected and contacted as participants. The assessment can be performed in two ways: by filling in the assessment form or a face-to-face meeting which allows a follow-up interview. We recommend performing assessment through face-to-face meeting because the assessment is not only to measure the relationship health in the eyes of the participants but also to collect their personal reflections regarding specific sub-criteria of the relationship they experienced. After completing the assessment with all targeted participants, the assessment data and interview report are compiled.
(step 2b). Further analysis of interview results will provide more factual information in order to write constructive narratives about specific criteria/ sub-criteria of the relationship.

3. **Perform constructive discussion or workshop**
   After the analysis of the assessment responses and interview results, a constructive discussion is performed and attended by both parties’ managers and team members (step 3a). The discussion enables the whole team to form a consensus on the strengths and weaknesses of the focused relationship. The reported scores by sub criteria and criteria are presented and compared side by side in various ways, for example according to the parties (owner and contractor), levels (senior management, project managers, or team levels), or even specific functional disciplines area. Specific attention should be given to a particular criterion/ sub-criterion with the score gap of one point or more. The same attention should also apply to a situation where, regardless the gap, a particular sub-criterion is scored worse than moderate (below 3.0). In both situations, the insights collected from assessment interviews can be used to enrich the discussion in formulating possible actions or resolution to improve specific aspects of the relationship. An action plan to the relationship is then developed together with all participants at the end of the discussion (step 3b). It not only provides an overview of the assessment results, key strengths and weaknesses of the current relationship but also resolutions and actions to improve the ongoing relationship.

4. **Implement and monitor relationship improvement plan**
   Project managers can implement the relationship improvement plan and regularly monitor the realization of the plan (step 4).
Chapter 8 | Abstract

*How could the collaborative relationship be designed and developed to improve the performance of capital projects?* This was the main question posed in the introduction of this dissertation. After conducting a series of studies, guided by several sub-questions, it is time to conclude on the results and reflect on the implications. What did this PhD research contribute to science? What remains open for future research? And how would and should the future project-based collaborative relationships look like to anticipate an increasingly complex and uncertain future? To conclude this research in detail, the research background is revisited and followed by the answers to the defined sub-questions, which can be found in Section 8.1. Subsequently, the scientific contribution is discussed in Section 8.2, and a reflection on the overall research findings and recommendation for future research avenues are given in Section 8.3.
Chapter 8 Conclusions

8.1. Conclusions of this dissertation

Owners and contractors face several challenges when delivering work in capital projects. These challenges are related to the increasing complexity and unforeseen events that emerge throughout the project life-cycle. The fragmentation of the project-based industry in combination with a traditional contracting approach and risk transfer further complicate the effort in delivering efficient, effective, and satisfactory projects. Cost and time overruns in capital projects become common in spite of professionalization of project management and significant efforts in front-end definition. It is not unusual that owner and contractor (both at firm’s and team’s levels) cope with the challenges in adversarial manners leading to a blame game, claims, and conflicts escalating to litigations. Both project management scholars and the community of practice embrace the need for more collaborative relationships in project working to at least try to overcome the above problems.

There have been a number of innovative approaches to collaborative working arrangements like project partnering, project alliancing, and integrated project delivery/team. In practice, however, these arrangements were often applied in a formalistic manner with an expectation to automatically solve the problems in collaboration. This research investigated what constitutes the antecedents and dimensions of collaborative relationship quality; developed and empirically tested a conceptual model explaining the relations between antecedents, collaborative relationship quality, and project performance; and developed and validated a relational capability assessment tool that can help owners and contractors (and the practitioners) improve their collaboration quality.

Prior to addressing the main research question, the defined sub-questions are answered subsequently.

1. What are the dimensions and elements of collaborative relationships in projects?

Extant literature recognizes collaborative relationship in positive sense and includes various forms of inter-organizational relationships ranging from supply chain partnerships, partnering/alliances, strategic alliances, and joint ventures covering both vertical and horizontal value chains. In projects, a collaborative relationship is considered as a broad term representing a range of practices and contractual arrangements such as project partnering, project alliancing, and integrated project team. Despite the differences in labeling, they share some common features such as aligned goals between project parties, mutual trust and respect, transparent and open communication, no
The results of the exploratory case study reported in Chapter 2 indicated how an owner and a contractor working in a complex engineering project, in the absence of formal collaborative arrangements, had practiced collaborative working characterized by a number of practices and success factors found in the formal collaborative arrangements like project partnering or alliancing. Notable practices and success factors are behavioral alignment, team building exercises, open communication, joint problem solving, integrated project team, competent team, leadership, trust, and long-term orientation. It was also found that the effort to form a collaborative relationship could be hampered by the difficulty in embedding the agreed behavior protocol at senior level into effective working relationships at team level. Although team building and an integrated project team were recognized as important aspects, they were not in themselves perceived as sufficient to ensure a truly collaborative relationship. It also turned out that commitment and support from senior management of the permanent organizations, and project managers’ leadership are necessary ingredients to transcend collaborative principles into real practice at individual level.

Based on the initial findings resulted from the exploratory case study, the literature review in Chapter 3 was focused on elements that constitute a collaborative relationship in more detail. Upon a systematic literature search, 21 empirical studies (10 case studies, 9 survey studies, and 2 longitudinal studies) were selected for an in-depth textual analysis. The analysis resulted in 9 prominent factors of collaborative relationships: (1) teamworking: team trust, communication, team identity, mutual support, cooperation, coordination, participation in team; (2) relational attitudes: mutual trust, transparent and open communication, no-blame culture, win-win attitude, interdependence, long-term orientation; (3) team integration: integrated team, single focus, shared vision, aligned goals, dedicated structure; (4) trust: competence trust, goodwill trust, integrity trust, trust in team, inter-organizational; (5) joint working: joint involvement, risk management, performance management, active dispute resolution, joint problem solving; (6) contract: clear definition of roles and responsibilities, incentives, fair risk allocation, safeguard; (7) communication: open, transparent/honest communication between parties and in team; (8) commitment: senior management commitment, support, involvement, leadership; (9) capability: project management and technical capability, financial capacity, early joint effort/involvement. Building on an input-mediator-output framework known in team effectiveness literature, an integrative model of collaborative relationship was conceptualized in which teamworking and team trust act as mediators that link the antecedents (relational attitudes, team integration, joint working, senior management commitment, owner-contractor capability, and contract) to the outcomes (project performance and expectation of a continuing
Collaborative contracting in projects

