LICENTIATE THESIS

MANAGING CHANGE FOR INCREASED INNOVATION IN THE INFRASTRUCTURE SECTOR

EXPLORING A CLIENT'S STRATEGY IMPLEMENTATION

Anna-Therése Järvenpää

Construction Management and Building Technology

LULEÅ UNIVERSITY OF TECHNOLOGY

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Abstract

Strategy implementation for driving innovation and change within the infrastructure sector is important because the path from making a decision to change to actually reaching the intended vision is complex. A client needs to find strategies for how to stimulate innovation when the client has to go via the contractor during the execution of a project. The contractors are therefore important in achieving the intention of increasing the innovation rate in the sector in general. A client interested in enabling innovation must find and utilise strategies within the relationship with their contractors. That a client should stimulate innovation has been established in earlier research; however, how this could be done is less studied.

The client in this study, the Swedish Transport Administration, has decided upon two strategies to increase the innovation rate: a change to procuring design-build (DB) contracts instead of design-bid-build (DBB) contracts, and increasing the number of foreign contractors in the Swedish infrastructure sector. The purpose of this thesis is to explore the implementation of these two strategies — DB contracts and working with foreign contractors — with a focus on the perceived challenges for both client and contractors.

The method used has been a multi-case study with 40 semi-structured interviews with project managers, procurement officers, project directors, site controllers, site managers, and project engineers in eight different cases. The empirical data are all from Swedish infrastructure projects with a duration of 1 to 10 years. Some of the cases have been multicultural and multilingual.

The findings of this study are that, firstly, the client seems not to have made the transition entirely to the DB contract setting, resulting in a mix between the two contract types. This results in confusion for both the domestic and foreign contractors. The domestic contractors in general have not fully adapted to the new contract type where they are to take more responsibility, and the foreign contractors are more used to the DB contract and therefore feel confused by the client not utilising it as intended. Secondly, the strategy of increasing the number of foreign contractors has been fruitful. There are a number of foreign contractors that have both submitted tenders to the Swedish Transport Administration, and established themselves in Sweden. There are, however, five different categories of perceived challenges that have been identified. These categories are economic, political, procurement-related, social, and project-related challenges for foreign contractors after entering in the Swedish infrastructure sector.

The contributions of this thesis are that the client's role in strategy implementation should be further explored, and that perceived challenges should warrant attention. This thesis focuses on two strategies on how the path towards innovation could look, from both client and contractor perspective, resulting in a theoretical contribution to the client-driven innovation literature, as well as construction management literature. By being aware of the challenges and that changing the project delivery system is more than changing the name of the contract, a client could ease a contractor's situation and therefore enable them to focus on innovation and improvements.

Sammanfattning

Strategiimplementering som syftar till att öka innovationsgraden och förändring i infrastruktursektorn är av vikt att studera eftersom förändringen från beslut till att faktiskt nå den eftersträvade visionen är komplex. En beställare behöver hitta strategier för att stimulera innovation i en inter-organisatorisk relation, där entreprenören är den part som ansvarar för utförandet av projektet. Entreprenörerna är därför viktiga nyckelspelare i att nå ökad innovationsgrad generellt i sektorn. En beställare som vill stimulera innovation måste hitta och nyttja strategier inom relationen gentemot sina entreprenörer. Att det åligger en beställare att stimulera innovation kan anses vara väletablerat inom byggsektorn, däremot hur strategiimplementeringen kan gå till är mindre utforskat.

I denna avhandling studeras två strategier, som syftar till att öka innovationsgraden; att upphandla totalentreprenader i större utsträckning istället för utförandeentreprenader, samt att öka antalet utländska entreprenörer i den svenska infrastruktursektorn. Det är Trafikverket som innehar beställarrollen i denna studie. Syftet med denna avhandling är att undersöka implementeringen av dessa två strategier – ökat antal totalentreprenader och att arbeta med utländska entreprenörer – med fokus på uppfattade utmaningar hos både beställare och entreprenörer.

Som metod har valts en multipel fallstudie med 40 semi-strukturerade intervjuer med projektledare, upphandlare, projektchefer, byggplatsuppföljare och projektingenjörer i åtta olika infrastrukturprojekt. Dessa projekt har kontraktstider som spänner mellan ett till tio år. Några av fallen som ingår i studien är mångkulturella och flerspråkiga.

Resultaten i studie visar på att gällande strategin att öka antalet totalentreprenader verkar beställaren inte ha tagit steget fullt ut från utförandeenteprenadformen, vilket resulterat i en blandning av dessa två kontraktstyper. Detta har resulterat i förvirring för både inhemska entreprenörer så väl som för utländska. De inhemska entreprenörerna, som är vana vid utförandeentreprenadformen, har inte helt anpassat sig till den nya kontraktstypen där de ska ta större ansvar, och de utländska entreprenörerna som är mer vana vid totalentreprenadformen upplever förvirring att beställaren inte nyttjar kontraktsformen fullt ut. Strategin att öka antalet utländska entreprenörer har i sig varit framgångsrik, ett antal har lämnat anbud till Trafikverket och etablerat sig i Sverige. Det har dock identifierats ett antal utmaningar med denna strategiimplementering, som kan delas in i fem olika kategorier; ekonomiska, politiska, upphandlingsrelaterade, sociala och projekt-relaterade när utländska entreprenörer etablerar sig på den svenska infrastrukturmarknaden.

Denna studie bidrar till att öka förståelsen kring hur beställarrollen vid strategi-implementering kan fungera och att det finns ett antal utmaningar som bör hanteras. Denna avhandling fokuserar på dessa två strategier kring hur implementeringen mot ökad innovationsgrad, från både beställar- och entreprenörsperspektiv, vilket ger ett teoretiskt bidrag kring beställarrollen i innovationsliteraturen, såväl som till byggprojektledningsliteraturen. De identifierade utmaningarna och att entreprenadform kräver mer än namnbyte på kontraktet kan från ett mer praktiskt perspektiv användas av en beställare som vill underlätta för nya entreprenörer arbeta i den svenska infrastruktursektorn, och därmed ge entreprenörerna möjlighet att fokusera på innovation och förbättringar.

List of appended papers

Paper 1: The transition from Design-bid-build contracts to Design-build

Järvenpää, A-T., Larsson, J. and Eriksson, P. E.

This paper was presented at a peer-review conference, the biannual CEO conference, 7-8 May 2019, Tallinn, Estonia, 10th Nordic Conference on Construction Economics and Organization.

This paper was written by Anna-Therése Järvenpää, Johan Larsson, and Per Erik Eriksson. Järvenpää gathered the empirical data with Eriksson and Larsson, and the paper was jointly designed and edited by all three authors.

Paper 2: Exploring entry barriers in the public infrastructure market

Järvenpää, A-T., Larsson, J. and Eriksson, P. E.

This paper was presented as a working paper at a peer-review conference, the annual ARCOM conference, 3-5 September, 2018, Belfast, UK, Association of Researchers in Construction Management.

This paper was written by Anna-Therése Järvenpää, Johan Larsson, and Per Erik Eriksson. The empirical data was gathered by all three authors, and the paper was jointly written and edited by all three authors.

Paper 3: Contextual communicative competence in multinational infrastructure projects

Järvenpää, A-T. and Pavlik, A.

Under review for possible publication in Construction Management and Economics

This paper was written by Anna-Therése Järvenpää and Anthony Pavlik. Järvenpää gathered the empirical data with Per Erik Eriksson. The paper was designed and edited jointly by both authors.

Paper 4: Control systems in inter-organizational multi-cultural infrastructure projects

Järvenpää, A-T, Eriksson, P. E. and Larsson, J.

Under review for possible publication in Construction Management and Economics

This paper was written by Anna-Therése Järvenpää, Per Erik Eriksson and Johan Larsson. Järvenpää gathered the empirical data with Eriksson and Larsson, and it was jointly designed and edited by all three authors.

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1 INTRODUCTION

1.1 Background

A client in the construction industry does not have a passive role; a client outlines the specifications and requirements instead of choosing from predetermined products (Hartmann et al. 2008). The role of the client could therefore be described as in the centre of a construction project due to its prominent position for demands connected to quality, costs, time, and innovation. For innovation and improvements in performance, clients have been shown to be important drivers for supply-led innovation (Briscoe et al., 2004). Earlier research has established the client as key player for stimulating innovation in the construction industry (Gann & Salter 2000, Harty 2005, Manley 2006, Roger 2008, Håkansson and Ingemansson 2013). Earlier studies have also shown that success for an innovation process is connected to the willingness a client has towards risk sharing, commitment to innovation and leadership in project planning and execution (Kulatunga et al. 2011). Much focus is placed on the client's innovation champion role; however, there are obstacles when enabling an innovation champion, such as needing to be flexible, keeping constant flow of information and knowledge, and being supportive (ibid.). The adoption behaviour at a construction client has also been researched, whether to suppress or support innovation from a supplier, and thereby enabling innovative solutions (Hartmann et al. 2008).

Due to the construction industry being project-based, the perspective could be described as narrow regarding both time and scope (Dubois & Gadde, 2002). Clients in the construction industry seem to have a short-term focus and project focus instead of a process focus (Vennström & Eriksson, 2010). This affects the long-term perspective in the industry and therefore adds to the problem of

change on a larger scale. A client in the construction industry is therefore important for driving innovation, but the focus needs to shift from a project-based view to a more general, long-term perspective. According to Nam and Tatum (1997), a construction client's commitment and involvement in project planning and execution seems to be vital for implementing successful innovation. The project level in an organisation could be described as having the population of solutions and ideas, and the organisation level is retaining the population of rules, processes, and metrics (Loch & Kavadias, 2013). It could therefore be argued that the project's task in organisations is to implement ideas from the top and merely execute orders. The projects are usually the motor for the implementation of a new strategy decided by top management.

The capabilities that a client needs seem to be an ability to sense, seize, and transform opportunities in order to secure the project's delivery by a contractor (Adam and Lindahl 2017). These abilities are connected to the possibility for strategy implementation in the projects, thus the projects in focus. The resources and activities a client has in a construction project are dependent upon other external actors to be activated (Ingemansson Havenvid et al. 2016). Therefore, the client's innovative capabilities are connected to the ability to utilise the inter-organisational relationship in the projects.

Before the inter-organisational relationship is created in a project, a client procures the contractor. When procuring a project, a public client in the construction industry has an opportunity to choose between different project delivery systems, such as Design-Bid-Build (DBB), partnering, Design-build (DB) and project alliance. A client has an opportunity to procure according to which project delivery system best fits the needs of each project, as investigated for example by Eriksson and Hane (2014) in the Swedish context.

In general in the construction industry, there has been a movement from traditional contracts such as DBB towards DB, Design-build-maintain, and partnering (Bresnen and Marshall, 2000, Ibbs et al. 2003, Cacciatori and Jacobides 2005, Bröchner 2016). This general shift to use other project delivery systems often aims to achieve a higher performance rate by enhancing the procurement processes, and public clients often build their own internal procurement practices (Voordijk et al. 2016).

1.2 Problem discussion

The importance of the client role in stimulating innovation in the construction industry is, as discussed above, well established. However, how a client actually contributes to innovation at an organisational level is less explored. A study by Ingemansson Havenvid et al. (2016) emphasizes the client requirements in long-term relationships as important factors for innovation enabling when trying to answer the '*how*'-question. Focus on the inter-organisational relationships or transferring between projects are two different paths to take to further the understanding of how clients could enable innovation. However, the long-term relationship focus could be difficult in a public sector due to the legal requirement in the Public Procurement Act (SFS 2016:1145) to seek out competition between contractors. Long-term relationships are harder to establish for a public client and a client, therefore, needing strategies that are more generally applicable to stimulate innovation, regardless of which contractor the client procures.

The largest client in the infrastructure sector in Sweden, the Swedish Transport Administration ('STA' henceforth), has a government directive to stimulate productivity and innovation (SOU 2012:39, 2012). The STA, therefore, need better use of supplier competence and experience due to their projects being executed by another actor. Two of the STA's strategies towards increasing innovation in the infrastructure sector are moving from primarily using DBB contracts (where the client is responsible for design) towards more use of DB contracts (where the contractor is responsible for design), and increasing capacity and competence in the sector by expanding the number of contractors via an active outreach for foreign contractors to submit tenders and to establish themselves in Sweden.

The STA has earlier generally used design-bid-build contracts in its procured construction projects. With the governmental directive from 2012 (SOU 2012:39) as a foundation, the STA decided to procure DB contracts. The objective of changing to DB-contracts was to increase the degree of freedom for the contractor, with the intention of increasing capacity, using fewer resources and lowering costs. This top-down strategy was decided at management level at the STA and was to be carried out at project-level. As with the general trend in the construction industry, the STA also decided to procure DB contracts to a greater extent. However, just labelling a contract DB instead of DBB has been found not to be enough (Nyström et al. 2016); therefore, more than changing the contract type seems to be needed.

Increasing the number of foreign contractor was another strategy connected to the governmental directive described above. This strategy aimed both to facilitate foreign contractors' submission of tenders, and for them to establish themselves in the Swedish infrastructure sector. The STA has used different channels to attract foreign contractors, such as visiting fairs outside Sweden and informing foreign contractors about forthcoming larger projects open for tendering. The Public Procurement Act clearly states that a public client, such as the STA, needs to ensure fair competition for all interested suppliers to both submit tenders and execute the contract. Earlier research has been focused on entry decisions, how entry could be made, e.g. joint venture, new subsidiary, (Whitelock and Jobber 2004), entry mode (Chen 2007, Chen and Messner 2009, Jia et al. 2017), but little research is found regarding the stage after an entry in the construction industry.

The path towards increasing the innovation rate in the construction industry is somewhat unclear. Moving past the decision to implement strategies and how to implement them, the next step is to actually implement the chosen strategies. Therefore, starting with identifying perceived challenges when implementing strategic changes is an important step towards furthering the understanding of how a client could stimulate supply-led innovation. This is of interest as the aim of increasing the innovation rate is sought after in general in many industries, not just construction. Even if the definitions of innovation might differ (e.g. Loosemore 2015), the strategies for stimulating innovation could be transferred to other areas and fields. How the client and the contractors perceive the challenges when implementing the two strategies is the focus of this thesis.

1.3 Research purpose and questions

This thesis is written with the intention to contribute to the research on a client's role to stimulate innovation in an inter-organisational relationship in the construction industry by using a multi-case perspective approach. The ambition to stimulate innovation has, as mentioned in the problem discussion, been addressed by two strategies by the client in this study: by changing from DBB contracts to DB instead, and by increasing the number of foreign contractors to enable an increase in capacity and knowledge. The purpose of the thesis is to explore the implementation of these two strategies — DB contracts and working with foreign contractors — with a focus on the

perceived challenges for both client and contractors. From this purpose, two questions have been formulated:

RQ1: How has the implementation of the strategy based on DB contracts been perceived by both actors?