Conclusions

2. How could the practitioners improve their collaborative relationships to ensure successful project delivery?

Answer this sub-question was based on the project practitioners' subjectivity that is the practitioners' own perception, belief, and reflection casted through their experience in different projects. In Chapter 4, Q-methodology (Brown, 1980; Stephenson, 1953) was applied to systematically analyze the project practitioners' subjectivity. The Q-factor analysis revealed four subjective distinct preferences for improving owner-contractor relationship, i.e.: shared team responsibility, execution focused team, joint capability and structure, and senior leadership pair. The shared team responsibility perspective is built on a view that owner-contractor relationship can be improved by focusing on the formation and governing process of effective teamwork. The execution focused team perspective is built on a view that owner-contractor relationship can be improved by teamworking that is primarily driven by the contractor with the focus on project execution. The joint capability and structure perspective underlines the formation of the project team at the front-end of the project as the core element of owner-contractor collaborative relationship. Finally, the senior leadership pair perspective emphasizes relational attitudes, particularly the influence of senior management leadership from both sides on the formation of the project team and on shaping the right teamworking culture.

Across the four perspectives, through the practitioners’ reflection it was found that the top-10 most important elements of a collaborative relationship are **team's affective trust**, **open and honest communication**, **shared objectives**, **no blame culture**, **contractor's project management capability**, **owner's senior management leadership**, **senior management involvement in conflict handling**, **contractor's senior management support**, **contractor's trust**, and **contractor's senior management leadership**.

At the higher conceptual or factor level, it was found that collaborative relationships as perceived by the practitioners are more about **teamworking** and **relational attitudes**, i.e.: by nurturing the team's **affective trust** and **shared objectives**, by intentionally establishing **no blame culture** and **open and honest communication** on inter-firm level, **social interaction**, **acceptance of conflicting opinions**, and **senior management commitment and leadership**. Overall, more effective collaborative relationships could be achieved through relational attitudes shared by senior management and day-to-day management attention for teamworking. According to the Q-sort results, **capable teams**, **team integration practice**, **joint working procedures** and **contract** are necessary but not sufficient for effective collaboration. Interestingly, contractual functions (as the **basis to manage the project activities and to specify risks, scope of work, explicit financial incentive, and remuneration scheme**) were perceived to be relatively less important than
other elements. All in all, a collaborative relationship in projects is not so much about contract and there is a real role for senior management to take in this approach.

3. To what extent do relational factors determine collaborative relationships, project performance and expectation of a continuing relationship?

A number of critical success factors (CSFs) have been suggested to influence owner–contractor collaboration such as top management commitment, team integration, joint working, capability, and teamwork. While such contributions recognize the factors that contribute to owner–contractor collaboration, there is a lack of empirical studies that provide an integrative model and empirical validation of how these factors relate to each other and contribute to project performance. Building on the initial conceptual model (Chapter 3) and the results of the Q-study (Chapter 4), in Chapter 5 the aforementioned CSFs were structured into an integrative model: antecedents, mediators, and consequences. With the focus on inter-team collaborative processes, teamworking quality (with 7 components: communication, coordination, balanced contribution, aligned effort, mutual support, cohesion, and affective trust) was positioned as the mediator that links the effects of three antecedents—relational attitudes (relational norms and senior management commitment), collaborative practices (team integration and joint working procedures), and teams' joint capability (the project team's overall competence and experience)—on consequences—project performance (efficiency, effectiveness, perceived satisfaction, and perceived success) and perceived relationship continuity (expectation of a continuing relationship). Based on the model, it was hypothesized that the antecedents directly affect project performance and perceived relationship continuity, indirectly affect project performance through teamworking quality, and indirectly affect perceived relationship continuity through teamworking quality and project performance.

The results from the survey supported the hypotheses that teamworking quality significantly improves project performance and teamworking quality mediates the indirect effects of relational attitudes, collaborative practices, and teams’ joint capability to project performance. There was no empirical evidence that relational attitudes, collaborative practices, and teams’ joint capability directly affect project performance. Taken together, the results suggest that project teams' capability, the formal application of collaborative practices, and shared relational attitudes do not automatically lead to a successful project without day-to-day managerial attention for the teamworking processes. Without this attention, project teams often face difficulty in implementing formal collaborative arrangements into their daily practice. Furthermore, the relatively stronger effects of relational attitudes compared to collaborative practices on project performance, provide a confirmation that the focus on soft and people aspects is more influential than the formal application of supporting practices and techniques.
It was also found that project performance and relational attitudes significantly affect the parties’ expectation of a continuing relationship. A successful project-based collaboration may create a positive opportunity beyond the individual project, as it positively affects the parties' expectations regarding continuing their relationship. Interestingly, relational attitudes have much more positive direct effects on the parties' perceived relationship continuity than the indirect effects through teamworking quality and project performance. This suggests that the opportunity for future relationships is also strongly determined by the extent of the relational norms built and the commitment retained between the two permanent organizations.

4. **How do different contract types and contractual incentives influence collaborative relationships and project performance?**

The mixed results of collaborative contracts on project performance suggest a missing mechanism linking effects of contract types to project performance. In Chapter 6, the PLS-SEM model developed in Chapter 5 was extended into a mediation model with **multi-categorical antecedents** in which relational attitudes and teamworking quality mediate the effects of contract types and contractual incentives on project performance.

The results supported the hypotheses that a partnering/alliance contract is likely to be more collaborative than a lump-sum or reimbursable contract; and through better relational attitudes and teamworking quality, projects with a partnering/alliance contract are likely to perform better than those with lump-sum and reimbursable contracts. In the same way, through better relational attitudes and teamworking quality, projects with contractual incentives are likely to perform better than those without incentives. Apart from this indirect mechanism, no differences in the performance of projects can be directly attributed to different contract types and contractual incentives. Contrary to a common belief that a lump-sum contract tends to be more adversarial than a reimbursable contract, no difference was found in the degree of relational attitudes and teamworking quality between reimbursable and lump-sum projects. This suggests that the predominant use of lump-sum contracts does not always result in adversarial attitudes.