RQ2: How has the implementation of the strategy based on working with foreign contractors been perceived by both the client and the foreign contractors?

The first question is connected to the first strategy of procuring DB contracts, a shift in contract type that includes a transfer of responsibilities to the contractors from the client. The DB contract setting, in comparison to that of the DBB contract, entails that the contractor is responsible for the design and the client instead does a pre-design of the project. There is, therefore, more to the change than just the mere wording of a contract. The question has been analysed from a change perspective using Mintzberg and Westley's (1992) model of organised change in combination with Ouchi's (1979) model of control systems to explore the strategy implementation.

The second question is connected to the second strategy implementation of increasing the number of foreign contractors and thus increasing capacity and knowledge in the infrastructure sector in Sweden. The focus of the study is on the perceived challenges from both perspectives after foreign contractors submit tenders, enter and become established in the Swedish infrastructure sector. By combining relevant parts of Porter's (1980) entry barriers from his competitive strategy model with culture and communicative competence literature (Chevrier 2003, Piekkari and Zander 2005), and notions of risk in the construction industry (Han et al. 2004, Ozorhon et al. 2007, Xiaopeng and Pheng 2013, Odediran and Windapo 2018), the challenges with multi-national projects have been examined.

1.4 Delimitations

Strategy implementation could be view from many different perspectives and at different levels in an organisation. Therefore, limitations are needed to enable a reasonable approach to the purpose of the study. The richness in the

empirical data set that is the foundation for this thesis could be dealt with from different perspectives and with different aims. The richness itself produces a need for detailed and thoroughness and to not be handled in a way that does not delete that which is important (Weick 2007). Therefore, the reasons for the new strategies, the decision-making level or the impact the strategies have on innovation will not be elaborated upon. Neither are the internal aspects of the strategy implementation in the client or the contractors' organisations (such as decision-making at one place in the client organisation and implementation carried out in the projects, which could result in tensions) in focus. The strategic decision for the contractors in this study to enter a new foreign sector is also not elaborated upon, even if there might be a close connection between the anticipated challenges and the decision to make a new entry. The enabling forces for strategy implementation will not be elaborated upon in this thesis either.

2 PREVIOUS RESEARCH AND THEORETICAL BACKGROUNDS

This chapter considers earlier research within managing change, DB contracts, challenges when submitting tenders and establishing in a new foreign sector, and control systems.

2.1 Managing change

The content of organised change according to Mintzberg and Westley (1992) could be divided into two different modes: state and direction. *State* entails culture, structure, systems, and people, and *direction* includes vision, position, programs, and facilities (ibid.). These modes indicate that organisational change is complex and multi-layered. Making an actual change requires that the different levels are handled due to that change, as described in Mintzberg and Westley's (1992) model, being hierarchical and reliant on other levels; a change in vision is connected to a change in culture. Table 1 summarises this model.

Higher levels entail higher complexity and are more time-consuming, an example being that the implementation of a new vision is more intricate thab

changing a piece of machinery in a factory. The conceptual changes also aim to have a more long-term impact. The highest level entails rethinking or re-conceptualisation within the mind-set of the involved people when aiming at changing culture or vision. The importance of a change in culture has also been established in construction (Price and Chahal 2006). Structure and position could entail changing business portfolio or market. Systems and programmes change could be a new budget planning tool. The fourth level is hiring new people or moving to new facilities.

Table 1: Contents of organized change, from Mintzberg and Westley (1992, p.40).

	Change in organization (state)	**Change in strategy (direction)**
More conceptual	Culture	vision
	Structure	positions
More concrete	Systems	programs
	People	facilities

2.2 Design-build contracts

Deciding on whether to use a DBB or DB contract is a strategic choice by the client, and this is part of the procurement strategy. Other aspects to decide are, for example, price, penalties, incentives, collaboration level, and warranty period. The reason for choosing DB contract is that when the contractor is responsible for the design, it entails usage of the contractor's knowledge and experience, which should, therefore, result in innovation (Blayse and Manley 2004). It has been established that clients, in theory, prefer to utilise DB contracts not only to enable innovation, but also to increase the contractor's involvement in the construction project (Eriksson 2017). The challenge identified is then deciding on level of control and technical requirements to enable better usage of contractor's knowledge and expertise. Challenges have also been identified by Bröchner and Silfwerbrand (2019) in DB contracts as

initial design plans and prescriptive requirements that are in conflict with a outcome focus. Nyström et al. (2016) found that just labelling a contract as DB, instead of DBB, is not enough to reach the intentions with the DB contract type; instead, there needs to be a clear adding of degrees of freedom for the contractor by the client.

2.3 Challenges when entering a new sector

Porter (1980) has identified eight barriers when entering a new market: economies of scale, product differentiation, capital requirements, switching costs, access to distribution channels, cost disadvantages independent of scale, government policy, and expected retaliation. According to Bo and Chan (2012), the most important entry barriers according to the industrial organization and strategic management theory are *economics of scale*, *capital requirements* and *product differentiatio*n. These entry barriers have also been found and explored in earlier construction literature (e.g. Langford and Male 2001; Male 1991; Cheung & Shen 2016).

The use of Porter's (1980) model in the construction industry has been criticised by, for example, Fellows (1993) and Flanagan et al. (2007) for being too narrow and not considering both the demand and supply side. The entry barriers are a part of Porter's five-force model, which Fellows (1993) states is based on a perfect competition-monopoly continuum, which usually is not the case for the construction industry.

Suppliers entering a new or foreign market in the construction industry could face challenges and risks such as political, economic, or social (Ozorhon et al. 2007). *Political risks* could be the governmental influence and stability, and policies, but also social factors such as racism, terrorism and attitudes towards foreign companies (Xiaopeng and Pheng 2013). *Procurement-related risks* could be uncertainties with the estimation process, competition, and managerial risks handling demands from the client and project owner (Odediran and Windapo 2018). *Social risks* are connected to human rights, policies, labour and ethical issues, and similar factors that could pressure a new entry to change business strategies and practices (Odediran & Windapo, 2018). *Economic risks* could be the factors resulting in uncertainties for the new entry, such as inflation, exchange rate, and the expected revenue (Han et al. 2004, Ozorhon et al. 2007). Besides the challenges and risks listed above, there are *project-*

related risks that could be challenging for a new entry, such as concept, design, and project execution (Han et al. 2004).

Combining Porter's (1980) entry barriers with the risk factors identified by Han et al. (2004), Ozorhon et al. (2007), Xiaopeng and Pheng (2013), Odediran and Windapo (2018) in the construction industry could give a broader picture of challenges when entering a new foreign market. Combining these two different areas enables an analysis of establishing an operation in a new, foreign market in the construction industry, instead of only identifying barriers when entering a new market.

Table 2: Summary of challenges when combining entry barriers and risks.

Challenges	**Risks**	**Entry barriers**
Economic	Economic risks (Han et al. 2004, Ozorhon et al. 2007)	Economics of scale (Porter 1980) Capital requirements (Porter 1980) Switching costs (Porter 1980) Cost disadvantages independent of scale (Porter 1980)
Political	Political risks (Xiaopeng and Pheng 2013)	Government policy (Porter 1980)
Procurement-related	Procurement-related risks (Odediran and Windapo 2018)	Product differentiation (Porter 1980)
Social	Social risks (Odediran & Windapo, 2018)	Expected retaliation (Porter 1980)
Project-related	Project-related risks (Han et al. 2004)	Access to distribution channels (Porter 1980)

2.4 Language and cultural aspects

The way language is used for the purpose of achieving a particular goal in a specific situation requires a level of communicative competence. How such competence is achieved in construction projects where the possibility exists for more than one language, each used at different levels of linguistic ability, is important for achieving a more in depth understanding of communication in multinational (and therefore multilingual) projects. Communicative competence refers to the knowledge of a language (competence), the actual use of language in real situations (performance), and the ability to create meaning in a language (capacity) (Bagarić and Mihaljević Djigunović 2007).

Demanding a specific language in a contract is problematic, Piekkari and Zander (2005) suggest that mandating a language of communication, for example Swedish, does raise issues of asymmetrical power relationships between participants based on language competence if the project consists of multi-language participants.

Three aspects regarding intercultural relationships have been identified in an intra-organisational study (Chevrier 2003). The first is regarding the absence of specific measures to deal with conflicts from cultural mismatches due to practices and performance. A need for tolerance and self-control by the participants is highlighted. The second aspect is a process of “trial-and-error” within the daily interactions, an inevitable process to learn about each other’s practices and routines. The third is, by taking advantage of the different opportunities of business cultures that may arise.

2.5 Control systems

The principal-agent theory (Ross 1973) describes the relationship between an agent that acts on behalf of another party: the principal. The social relationship between these two actors is based on the principal’s resources but lack of skills, and the agent’s position is the opposite (Braun and Guston 2003). The principal-agent theory assumes an information asymmetry between the two actors, an asymmetry that could result in opportunistic behaviour in order to enhance the agent’s own profit (Williams 1973).

An organisation could use different control systems to oversee an agent's actions. Control could be divided into different levels: systems and targets (Cardinal et al. 2010). The control systems are, according to Ouchi (1979) market, bureaucratic, and clan. The targets are related to, for example, inputs, behaviours, outcomes and values (Cardinal et al. 2010). Control systems and targets can be applied in both internal and external principal-agent relationships (Eisenhardt 1985) due to similar logics, and whether the principal-agent relationships are found internally within organisations or between them.

Bureaucratic control system entails monitoring a partner's processes, practice, activities, and procedures to achieve desirable objectives (Aulakh et al. 1996). This system is resource demanding due to the close oversight of the agent and is described as the 'visible hand of management' (Anderson and Oliver 1987, Gencturk and Aulakh 1995). Bureaucratic control in construction could be conducted through the principal's procurement strategies connected to how an agent should perform as well as what should be performed (Korczynski 1996, Eriksson and Laan 2007). The benefits of the bureaucratic system are a careful analysis of tasks and goals and the ability to achieve these goals, provided that it works properly, and an improved ability to respond rapidly to new demands and directives from the principal (Heckscher 1994). A principal's use of bureaucratic control could be regarded as suitable if the situation is regarded as complex and uncertain (Celly and Frazier 1996), however, bureaucratic control that the agent sees as uncalled for could be regarded as intrusive and therefore unwanted (Aulakh and Gencturk 2000).

Market control system is focused on an agent's outcomes or results (Aulakh et al. 1996, Bello and Gilliland 1997, Aulakh and Gencturk 2000). This control system could be described as the 'invisible hand of the market' (Anderson and Oliver 1987, Gencturk and Aulakh 1995). Accordingly, Ouchi (1979) notes that it is the most effective type of control when the market is frictionless; the price provides the means for solving any problems with inconsistent goals, and the prices then contain all information necessary for correct decision-making. Market control assumes that, in a principal agent relationship, the agent has the best possibility to determine their direction and level of effort (Aulakh and Gencturk 2000). If the agent has sufficient information and knowledge to fulfil the contract, the principal only needs to check that the terms and conditions are met. A market control system is also connected to different price mechanisms and competitive tendering, as well as supplier selection (Eriksson and Laan 2007), which is common in the construction industry. With high complexity or uncertainty, market control could be regarded as less suitable due to the principal not being able to predict the outcome (Bello and Gilliland 1997).).

Hence, when uncertainty or complexity is high, market control is considered less efficient than bureaucratic control (Anderson and Oliver 1987, Celly and Frazier 1996). A complex project delivery could also be hard to judge afterwards when there are many interdependent deliveries or parts.

Clan control system entails social interactions to develop shared norms and values as well as mutual understanding to guide the agent's behaviour (Ouchi 1979, Aulakh and Gencturk 2000, Fryxell et al. 2002). The recursive social interactions between the principal and agent results in relationship boundaries and a sense of socially accepted behaviour within a systematised and shared values setting (Aulakh and Gencturk 2000, Fryxell et al. 2002). A clan control system is the social requirements comprised of a set of agreements within a specific group, and these could be described as integrity, values, beliefs or socialization processes within a culture (Ouchi 1979). It could therefore be described as a social observation to check if the right objectives are fulfilled. The principal and agent usually jointly undertake the specification, formulate joint objectives, uses teambuilding and co-location within a clan control system (Das and Teng 1998, Eriksson and Laan 2007). The resources needed to create the foundation for clan control are vast, as is the communication needed, which requires human investment to facilitate it, especially if there are cultural differences (Bello and Gilliland 1997).

3 METHOD

The method chapter provides a description of the research design, case description, data collection, and how the appended papers are related to the research questions. There is also a section regarding my impact on the research, and research quality.

3.1 Background of the studies

This research in general is focused on DB contracts and innovation in the infrastructure sector. However, the empirical data has a connection to two different objectives, as the starting point was two different tasks from the STA, the largest client in the infrastructure sector in Sweden. The first, and larger, on-going study considered the change from mainly DBB to DB contracts that the STA undertook to increase the innovation rate. The other, and smaller study, considered the STA's aim both to increase the number of foreign contractors that submit a tender and, if they are awarded a contract, establish themselves in Sweden. Some of the cases in these studies have been both DB contracts and with foreign contractors, resulting in the data from the interviews being applicable for different papers. The research project is a part of the research platform ProcSIBE (Procurement for sustainable innovation in the built environment).

3.2 Research design

The multi-case study approach was a suitable method to answer the questions thoroughly and in depth. Multi-cases provide rich and real-world data in which the phenomena that the study is focused on occur, and this enables replication, contrast and extensions to existing literature (Eisenhardt and Graebner 2007). The multiple cases have provided a rich data set to enable conclusions on a deep but also broad level.

There are two paths in this thesis – the first regarding changing to design-build contracts, and the second one regarding foreign contractors' possibilities to submit tenders to the Swedish Transport Administration and establishment in the Swedish sector after being awarded a contract. The research questions follow the same divided paths. To answer RQ1, empirical data from all cases procured with design-build contracts was used to study the shift from DBB to DB contracts after the strategic decision to transfer responsibilities to the contractors. Data from the foreign contractor study has been the foundation for papers 2 and 3 and for answering RQ2 regarding increasing the number of foreign contractors to secure capacity and increase knowledge. Paper 4 combines the foreign contractor perspective with the shift to DB contracts from a control system perspective. The numerous cases have not all been used in some of the papers due to some cases not having a DB contract setting or having a domestic contractor. Table 3 shows the connections between the appended papers, cases in the empirical data, and which research question they belong to.