After controlling for contract types and incentives it was found that relational attitudes significantly lead to enhanced teamworking quality which in turn improves project performance. This suggests that regardless of contract type and incentive, the quality of owner-contractor collaboration significantly contributes to project performance. Taken together and also consistent with the relatively low ranked contractual aspects as perceived by practitioners in Q-study (Chapter 4), it was concluded that partnering/alliance and contractual incentives by themselves are not the game changer but the parties’ attitudes towards collaborative relationships and how they play out throughout the project into actual teamworking behavior do make a difference.
5. **How can the practitioners improve their collaborative relationship in real-life project practice?**

The answers to prior sub-questions consistently support the notion that real collaboration in capital projects requires deliberate relational attitudes between senior management and teamworking within and between project teams. Given the dynamic nature of collaborative relationship over the project life cycle, it is important to recognize that collaborative working is a fluid concept that emerges from individual and organizational interactions. This implies the need for a means of assessing how well the owner and contractor and the teams are working together and how this changes over time. In Chapter 7, *Relational capability assessment tool* (RECAP) was developed and validated for the project practitioners to measure the current state of their collaborative working. Connecting all findings from chapters 2–6, RECAP includes 4 relational capability criteria: *relational attitudes, teamworking quality, good collaborative practices, and front-end definition*; and 2 performance criteria: *project performance and relationship continuity* (see Table 7-1 and Appendix 7-1). On the basis of pilot applications in three projects and interviews involving 6 project practitioners, RECAP was validated. It was shown that RECAP could be applied by the project practitioners to measure what it is supposed to measure: the soft and relational aspects of collaboration in real-life projects at different stages. The assessment results, score levels and gaps in responses between the owner and the contractor were recognized by the participants as useful to discuss specific improvement of their collaboration. In addition, positive feedback has been received from all participants on the practicality and usefulness of RECAP. Not only did they perceive RECAP as practical to measure the collaboration health but they also foresee its usefulness as instrument to building awareness and facilitating constructive discussions for improving ongoing working relationships. The practitioners can apply RECAP on any project with any contract because the assessment criteria/sub-criteria are generic and independent of any prescribed model of collaboration.

Having answered all sub-research questions, regardless of contract types and incentives, collaborative relationship could be designed and developed to improve the performance of capital projects as follows.

a. Answers to all sub-questions consistently show the evidence of the efficacy of teamworking as key determinant of and a mechanism that links other factors to project performance. A collaborative relationship could be designed and applied through day-to-day managerial attention for teamworking: ongoing communication, coordination, affective trust, cohesion, balanced contribution, aligned effort, and mutual support are manifested between teams. It was also evident that relational attitudes, collaborative practices, and joint teams’ capability do not directly affect project performance but improve teamworking. Owners’ and contractors’ project managers need to constantly manage their relationships over time at the permanent organizational level by catalyzing shared relational attitudes (characterized by *mutual trust, commitment, openness*, and a
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**no-blame culture** between the senior management of both the owner and the contractor. Apart from assembling teams with sufficient capability, project managers from both sides can apply collaborative practices—such as formal team integration, team building, and joint risk management—early and throughout the project.

b. Additionally, owners and contractors can adopt a formal collaborative contract like partnering or alliance to structure their collaborative relationships but need to be aware that such a contract does not directly increase project performance on its own but indirectly through its effect on relational attitudes and then teamworking quality (see answer to sub-question 4). Partnering/alliance and contractual incentives do have a positive influence on the project but they also come at a cost. The most costly resources of collaboration are not money but extra time and thoughtful effort that are needed for establishing relational norms of trust, building credible commitment from senior management, and ensuring effective task-related and social interactions in teamworking while coping with accountability issues and other organizational priorities outside the collaboration process. The amount of time and effort that are demanded from both parties can be demotivating, particularly when they do not recognize the emergent nature of collaboration. Partnering/alliance and contractual incentives do not improve performance if the managers (senior management and project managers) from both sides do not share equitable commitment, do not trust each other, do not properly manage to articulate a direction persuasively on the extent the teams work together, and cannot confront conflicts or difficulties openly and constructively whenever they arise.

c. Besides delivering a successful project, it is of mutual interest to both owner and contractor to establish a longer-term relationship (see answer to sub-question 3). Shared relational attitudes between senior management at the firms level are highly influential in shaping the parties' expectations (as perceived by project managers) regarding a future relationship. This means that to establish a longer-term relationship with a particular owner or contractor, it is crucial for the senior management from both sides to not only build their reputation through successful projects, but also maintain their relationships over time across projects.

d. A real collaborative relationship is a fluid phenomenon, individual and organizational interactions evolve and unforeseen events emerge over the project life-cycle. Failing to recognize this creates surprises and potential dysfunction. Owner and contractor need to be aware and identify specific aspects of their collaboration so that together they can formulate specific interventions, in a constructive way to improve the ongoing (and potentially future) relationship. The RECAP provided answer to sub-question 5 (developed and validated in Chapter 7) enabling the practitioners to self-diagnose the soft and relational nature of collaboration in projects over different phases and regardless of contract types.
8.2. Scientific contributions

This research made several scientific contributions. Extant literature on collaborative contracting suggests the need to investigate what factors and mechanisms actually make owner-contractor collaboration become effective and eventually improve project performance (Bresnen and Marshall, 2002; Chan, Johansen and Moor, 2012; Hartmann and Bresnen, 2011). This research adopted a broader concept ‘relationship approach’ (Pryke and Smyth, 2006; Smyth and Pryke, 2008; Walker and Hampson, 2003) by focusing on the primary mechanism in transforming input factors into values that represent the collaboration between organizations and people in teams. With such a focus, this research took into account that projects are about people, their mind sets (Winch and Maytorena, 2011) and characterized by competing cultures and rationalities (Sanderson, 2012).

With a stronger focus on the actuality of projects and project-as-practice (Cicmil, Williams, Thomas and Hodgson, 2006; Hällgren and Söderholm, 2011), a systematic study of subjectivity, based on Q-methodology, was performed to investigate the practitioners’ perspectives on collaborative relationships. The results reveal four subjective distinct preferences for improving owner-contractor relationship, i.e.: shared team responsibility, execution focused team, joint capability and structure, and senior leadership pair. Despite the differences, the practitioners shared common beliefs and perceptions that an effective collaborative relationship is more about teamwork and attitudes. The practitioners’ views supported the notion that collaboration cannot only be prescribed through formal arrangements/contracts but should also be socially constructed.

It is widely presumed that owner-contractor collaboration quality positively influences project performance, but this view lacks empirical support (Bygballe, Jahre and Swärd, 2010; Meng, 2011; Xue, Shen and Ren, 2010). The survey study in Chapter 5 confirmed the positive effect of owner-contractor collaboration quality (operationalized in terms of relational attitudes and teamworking quality) on project performance. Furthermore, the analysis reported in Chapter 6 clarified the role of contract types and contractual incentives. By systematically analyzing the relative effects of three different contract types and the presence (or absence) of contractual incentives, it was found that a partnering/alliance contract and incentive contract do not necessarily result directly into better project performance but through relational attitudes and how they play out into actual teamworking behavior.

In their discussion on the classical work of Pinto, et al. (Pinto and Slevin, 1988; Pinto and Prescott, 1988), Müller and Jugdev (2012) call for more research towards development of middle range theory that “examines causal relationships between success factors, project success and organizational success, and research that explores moderating and mediating variables of success” (p.768-9). Answering this call, this research applied a structural model in which teamworking mediates the effects of antecedents—relational attitudes, collaborative practices, teams’ joint capability—on project performance and relationship
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continuity as the consequences. Furthermore, by assimilating the works of Hoegl and colleagues (Hoegl and Gemuenden, 2001; Hoegl, Weinkauf and Gemuenden, 2004; Hoegl and Parboteeah, 2007) and Pinto et al. (2009) with the rich ‘team and teamwork’ literature (for example Mathieu, Maynard, Rapp and Gilson, 2008), this research broadened and validated the concept of teamworking quality as a higher-order construct of 7 dimensions (communication, coordination, cohesion, aligned effort, balanced contribution, mutual support, and affective trust) for measuring collaboration or relationship quality at inter-team level.

8.3. Implications for management of projects

There have been some innovations to cope with the aforementioned risk-adverse behavior in project working, namely relationship contracting aiming to develop interdependent, reciprocal, and collaborative relationships between two (or more) project parties beyond the narrow view of the contract as legal document. Most attempts in operationalizing and applying relationship contracting in engineering and construction projects began in the 1990s and were advocated as partnering, alliancing, or integrated project delivery/team. Over the last two decades, this ‘new way of working’ was increasingly applied in practice, with both satisfactory and unsatisfactory results. Research in partnering/alliance frequently dubs the reasons for unsatisfactory results being the lack of a precise definition of partnering, the lack of willingness and commitment from senior management, the conflict between commercial pressures and forms of collaboration, and the inherent barriers to change the (organizational) culture to support collaborative approaches.

Building upon theories and prior research in inter-organizational relationships, this research reassessed project-based collaboration through its essential ingredients rather than prescribed models. In particular, this research concentrated on and traced through the effects of relational attitudes, teamworking, collaborative practices, and joint teams’ capability that are often presumed to play an important role to support or inhibit the performance of owner-contractor collaboration. It confirms that teamworking quality (including team level affective trust) and front-end definition are the main determinants to better project performance. Other factors: relational attitudes, collaborative practices, joint teams’ capability indirectly contribute to project performance through teamworking quality. Interestingly, these effects hold regardless of the contract types and contractual incentives.

The latter finding, supported by a recent report on partnering/alliance projects (see Walker and Lloyd-Walker, 2015), has the most important implication for practice. It turns out that a successful collaboration is not so much about innovation in contractual arrangement but more about ‘people management’: senior management commitment and leadership, mutual trust and shared norms, team’s task-related interactions (communication, coordination, mutual support, aligned effort, and balanced contribution), and team’s social interactions (cohesion or ‘we-ness’ and affective trust). These aspects were considered as a new way of ‘managing teams’ in PMI’s CIRCA 2025 that is by recognizing people aspects and associated
Such a new way of managing teams is actually not a new concept in the organization management field. The only challenge is that project managers, especially those whose background is in technical disciplines, are not used to/prepared to perform such a management approach. Managing a large number of people at different levels (hierarchy) with diverse background, experience, skill-sets, cultures, from different firms temporarily and in a relatively short period of time is already a challenge itself in addition to managing other project resources. Fortunately the project organization is a hybrid form of hierarchy and cross-functional hence offers layering to reduce the complication. Perhaps what need to be crafted by future project managers is ‘experiential learning’ of new social and behavioral skills. Of course this experiential learning does not come from a lecture in class but through real-life situations. The more experienced a project manager is, the more she or he is able to craft the skills (Bakker, Arkesteijn, Bosch-Rekveldt and Mooi, 2010). This natural process, however, takes years and may not be able to keep up with the demand in the industry. One way to speed up this process is, besides training on the job for young future project managers, by means of simulation-based training with the application of serious gaming. At the same time, this offers a rich ground for future research avenues.

What can be learned from current progress in practice and research of collaborative relationships? In practical sense, it is about changing the mindset (way of thinking) and behavior (way of conducting). Quite often, there is a question whether it is about adversarial competition versus collaborative working. Not exactly, both are necessary and complementing but in different situations. Competitive attitudes or even adversarial behavior is still needed prior to and during the contract. Not only competition between contractors bidding for a particular project is necessary but also between the preferred/selected contractor and the owner. This competitive attitude can be focused to challenge the assumptions underlying the project definition and estimates. This can encourage innovation, reduce optimism bias, and at the end result in a mature and realistic front-end definition. When the owner and the contractor enter a relationship and start working together, they have to ‘cease to be strangers’ and change their attitudes and behavior into a collaborative mode. Of course, working together collaboratively will not eliminate, but make the teams more able to actively cope with conflicts, tensions, and potential disputes between the parties and between people due to internal or external unforeseen events. A collaborative relationship is about working together and integrating different sets of skills, expertise, experience, views, and thoughts from many people with diverse backgrounds and interests. It is neither a given nor flourishes automatically. It needs to be “managed” in an ongoing manner at all levels, from the project steering committee or senior management to the project management team, team leaders, and team-members on both owner and contractor sides. In addition to standard project management processes, future project managers need to put sufficient time and effort in building the collective will of the people to perform as one team, and become proud of what they do.
8.4. Recommendations for future research

This research resulted in tested conceptual models (see Figure 5-2 and 6-2) of collaborative relationships in capital projects. The empirical data used in the testing and validation of the model includes engineering and construction projects in various industrial sectors executed worldwide with the majority of them in the Netherlands. How this framework/model could be applied for different types of projects (research and development or new product development projects) in the same sectors or for publicly funded projects (infrastructure) in developed or developing countries provides research opportunities in the future. Future studies could aim to replicate the findings with a larger sample, in different countries and with different project types. Another promising avenue for future study is to extend the research model by adding country-specific and cultural factors as potential moderators.