Table 3: The connection between appended papers, cases and research questions.

Appended papers	Empirical data	Research questions
Paper 1 The transition from Design-bid-build contracts to Design-build	Cases A, B, D, E, G, H	RQ 1
Paper 2 Exploring entry barriers in the public infrastructure market	Cases A, C, D, E, F	RQ 2

Paper 3 Contextual communicative competence in multinational infrastructure projects	Cases A, C, D, F	RQ 2
Paper 4 Control systems in inter-organizational multi-cultural infrastructure projects	Cases A, B, D, E, G, H	RQ 1 RQ 2

3.2.1 Case selection and case descriptions

Each case included in the appended papers and this thesis is described below. A summary of the cases is provided at the end of this section in Table 4.

As mentioned before, the cases in this study were either selected due to connection to the DB contract type or the foreign contractor task. As seen in Table P below, there is a mix between contract type and the contractors' native country.

The cases connected to the DB contract type were all procured after the client's decision to utilise this type of contract and could therefore be regarded as illuminating the strategy implementation. Most of the project members in these cases have not worked with a DB contract before, resulting in a contrast for them during their work in these cases. The selected cases were also in the execution part of the projects, meaning that the impressions and perceived difficulties were up-to-date when the interviews took place. These cases, therefore, should all offer insights into the questions at hand.

The cases connected to the foreign contractor are all with foreign contractors that have been procured after the client's decision to answer the governmental directive by trying to increase the number of foreign contractors submitting tenders and establishing themselves in Sweden. The comparison between foreign contractors' perception of the client's use of control systems in appended Paper 4 was possible due to the other cases with DB contracts.

Cases could be chosen because they are revelatory, extreme or give opportunities for unusual research access (Eisenhardt and Graebner 2007). None of the cases was selected as being either extreme or unusual; however, they do offer a revealing insight into the strategy implementation as they were on-going during the data collection. The close collaboration with the STA, with direct access to the cases being given, has hopefully resulted in good quality data. An exception among the cases is Case H, which could be regarded as unusual due to this case being the first DB contract in a railway project for the client.

Case A: this project, in the south of Sweden, entails roads and a bridge crossing the river in a smaller town. This relatively small infrastructure project lasted one year, and was completed in December 2015. However, the contractor was still handling inspection remarks on site when the interviews took place.

Case B: the project was for the repair of 40 kilometres of existing road in the north of Sweden in the countryside. The project could be described as a traditional infrastructure project.

Case C: the project is a part of the metro system in Stockholm, with the aim of doubling the capacity on affected lines. The project entails both new underground tracks as well as a metro station and maintenance tracks. The project is described as having high complexity due to blasting directly under Stockholm city.

Case D: the project is a conventional road project that entails reconstruction of an existing road junction, a new bridge and a roundabout. The project duration is three years.

Case E: this project is a sub-project of a mega-project on the west coast in Sweden. It consists of construction of a new tunnel under a large river, which is described as a complex task, and the project was on going when the interviews took place.

Case F: the project consists of tunnels to an island, but also temporary constructions, such as a harbour to ship out materials. This project is a sub-project within a mega project. The tunnel project will result in one of the longest tunnels in the world in an urban environment.

Case G: this project is constructing a new, 8 km road between two larger roads, including a 120-meter long bridge over a small river.

Case H: this railway project entails a tunnel that will increase the capacity for commuter trains in Stockholm by adding a second track next to the existing one. This is the first DB contract in a railway project that the client has procured.

Table 4: Summary of the cases.

Case	Contract type	Number of interviews	Foreign/domestic contractor	Duration (years)
A	*DB*	5	Foreign	1
B	*DB*	8	Domestic	3
C	*DBB*	3	Foreign	8
D	*DB*	4	Foreign	3
E	*DB*	5	Foreign	7
F	*DBB*	3	Foreign	10
G	*DB*	5	Domestic	2
H	*DB*	5	Domestic	10

3.2.2 Data collection

All cases are either roads or railway projects in Sweden and were on-going projects at the time of the empirical data collection. All cases have the same client; however, the contractor differs in almost all cases. The large number of cases explores the implementation of the strategies studied in the same way across all cases.

The respondents in the interviews were asked to answer questions regarding procurement strategy, the collaboration between the client and contractor, innovations, project-specific characteristics, and organisation of the project teams (see appendix for interview guides). The respondents were asked to share their view on these aspects, or perhaps their view of the construct of these aspects. Because the idea of innovation, contractual degrees of freedom and collaboration aspects are all constructed and not natural law, the questions were tailored towards asking about their comprehension of these aspects. They are not a part of a physical thing only; they have been given meaning within this context, and that meaning is an important part of my research.

The data collection method is interviews with respondents from both the client and the contractor to be able to capture both sides of the contract and to get a multiple lens perspective of the implementation of the two strategies. The respondents all have different roles, different background, and sometimes even different education, but all are key persons within the studied cases, such as project manager, procurement officer, project director, project engineer, design manager, contract manager, and site controller.

All interviews were semi-structured to not exclude the possibility for the respondent to elaborate, thus allowing for the capture of more details and nuances. By interviewing both sides and getting their point of view from different angles, a richer data set has been collected. The empirical data was collected during 2017 and 2018. In Appendix A is an example of two interview guides from the foreign contractor data collection. The interview guides to the DB contract study is similar, except that the questions were asked regarding foreign entry. Due to technical problems, two of the interviews were not recorded (as the rest of the interviews were). The data from these interviews consists of the researcher's notes of the given answers.

Some consultants were interviewed due to their key roles in the projects; one example of this is the site controller. However, the consultants have been regarded as either client or consultant, and not as a third party in this study. Their assignment to one or other category was decided based on which party had procured them. See Appendix B for each respondent's role, affiliation, and the length of each interview.

3.3 Data analysis

Analysis of the empirical data has been an on-going process, as the process on a general level could be described as close to an abductive approach. Most of the data was collected before any analysis started, resulting in a need first for familiarisation with the data and the actual directions that the respondents leaned towards in the different topics that the interview covered. The result from the first step was Paper 1 regarding the actual transition from DBB to DB contracts that the client decided upon. Many respondents expressed opinions regarding this transition; therefore, a paper covering this subject was regarded as suitable within Mintzberg and Westley's (1992) model for organised change. The data with foreign contractors mostly focused on the entry to the Swedish infrastructure sector; therefore, Paper 2 is connected to their entry from both the contractors' and client's perspective. The theoretical framework that seemed suitable was Porter's (1980) entry barriers from his work regarding competitive strategy. This was supplemented with newer research from the construction industry. However, Porter's (1980) model did not cover topics such as language, culture and communication, and a lack of a theoretical framework combining these aspects when entering a foreign market. This inspired Paper 3, with its focus on contextual communicative competence, using the empirical data from the foreign contractors, as these cases were multi-lingual and multi-cultural. In this thesis, entry barriers, risks in the construction industry combined with culture and language are used as a foundation for identifying the perceived challenges connected to the strategy implementation for working with foreign contractors. Barriers, risks and communicative concerns emerged as the challenges that the respondents have raised as issues. Paper 1 identified relations between the transition to DB contracts and the oversight that the client uses, which resulted in Paper 4 regarding control systems. The control system framework by Ouchi (1979) was used to categorise the control targets identified in an explorative approach. The foreign contractor perspective on the control systems used highlighted another aspect of the perceived challenges in connection to the strategy implementation of working with foreign contractors.