Regarding the effects of different contract types, this research did not distinguish partnering from ‘pure’ alliance contract. The proponents of ‘pure’ alliance argue that alliance is a legally enforceable form of relational contracting with formal charter, governance, and management structures and hence expect better outcome of pure alliance in public construction/infrastructure projects than from partnering (see Ross, 2003; Walker and Hampson, 2003). Future studies with a focus on publicly funded projects could extent the analysis by further comparing the performance of alliance with partnering contract.

The current research was primarily focused on the effect of collaborative relationships in the execution phase of projects, particularly on two types of relationships: inter-firm and inter-team levels. In reality, it is also necessary to recognize other types of relationships, for example, the relationship between the parent organization (senior management) and the project team. Another caveat is that relationships are evolving and potentially change throughout the project lifecycle. Future research could focus on the dynamics of different types of relationships in more detail through a longitudinal study. The RECAP assessment tool developed and validated in Chapter 7 can be utilized to support such a study.

This research has revealed interesting results. A thorough front-end development is indispensable but won’t deliver success without real teamworking. So, all in all, teamwork is of paramount importance. Let’s team up and make it happen!
References


Samenvatting

Er zijn legio voorbeelden van grote investeringsprojecten op verschillende gebieden, denk aan LNG installaties, olieboorplatforms, massatransportsystemen, chemische fabrieken en nieuwe infrastructuur. Stuk voor stuk vragen deze projecten enorme investeringen van privaat en/of publiek geld en deze belanghebbende organisaties hebben een strategisch belang bij de realisatie van de artefacten. Ondanks de professionalisering van projectmanagement en de bereidheid van eigenaren om (flink) te investeren in een degelijk voortraject (“front-end development”) van de projecten wordt meer dan de helft van deze projecten boven budget en met vertraging opgeleverd. Hoewel de geleverde artefacten uiteindelijk wel hun functie vervullen, is hiermee wel de (financiële) reputatie van de opdrachtgevers in het geding, ook in de ogen van bijvoorbeeld financiers of aandeelhouders. Zowel vanuit het oogpunt van beleggingsanalisten als vanuit projectmanagementonderzoek is er meer inzicht nodig hoe de samenwerking tussen opdrachtgever en opdrachtnemer verbeterd kan worden zodanig dat de projectresultaten ook verbeteren.

Bestaande literatuur erkent het concept samenwerking in projecten als principe dat een scala aan relatiegeoriënteerde contracten, zoals project partnering, projectallianties en geïntegreerde projectteams omvat. De succesverhalen van project partnering of projectallianties zijn breed uitgemeten in de Verenigde Staten, Groot-Brittannië, Hong Kong en Australië. Echter, een aantal diepte case studies onthult ook dat partnering of projectallianties niet altijd ten volle benut worden en dus rijst de vraag wat dergelijke voorbeelden van collaboratieve aanbestedingen nu eigenlijk inhouden. Een grondig empirisch onderzoek wordt voorgesteld om de essentie te begrijpen (factoren, mechanismen en attributen) van samenwerkingsverbanden en hun specifieke effecten op de resultaten van het project. De centrale onderzoeksvraag van dit proefschrift luidt dan ook: Hoe kunnen samenwerkingsverbanden worden vormgegeven en tot uitvoer worden gebracht zodanig dat de algehele prestaties van projecten verbeteren? Het onderzoek werd uitgevoerd in vier fasen met kwalitatieve en kwantitatieve empirische studies, met de nadruk op de uitvoering van investeringsprojecten binnen de Nederlands Apparatenbouw en Procesindustrie (NAP).

De eerste fase van het onderzoek wordt beschreven in hoofdstuk 2 en 3. Hoofdstuk 2 beschrijft een case studie waarin een projectmanager van een opdrachtgever en een projectmanager van een opdrachtnemer een samenwerkingsverband voor het leveren van een complex engineering project hebben gerealiseerd. Hoewel het niet formeel een collaboratief contract was, werd de relatie gekenmerkt door een aantal manieren van werken en succesfactoren die ook kunnen worden gevonden in project partnering of alliantievorming. Manieren van werken en succesfactoren waren afstemming van de manier van werken, teambuilding, open communicatie, gezamenlijke probleemoplossing, geïntegreerd projectteam, een competent team, leiderschap, vertrouwen en lange termijn
oriëntatie. Hoewel teambuilding en een geïntegreerd projectteam werden erkend als belangrijke aspecten, werden ze niet op zichzelf beschouwd als voldoende om een echt samenwerkingsverband te garanderen. Uit de case studie kwam ook een probleem naar voren met het vertalen van het overeengekomen gedragsprotocol op senior management niveau naar effectieve werkrelaties op teamniveau.

Op basis van deze eerste bevindingen richt de literatuurstudie in hoofdstuk 3 zich op de elementen die een samenwerkingsverband karakteriseren. In een systematisch literatuuronderzoek zijn 21 empirische studies (10 case studies, 9 survey studies, en 2 longitudinale studies) geselecteerd voor een grondige tekstanalyse. De analyse resulteerde in een aantal factoren voor samenwerkingsrelaties: teamverband, relationele houding, teamintegratie, vertrouwen, gezamenlijk werken, contract, communicatie, betrokkenheid en kundigheid. Voortbouwend op een input-mediator-output model uit de literatuur over teameffectiviteit, is een geïntegreerd model ontwikkeld waarin teamverband en het teamvertrouwen fungeren als mediators tussen de antecedenten (relationele attitudes, teamintegratie, gezamenlijke werkgroep, senior management commitment, kundigheid van de opdrachtgever/opdrachtnemer en het contract) en de resultaten (projectprestaties en het uitzicht op een langer voortdurende samenwerkingsrelatie).

De tweede fase van het onderzoek wordt beschreven in hoofdstuk 4 en presenteert de ingrediënten voor het verbeteren van de relatie tussen opdrachtgever en opdrachtnemer in projecten vanuit de subjectieve visie van projectleiders uit de praktijk. Het onderzoek richt zich op een systematische analyse van subjectiviteit van de projectleiders door toepassing van de Q-sort methodologie - een discursieve, constructivistische benadering waarbij zowel kwalitatieve als kwantitatieve methoden worden gecombineerd. Bij het onderzoek zijn 30 project professionals geïnterviewd (15 uit 9 verschillende opdrachtgevende bedrijven en 15 uit 10 verschillende aannemersbedrijven), waarbij ze gevraagd is om 55 statements op volgorde van belangrijkheid te ordenen. In de 55 statements zijn de 6 factoren van samenwerken uit hoofdstuk 3 vertegenwoordigd.

De Q-sort bleek vier verschillende perspectieven op te leveren voor de verbetering van de opdrachtgever-opdrachtnemer relatie te weten: een gedeelde teamverantwoordelijkheid, focus op projectexecutie, gezamenlijke kundigheid en structuren en tenslotte senior leiderschap samenwerking. Over de vier perspectieven heen, bleek dat de top-10 van belangrijkste elementen voor een samenwerkingsverband waren: vertrouwen in het team, open en eerlijke communicatie, gemeenschappelijke doelstellingen, geen verwijtcultuur, projectmanagementkwaliteit van de aannemer, leiderschap van het senior management van de opdrachtgever, senior management betrokkenheid bij conflicten, senior management ondersteuning van de opdrachtnemer, vertrouwen opdrachtnemer en leiderschap bij het senior management van de opdrachtnemer. In het algemeen bleek dat de project professionals van mening waren dat meer effectieve samenwerkingsverbanden resulteerden uit gezamenlijke waarden op het gebied van samenwerking op het senior management
niveau en een continue aandacht voor samenwerken in een team. Volgens de Q-sort resultaten zijn kundige teams, het integreren van de teams, gezamenlijke werkprocedures maar ook het contract noodzakelijke maar geen voldoende voorwaarden voor een effectieve samenwerking. Interessant is dus dat contractuele zaken gezien worden als relatief minder belangrijk: in samenwerkingsverbanden gaat het dus niet zozeer om het contract maar wordt de -samenwerkende- rol van het senior management gezien als veel belangrijker.

De derde fase van dit onderzoek wordt beschreven in hoofdstuk 5 en 6. In hoofdstuk 5 wordt het conceptueel model, zoals dat geformuleerd was in hoofdstuk 3, geoperationaliseerd en empirisch getoetst. Met een focus op inter-team samenwerkingsprocessen wordt team working (onderverdeeld in 7 onderdelen: communicatie, coördinatie, evenwichtige bijdrage, onderling afgestemde inspanning, wederzijdse ondersteuning, teamcohesie en vertrouwen) gemodelleerd als de mediator die de drie antecedenten – relationele houding (relationele normen en senior management betrokkenheid), collaboratieve praktijken (teamintegratie en gezamenlijke werkprocedures) en de gezamenlijke kundigheid van de teams (algemene kundigheid en ervaring van de projectteams) – koppelt aan de projectprestaties (efficiëntie, effectiviteit, aantoonbare tevredenheid en gepercipieerd succes) en een gepercipieerd uitzicht op een langer voortdurende samenwerkingsrelatie (toekomstige samenwerking). In lijn hiermee werd de hypothese opgesteld dat de antecedenten a) rechtstreeks van invloed zijn op de projectprestaties en toekomstige samenwerking, b) indirect van invloed zijn op de projectprestaties via teamwork kwaliteit en c) indirect van invloed zijn op toekomstige samenwerking via teamwork kwaliteit en projectprestaties.

Figuur 0-1. Conceptueel model en empirisch getoetste resultaten
Opmerking: alle gestandaardiseerde regressie coëfficiënten zijn significant bij $p < 0.05$
De empirische gegevens zijn verzameld met behulp van een online vragenlijst in de periode oktober-december 2013. De respondenten waren vooral projectmanagers, teammanagers en functionele managers van bedrijven binnen NAP. De 113 reacties zijn geanalyseerd met behulp van *partial least square structural equation modeling* (PLS-SEM). De PLS-SEM analyses bevestigden de hypothesen dat teamwork kwaliteit de prestaties van projecten significant verbetert en dat teamwork kwaliteit een mediërende rol speelt tussen de indirecte effecten van relationele attitudes, collaboratieve praktijken en de gezamenlijke kundigheid van teams op de projectprestaties. Er was geen empirisch bewijs dat relationele attitudes, collaboratieve praktijken en de gezamenlijke kundigheid van teams rechtstreeks de prestaties van een project beïnvloeden. Samenvattend suggereren de resultaten dat de drie antecedenten niet automatisch de projectprestaties verbeteren anders dan via echte teamwork. Bovendien zijn de relatief sterkere effecten van relationele attitudes ten opzichte van collaboratieve praktijken op de prestaties van het project, een bevestiging dat de focus op zachte en menselijke aspecten van meer invloed is dan de formele toepassing van de “harde” projectmanagementtechnieken. Ook is geconstateerd dat in verhouding tot de prestaties van de projecten, relationele attitudes sterkere effecten hebben op de toekomstige samenwerking van de partijen. Dit suggerereert dat de mogelijkheid van toekomstige samenwerking ook sterk wordt bepaald door de mate van de relationele normen opgebouwd en onderhouden tussen de twee samenwerkende organisaties.