The multi-case study was done by connecting the four different papers to either the strategy implementation connected to DB contracts or foreign contractors, or both strategies (as with Paper 4). By connecting the relevant parts of Porter's (1980) entry barriers to risks identified in the construction industry, the perceived challenges with working with foreign contractors could be structured. Some of the entry barriers in Paper 2 have been identified as entry barriers and not challenges when working in a infrastructure project. Therefore,

these are excluded from the analysis in this thesis. The analysis is focused on challenges after becoming established in a new, foreign market; therefore, the barriers a contractor could have faced while entering the market are not included in this thesis.

3.4 Ontology

A clear outspoken ontological base for any research could be difficult to establish. Glynos and Howarth (2007) state some problems with other researchers' ontology: "*very abstract theoretical claims whose relevance for conducting empirical enquiry is unclear /…/ the analytical framework emerging from their ontological reflections do not produce robust or convincing enough critical explanations, and we think this is partly because of their presupposed ontology*" (p. 103). So how does a researcher conduct research with a clear ontology that also results in relevance for the conducted research? What are my presupposed assumptions regarding the research I conduct?

My assumptions regarding the linkage between the two strategies and how the respondents have perceived them are that there is no simple cause and effect to look for. Another assumption is that the respondents were not, perhaps, able to see the non-existing boundaries between themselves and what is happening in the infrastructure projects. They do, to a greater or less extent, affect the outcome of the project simply because, to a large extent, they constitute the project. This results in a demand for them to be able to analyse their own actions and beliefs during the interviews, and this is something I think is challenging. It is particularly difficult if the person being interviewed is not an analytical and reflective person in general. Demanding that, during the interview, the respondents analyse and reflect on their personal and work output at the same time could be asking too much.

"Meaning" is also an important term to consider. As Barad (2003) puts it, "*Meaning is not a property of individual words or groups of words. Meaning is neither intralinguistically conferred nor extralinguistically referenced. Semantic contentfulness is not achieved through the thoughts or performances of individual agents but rather through particular discursive practices.*" (p. 818). The meaning of innovation, collaboration or contract is therefore not belonging to a specific respondent; the meaning of these aspects can therefore only be captured by several interviews. The meaning could be regarded as a

total sum of smaller pieces put together. When analysing the data, I cannot therefore only look for a single respondent's view on, for example, challenges when establishing themselves in a new foreign sector. I must seek a larger coherent meaning from the respondents to be able to conclude regarding a subject.

3.5 The subject of objectivity

The effect on research from the researcher must be regarded and highlighted. As Harding (1992) pinpoints "*The problem with the conventional conception of objectivity is not that it is too rigorous or too "objectifying," as some have argued, but that it is not rigorous or objectifying enough*" (p. 438). The separation of the researcher and the research is therefore in focus. Could this separation be possible? In addition, and even more importantly, is it necessary to do so?

The interviews that I have used as a data collection method in my research are affected by me and my background and experiences. The choice of words in the questions and the tone of my voice, the semi-structured method where I choose which parts of their answer I ask them to elaborate, whether I nod when they talk or if I confirm their answers with an 'ok', all these affect the outcome to some degree. I also affect the analysis of the empirical data. The theoretical framework I choose to structure or analyse the data with is something directly in connection with my opinion of work done before me. The way I interpret the answers from the interview and connect them to another source is another important aspect of the impact I have.

The other side of my impact on my research is how the respondent reacts to me as the interviewer. My dialect, my clothes, my gender, my age, and in some cases my language competence (when the interview was conducted in English), these are different factors that could affect the respondents' willingness to answer my questions. Another important aspect of objectivity is the respondent's view of the answer they give. It could very well be that the respondent thinks that they are *just telling it as it is*, that there is no other point of view or other possible explanations to consider. The possibility exists that they have not considered that their account of what has happened (or not happened) in the project is from their perception and that there could be other interpretations.

An important aspect of objectivity is "*what is important about causal intra-actions is the fact that marks are left on bodies. Objectivity means being accountable to marks on bodies*" (Barad 2003, p. 824). This suggests that there is no separation possible between the researcher and the researcher's impact on the research. Striving for objectivity is therefore being aware of the impact on the research and taking responsibility for this impact.

3.6 Research quality

There are a number of factors influencing the quality of the conducted research presented in this thesis. The data was collected by different persons, resulting in different persons using the semi-structured interview guide and choosing different ways to continuing asking questions depending on the response from the respondent. Therefore, the answers could differ in the different interviews depending upon what the interviewer finds interesting to follow up on. This implies that, theoretically, the interviews could have different focus points and different data. Due to the many interviews that have been made, this could result either in a rich data set or in an outspread data set. An example of the semi-structured interview guide is found in Appendix A. The same foundation has been used for gathering the empirical data regarding both the DB contracts and, to a certain extent, the foreign contractor study. The interview guide has been adjusted to fit either the client perspective or the contractor perspective depending on which organisation the respondent belongs to.

Judging research quality for qualitative studies could be done by borrowing parameters from Guba (1981) and naturalistic paradigm inquiries: truth value, applicability, consistency and neutrality. Truth value is also referred to as internal validity. The empirical data in this study are from multi-cases, which could be a seen as a good foundation for testing the selected findings. In the appended papers, there has been cross-case analysis conducted, meaning that there is often more than one source for the conclusions drawn. There is seldom only one respondent in one case that has been used to draw a general conclusion. The conclusions that have been made, either in the appended papers and in this thesis, do not contradict earlier research in general; rather, they extend or add new aspects to it. There is, however, not a search for truth, but for explaining phenomena. Applicability, or generalisability, is limited due to the Swedish setting and focus on one client. Much of the empirical data is connected to how the contractors' respondents perceive the STA as a client and the actions taken by this client, resulting in a focal point on this specific client.

To generalise is then done with caution. Consistency, or reliability, in this study depends on the instrument used: people. The respondents, as I discussed in the ontology section above, are influenced by many factors; not just their analytical abilities but also if they want to answer the questions truthfully. Judging the instrument used is therefore hard as the 40 interviewed people all differ. There is still a reliable foundation as the multi-case study enables a rich set of instruments. Neutrality, or objectivity, in the social sciences is biased due to the researchers using themselves as instruments while doing research. As discussed in the section above regarding the subject of objectivity, the impact I have on the research is important to highlight. There are, however, reasonable reasons behind the choices I have made, such as the theoretical foundations for this thesis and the methods. These theories and methods are well established and used by others before me; therefore, the reasons for conducting this research could be regarded as neutral enough.

4 SUMMARY OF PAPERS

This chapter summarises each of the four appended papers: background, empirical data collection, findings, and conclusions.

4.1 Paper 1: The transition from Design-bid-build contracts to Design-build

Paper 1 explores the shift from design-bid-build contracts to design-build contracts in the infrastructure sector in project-led organisations. This change has affects both at the organisational level as well as the individual level, and the paper investigates how the client manages the transition between these two contract types.

The major source of data is semi-structured interviews with respondents from both the client and the contractors (cases A, B, D, E, G, H). In the paper, Mintzberg and Westley's (1992) model of organisational change is used to analyse the data.

The cross-case analysis findings suggest that the transition has resulted in a mix of DBB and DB as contract type due to issues when making changes in a project-led organisation. A change in vision also requires a concomitant change in culture, systems and roles. The change from DBB to DB-contracts is intended to increase the innovation rate, meaning that it could be viewed as a new *vision* (Mintzberg and Westley, 1992) that sets out a new direction for the client. This strategic decision is decided upon at the functional level of the organisation (Hobday, 2000), but is carried out in the projects themselves. The

decision to procure according to DB-contracts instead of DBB-contracts is, therefore, expected to have an impact on both the entire client organisation and the contractor organisation. A change in *culture* (Mintzberg and Westley, 1992) had occurred in some, but not all, studied cases. However, changes in *structure* and *positions* (Mintzberg and Westley, 1992) were identified in all of the cases. The change in contract type showed both a structural and positional change through the shift in responsibilities among the actors, moving from a more traditional approach to procurement in DBB-contracts to a DB-contract. This also affected the next change level of *systems* and *programmes* (Mintzberg and Westley, 1992), where documentation was adapted to fit the requirements of a DB-contract. Change in *programmes* could be seen in the form of the new legal documents that the client uses. These contract forms have been distributed to the projects as a part of the change from DBB-contracts to DB-contracts. *System* change is discussed in one case, where the client has access to the contractor's accountancy system for the control of actual costs connected to the specific project. Only one case saw a change in *facilities*. The change regarding *people* in respect of new and changed roles (Mintzberg and Westley, 1992) shows some of the roles having shifted sideways (e.g., whereas the design manager in DBB contracts is employed by the client, DB contracts see the design manager as employed by the contractor instead, since the contractor does the design).

The change from DBB contracts to DB contracts in relation to the model of organised change by Mintzberg and Westley (1992) indicates that two of the cases have identified changes at the different levels, most of which have resulted in successful projects. These cases made changes at all different levels, resulting in a more complete change process compared to those cases where culture change was less well handled.

These findings could help further our understanding of managing change in complex projects, which might help practitioners to manage change in a more integrated way. It also enriches our understanding of the systemic change that a switch in contract types can have in inter-organisational complex projects such as transport infrastructure projects. Furthermore, it emphasises the intricate task of change management in project-led organisations and its effects on roles and responsibilities.

4.2 Paper 2: Exploring entry barriers in the public infrastructure market

The paper aims to explore the barriers associated with the procurement and execution of public infrastructure projects with new foreign contractors when needing to attract foreign contractors to secure capacity and maintain competition in the Swedish infrastructure sector. Barriers related to both the client and the contractor perspective in multi-national projects are the focus in this paper.

A multiple case study of five transport infrastructure projects (cases A, C, D, E, F), procured by the main public client of infrastructure in Sweden, was conducted to fulfil the purpose. Semi-structured interviews with respondents from both the client and contractor for each project were conducted to gain a broad perspective on perceived challenges. In this paper, Porter's model of competitive strategy regarding entry barriers (Porter 1980) is used to study challenges when a new contractor submits a tender in the Swedish transport infrastructure sector.

Challenges related to almost all entry barriers proposed by Porter (1980) were identified. The study identified challenges related to entry barriers such as; economics of scale, product differentiation, capital requirements, switching costs, policy related norms and country standards. There is also the expected retaliation from the existing actors at the market. Beyond Porter's (1980) model, challenges related to utilisation of in-house design competences and technologies, and a lack of suitable contacts and networks at the supply market were identified.

However, some of the entry barriers in Porter's model are not directly applicable for the specific studied market due to, for example, the public procurement act (PPA) and the structure of the market. The client, as a public authority, is obligated to see to that there is no barrier for any tenderers within the European Union to either submit tenders or to deliver according to the contract in the light of PPA. When Porter (1980) discusses governmental policies it refers to rules and regulations regarding taxes, load weight for trucks, etc., but it does not consider situations where both the writer of the policy and the client are the same, as is the case in this study in some regards. Prior literature also suggests that governmental policies may act as a barrier (Male 1991). One barrier identified related to this is that established contractors have an advantage compared with new contractors due to the fact that the client has enhanced their demands over the years and established contractors have

had the opportunity to prepare for the increasing demands over time at a slow pace. In line with prior construction literature (e.g., Preece et al. 2016; Langford and Male 2001), one major challenge found in this study is the need for financial funding. The findings indicate that establishment in a new market needs vast investment in time, staff and capital. Consequently, economies of scale, meaning that the project has to be of a certain size, are identified as a major challenge. Findings from the conducted study confirm this and highlight the fact that governmental norms, together with country specific rules and regulations, act as major challenges for new foreign contractors entering the Swedish infrastructure market.

The findings extend current knowledge on barriers when procuring and executing multi-national infrastructure projects from both the client and the contractor perspective, but they may also be of relevance to other sectors within the construction industry. By proposing new barriers previously not identified in construction, such as access to subcontractors, domestic staff and consultants due to the vast need of external resources when executing projects in this sector, a contribution is made. The traditional way to identify barriers has been from a strategic business approach and from the contractor's perspective. In the infrastructure sector, however, the public client has a vast influence on some of the challenges, and their perspective is, therefore, of importance. The findings also have managerial implications by increasing the understanding of the barriers that new contractors encounter and how they can handle them. These findings may also act as a basis for actions taken by the client to lower the entry barriers and attract new possible contractors.

4.3 Paper 3: Contextual communicative competence in multinational infrastructure projects

This paper explores how contextual communicative competence could be created in multi-national and multi-lingual construction projects. The members of the project from both the client and the contractor already have knowledge regarding field-specific communication, but they need to develop their communicative competence skills in relation to the other party to be able to bring the project to completion.

The method used was interviews with people I different roles in four construction projects (cases A, C, D, F) where the contractors are foreign and relatively new to the Swedish construction industry in general. By analysing

the data from the interviews, two themes emerged as the important factors influencing the progress of the communicative competence path.

Findings from the paper suggest that contextual communicative competence seems to have grown on both the client and contractor side. A shift from only communicating in Swedish to allowing, in this situation, English occurred, and this fusion of language possibilities, an intralanguage, allows the contractor to translate when appropriate. The communicative competence definition by Bagarić and Mihaljević Djigunović (2007) applied suggests that the respondents have, to a certain degree, shown that they are *competent* and can *perform* (e.g. knowledge of English and can talk English in real situations), despite the possibility of a lack of *capacity*, meaning being able to create meaning. Although the need to be able to communicate at a higher level is needed, this is not the kind of language competence that is normally formally taught, and so must be negotiated as a part of the linguistic dimension during the project.

Building towards contextual communicative competence through interlanguage creation and intercultural business competence seems difficult if a project is executed only according to documents, norms and standards, especially when these are extensive and new to the contractor. As with intralanguage, intercultural business competence is fluid, contingent and does not require achievement of an unobtainable level of proficiency. Instead, it is a developmental, process that need not be a linear progression. As with the imperfect intralanguage, low intercultural business competence may contribute to the fuzzy nature of interactions. However, in the same way that effective communication can occur despite inefficiencies in the realization of language competence, failings arising from a lack of intercultural business competence can be overcome by trial and error, linguacultural awareness, high levels of tolerance and flexibility, as suggested by Chevrier (2003).