De wat tegenstrijdige effecten van collaboratieve contracten op de prestaties van het project suggereren dat er een mechanisme ontbreekt in de modellen die de effecten van contractvormen aan de prestaties van het project koppelt. In hoofdstuk 6, zijn hypothesen getoetst dat de relatieve effecten van drie verschillende soorten contract (partnering/alliantie, reimbursable en lump sum) en het effect van contractuele bonussen (met en zonder bonus) van invloed zijn op projectprestaties gemedieerd door relationele attitudes en teamwork kwaliteit. De PLS-SEM analyses ondersteunden de hypothese dat een partnering/alliantie contract waarschijnlijk meer samenwerkend wordt ervaren dan een lumpsum of reimbursable contract. Daarnaast is met de PLS-SEM analyses aangetoond dat alleen door betere relationele attitudes en teamwork kwaliteit de projecten met een partnering/alliantie contract beter presteren dan die met lumpsum en reimbursable contracten. Op dezelfde manier zijn wederom door betere relationele attitudes en teamwork kwaliteit de projecten met contractuele bonussen succesvoller in de uitvoering dan die zonder contractuele bonussen. Afgezien van dit indirecte mechanisme via teamwork kwaliteit en relationele attitudes kunnen geen verschillen in de prestaties van projecten gevonden worden die rechtstreeks kunnen worden toegeschreven aan de verschillende soorten contracten en contractuele bonussen. In tegenstelling tot de algemeen geldende overtuiging dat een lumpsum contract meer frictie oplevert in de samenwerking dan een reimbursable contract, is geen verschil gevonden in de mate van relationele attitudes en teamwork kwaliteit tussen reimbursable en lumpsum projecten. Dit suggerereert dat lumpsum contracten, die nog steeds het vaakst worden toegepast, volgens deze resultaten niet vaker
zullen leiden tot meer onderlinge strijd tijdens de projectuitvoering dan contracten op uurbasis.

Onafhankelijk van de contractvormen en bonussen bleek dat de relationele attitudes leiden tot significant verbeterde teamwork kwaliteit die op zijn beurt weer leidt tot betere projectprestaties. Dit suggereert dat, ongeacht het type contract en bonus, de kwaliteit van de samenwerking tussen opdrachtgever en opdrachtnemer aanzienlijk bijdraagt aan de prestaties van de projecten. In overeenstemming met de resultaten van de Q-sort uit hoofdstuk 4 waar contractuele aspecten relatief laag gerangschikt waren, kan worden geconcludeerd dat de samenwerking/alliantie en contractuele bonussen op zich niet het verschil maken, maar daarentegen maakt de houding van de partijen ten opzichte van samenwerkingsrelaties en teamwork wél het verschil.

Alleen al vanwege het veranderende karakter van een project in de diverse projectfases is het van belang om te bedenken dat de samenwerking ook een dynamisch concept is dat voortkomt uit de interactie tussen individuen en organisaties. De vierde fase van dit onderzoek richt zich dan ook op de ontwikkeling van een hulpmiddel voor het management van een project of bedrijf om te beoordelen hoe goed de opdrachtgever en opdrachtnemer en de teams samenwerken in de loop van het project. In hoofdstuk 7 is de RELationale CAPabilititeit assessment tool (RECAP) ontwikkeld en gevalideerd voor toepassing in de projectpraktijk om de kwaliteit van samenwerking te meten. Deze metingen kunnen naar believen worden uitgevoerd. Bouwend op alle bevindingen uit de hoofdstukken 2 tot en met 6 bevat RECAP vier relationele criteria: relationele attitudes, teamwork kwaliteit, collaboratieve praktijken en project front-end definitie. Daarnaast bevat RECAP de twee eerder gebruikte afhankelijke variabelen: projectprestatie en toekomstige samenwerking. RECAP is gevalideerd door toepassing in drie projecten. Hiertoe zijn voor de drie projecten de projectmanagers bij de opdrachtgever en de opdrachtnemer geïnterviewd (totaal zes interviews). De projectmanagers bevestigden dat RECAP daadwerkelijk geschikt is om ondersteuning te bieden om in verschillende stadia van een echt project de relationele aspecten van de samenwerking in kaart brengen. De uitkomsten van RECAP (inschatting van het niveau van samenwerking van beide zijden en verschillen tussen de gepercipieerde niveaus van samenwerking tussen de opdrachtgever en de opdrachtnemer) werden door de deelnemers als zinvol ervaren met name om doelgericht de eventueel benodigde verbetering van de samenwerking te bespreken. Alle deelnemers waren positief over de uitvoerbaarheid en het nut van een tool als RECAP. De geïnterviewden zeiden RECAP in principe te kunnen toepassen op elk project met elk type contract, vanwege het feit dat de beoordelingscriteria en sub-criteria algemeen geformuleerd zijn en onafhankelijk van een bepaald model van samenwerking.

Alle bevindingen komen samen in hoofdstuk 8. Daarin wordt opgesomd hoe de samenwerkingsverbanden kunnen worden vormgegeven en tot uitvoer worden gebracht om de prestaties van projecten te verbeteren. Een echt samenwerkingsverband heeft de
dagelijkse bestuurlijke aandacht nodig voor teamwork: voortdurende communicatie, coördinatie, vertrouwen, cohesie en evenwichtige bijdragen, op elkaar afgestemde inzet en wederzijdse support van beide teams. Projectmanagers van de opdrachtgever en de opdrachtnemer moeten voortdurend hun relaties managen op het operationele niveau door bevorderen van gedeelde relationele normen en waarden (gekenmerkt door wederzijds vertrouwen, betrokkenheid, openheid en vergevingsgezindheid) tussen het senior management van de opdrachtgever en de opdrachtnemer. Afgezien van het samenstellen van teams met voldoende capaciteiten, zouden projectmanagers van beide kanten de relevante samenwerkingsvormen - zoals formele teamintegratie, teambuilding en gezamenlijk risicomanagement – zowel in de ontwerpfase moeten gebruiken als gedurende de uitvoering van het hele project.

Daarnaast moeten opdrachtgever en opdrachtnemer een formeel samenwerkingscontract afsluiten, zoals een partnerschap of alliantie om hun samenwerkingsverbanden formeel te structureren. Daarnaast moeten zij zich ervan bewust zijn dat een dergelijke overeenkomst de projectprestaties niet vanzelf verbetert, anders dan indirect via het effect van de relationele attitudes en de teamwork kwaliteit. Partnerring/alliantie en contractuele bonussen hebben een positieve invloed op het project, maar er hangt een prijskaartje aan. De kostbaarste kant van de samenwerking is niet het geld, maar de extra tijd en inspanningen die nodig zijn voor het vaststellen van relationele normen van vertrouwen, het bouwen van oprechte betrokkenheid van het senior management en het zorgen voor doeltreffende taakgerelateerde en sociale interacties in teamverband.

Naast het leveren van een succesvol project is het van wederzijds belang voor zowel opdrachtgever als opdrachtnemer om te werken aan een lang termijn relatie. Gedeelde relationele normen en waarden tussen het senior management van beide partijen zijn van groot belang voor het manage van de verwachtingen van de partijen met betrekking tot een toekomstige relatie. Om een lange termijn relatie tussen opdrachtgever en opdrachtnemer in stand te houden, is het van cruciaal belang voor het senior management van beide kanten om niet alleen te bouwen aan hun reputatie door succesvolle projecten, maar ook hun relaties in de tijd tussen projecten te onderhouden.

Een echt samenwerkingsverband is fluide, individuele en organisatorische interacties evolueren en onvoorziene gebeurtenissen beïnvloeden de gehele projectlevenscyclus. Als dit niet herkend wordt kan dit leiden tot verrassingen in een project en mogelijk disfunctioneren. Opdrachtgever en opdrachtnemer moeten zich bewust zijn van de specifieke aspecten van hun samenwerking, zodat ze samen specifieke interventies kunnen formuleren om op een constructieve manier de lopende (en mogelijk toekomstige) relatie te verbeteren. De in deze studie ontwikkelde tool RECAP stelt projectleiders in staat om zelf een diagnose te stellen van de zachte en relationele aspecten van de samenwerking in projecten in verschillende fasen, ongeacht het type contract.
De wetenschappelijke bijdragen van dit proefschrift kunnen als volgt worden samengevat. Ten eerste is in dit onderzoek de geschiktheid van een relationele aanpak van het projectmanagementonderzoek aangetoond door de constatering dat projecten gaan over mensen en hun gedachtenwereld, gekenmerkt door hun culturen en denkmodellen. Ten tweede is een Q-sort uitgevoerd om de perspectieven en percepties van de projectleiders te reconstrueren op het gebied van samenwerkingsverbanden. De resultaten bevestigen de idee dat samenwerking niet alleen kan worden gereguleerd door middel van formele regelingen en contracten, maar dat deze ook sociaal moet worden gevormd. Ten derde is empirisch materiaal verzameld voor het feit dat de samenwerkingskwaliteit tussen opdrachtgever en opdrachtnemer de prestaties van projecten positief beïnvloedt; dit empirische bewijs miste tot nu toe in de bestaande literatuur. Ten vierde, is een systematische analyse uitgevoerd van de relatieve invloed van drie verschillende soorten contracten en de aanwezigheid (of afwezigheid) van contractuele bonussen. Het is aangetoond dat partnering/alliantie contracten of contracten met bonusstructuur slechts werken via relationele attitudes en teamwork tussen beide partijen. Tot slot dragen de structurele modellen die empirisch getoetst zijn in dit onderzoek bij aan de roep uit de literatuur om meer onderzoek met betrekking tot de ontwikkeling van wetenschappelijke theorie die de causale verbanden tussen projectsuccesfactoren, project prestaties en organisatorisch succes onderzoekt.

Dit onderzoek heeft ook hands-on praktische implicaties. Het blijkt dat een succesvolle samenwerking niet gaat over innovatie in de contractvormen, maar meer over een nieuwe manier van aansturen van teams met meer nadruk op sociale en gedragsmatige vaardigheden. Samenwerking in een project gaat over integreren van verschillende sets van vaardigheden, expertises, ervaringen, meningen en gedachtengoed van (veel) verschillende mensen met uiteenlopende achtergronden en interesses. Dit mag niet als gegeven beschouwd worden noch komt het automatisch tot bloei. Het moet voortdurend actief worden aangepakt op alle niveaus, van de projectstuurgroep tot het senior management. Uiteindelijk wordt projectsucces gerealiseerd door mensen.

M. Suprapto
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M. Suprapto
Delft, The Netherlands
Curriculum Vitae

Name  Mohammad Suprapto
Address  Lagezijde 101, 2543 XM Den Haag, The Netherlands; Taman Pinang Indah GV-20, 61213 Sidoarjo, Indonesia
Phone  +31647196095; +6181231103335
E-mail  suprapto@live.nl
Born  4 April 1975 in Medan, Indonesia

Education:
11/2010 – 02/2016  PhD dissertation title:  **Collaborative contracting in projects.** Fieldwork included semi-structured interviews, Q-sorting and post-sorting interviews, site-visits, workshop, and surveys with project practitioners within but not limited to the Dutch process industry competence network (NAP). Development and validation of RElational CAPability assessment tool (RECAP) for assessing the relational capability and performance of collaboration in projects.
09/2008 – 08/2010  MSc. (*cum laude*) in Management of Technology, Delft University of Technology. Master thesis title:  **Niche applications for introducing radically new high-tech products in the market.**
08/1993 – 04/1999  BSc. in Industrial Engineering, Institut Teknologi Bandung, Indonesia. Under-graduate thesis title:  **Multi-item inventory optimization models for highly critical items under limited reordering capacity.** The case of Logistics Department, PT. Badak NGL.

Other activities:
2011 – 2015  Teaching assistant for Project Management courses and minor.
2011 – 2015  Master thesis co-supervisor to MOT and CME students.
2013  Local organizer of the 2013 PhD NITIM, TU Delft – Leiden University.
2011  Member of TPM PhD council.

Professional/Business experience:
2005 – 2008  Founder and board member of Yayasan Khaula Karya, a not-for-profit organization facilitating rural/ community-based business development.
2005 – 2008  Program manager – RAMP Indonesia, a technological and business incubation program for grass-root innovators and technopreneurs.
2003 – 2008  Managing director (co-owner) at PT. Advantic Consulting, information and business process management consultant.
2001 – 2002  Senior business analyst at PT. PNM Techno Venture, a technology-based venturing investment company.
1999 – 2001  Freelance business analyst.
List of publications