An important learning from this paper is the need for parties to understand from the beginning that project completion largely relies on the development of a contextual communicative competence in multinational projects that involves both intralanguage creation and intercultural business competence—for both client and contractor—for enabling project completion. To a large extent, intralanguage cannot be trained because it is context and needs based, so its development requires the willingness to adopt and adapt linguistically. Similarly, the likely effects of intercultural business competence must be considered by both client and contractor. Both parties would also need to recognise the trial-and-error nature of this development. It would also appear

that project length affects the development of contextual communicative competence: in longer projects since the parties will work together for a longer period and can therefore focus resources on collaboration and communication. However, if contextual communicative competence is a factor in the success of a project, then shorter length project participants should invest resources in establishing contextual communicative competence as an early priority in the beginning of the project. The contribution from this paper to the construction management literature is by identifying contextual communicative competence as an important factor in multi-national construction projects and also by highlighting the negotiation of meaning that is needed in a complex setting for creating an understanding between the project members.

4.4 Paper 4: Control systems in inter-organisational multi-cultural infrastructure projects

The paper compares how foreign and domestic contractors perceive and handle different control systems, and thus improve understanding of how control systems function in multi-national infrastructure projects characterised by cultural distance. A proper combination of control systems is a vital insurance that project delivery will be satisfactory for the client.

The subject was explored through empirical data gathering using semi-structured interviews in six different construction projects in Sweden (cases A, B, D, E, G, H), where three of the foreign contractors involved were new to the Swedish infrastructure sector,. An explorative starting point on how control targets in the studied cases resulted in rich descriptions on how the client controls and oversees its contracts in detail. The empirical data was analysed with the help of Ouchi's (1979) model of control systems.

The findings indicate that the client has focused on bureaucratic control and not on market control, as could be expected for design-build contracts. The foreign contractors perceive the use of a bureaucratic control system as confusing and less suitable in a design-build contract.

Despite the switch from DBB to DB contracts in the studied cases, all the respondents indicate the client using oversight with a strong focus on bureaucratic control. This control system is more suitable when inspection of critical sub-systems, such as foundation and reinforcement, must be performed during the on-going implementation of the project because it is impossible afterwards. Another aspect of high complexity is that the final product is a

subsystem of the client's entire infrastructure system. Hence, a reason for the strong reliance on bureaucratic control is that the client wants to programme the task (e.g. Anderson and Oliver 1987, Fryxell et al. 2002) in such a way that it facilitates a life-cycle perspective for their infrastructure system. By stipulating certain materials and solutions, the client achieves a homogeneous infrastructure system that is easily and efficiently maintained.

Furthermore, the difficulties of inspecting the final product, coupled with the catastrophic consequences of malfunctions, place considerable responsibility on the client to continuously follow up key processes. The risks and responsibilities for roads, railways and bridges not collapsing cannot be completely allocated to the contractor.

The findings support Ouchi's (1979) arguments that the three main control systems may be combined. The control systems used in the different cases are all a mix of bureaucratic, market and clan control. However, the empirical data highlights the importance of the contingency factor of cultural distance (e.g. Anderson and Oliver 1987, Fryxell et al. 2002) as foreign contractors perceive much confusion and frustration with the combination of DB contract (conceptually based on market control) and the prevailing bureaucratic control system. Unlike the case with domestic contractors, who are accustomed to the bureaucratic control system when working with the STA, the client's focus on detailed monitoring causes foreign contractors to experience uncertainty over responsibilities.

Furthermore, cultural distance (e.g. Anderson and Oliver 1987, Fryxell et al. 2002) also affects the implementation of clan control. To some extent, the collaboration-based clan control system can be seen as a new way of controlling processes by influencing contractors through social interaction. The foreign contractors are unaccustomed to the client's strong focus on collaboration, and they seem to be more experienced in working in arm-lengths relationships where the client utilises the "invisible hand of the market" and lets the contractor be responsible for the process, without continuous interaction. When combining market control and clan control in a DB contract, the client must keep in mind that they cannot suggest anything that the contractor could perceive as an authoritative order. Instead, the client should influence the contractor through joint objectives and dialogues. The information flow is mentioned in some cases as important for the client.

The contributions connect the market control system to design-build contracts, viewing collaboration as clan control, and the problems of combining detailed

bureaucratic control with market control due to difference in focus. Contingency factors like complexity, relationship history and cultural distance are seemingly connected in the studied cases. In addition, a new contingency factor – safety requirements – is identified as having considerable impact on the chosen control system.

5 DISCUSSION

The discussion in this chapter is developed from the integrative findings from the four appended papers. The focus in the discussion is on the perceived challenges connected to the two different strategies: DB contracts and foreign contractors. The findings could be of interest for construction management when implementing a new strategy in a complex, project-led setting.

5.1 The change towards using more DB contracts

The RQ 1 regarding how the implementation of the strategy based in DB contracts been perceived by both actors will be elaborated upon and discussed in this section. Nyström et al. (2016) point out that a change from DBB to DB could just be a changing of name of the contract, thus not utilising the benefits of the contract type or allowing the actors to work as intended. However, there seems to be more than just a change in name for the STA in the studied cases, as seen in some of the cases in Papers 1 and 4.

By applying Mintzberg and Westley's (1992) model of organised change, it seems that the change from DBB to DB contracts has not been addressed at all levels in the model. This seems to be the case for both the client and the domestic contractors. The change in *vision* has been accompanied by a change in *structure* and *positions*, as well as a change of *systems* and *programmes*. For example, that *systems* and *programmes* have been updated to better fit a DB contract, such as procurement documents, and a change in *people* can be seen

in the new role of the site controller that the client has created. However, a lack of change in culture could be a reason for the insufficient change to the DB contract setting, supporting the view from Price and Chahal (2006) regarding the importance of culture. The culture change seems to have happened in some of the cases presented in Paper 1 through the use of a more in-depth collaboration model and, as in Paper 4, as a project manager describes their new way of working, with joint problem solving.

Nevertheless, the client has not fully made the change from DBB contracts to DB contracts. This has caused confusion, uncertainties, and misunderstandings for all involved actors to some extent. The Swedish contractors in the studied cases have not entirely moved from the DBB setting (the same as for the client) and have not fully grasped their responsibilities in respect of the DB contract, as found in Paper 4. The client expressed a willingness to utilise the market control system that is suitable for a DB contract, but has identified a recalcitrance on the part of the Swedish contractors to fully grasp their role in the new contract setting. On the other hand, the foreign contractors that are accustomed to the DB contract express frustration with the fact that the client procures DB contracts but does not use the contract type as expected. As shown in Paper 1, this has caused problems when it comes to responsibilities and roles. Labelling a contract as DB entails that the contractor has a greater responsibility than with DBB. However, being somewhere between these two contract types result in an unclear situation for both actors. The foreign contractors perceive that the client acts in a way that does not work as intended when, on one hand wanting to control and oversee as in a DBB contract, and on the other hand, not taking responsibility for the documents and plans that the client has demanded to see and check but without offering an official approval. Paper 4 emphasises this tension between the bureaucratic control system and the DB contract.

The control systems model (Ouchi 1979) used to identify the client method of control and oversight are connected to the DBB contract setting instead of DB, as concluded in Paper 4. This emphasises the results from Paper 1 regarding the transition from DBB to DB contracts in that the shift has not been fully made. This perception seems to be valid for both contractor representatives as well as client representatives.

The principal-agent theory (Williams 1973) could explain the control use by the client in light of the asymmetry of information when reflecting on the empirical data in Paper 4. The change to DB contracts is also a change in information asymmetry and transfer from the client to the contractor, resulting

in the client (principal) exercising more control and oversight due to the loss of information. This could explain the perceived challenges from the client representatives when changing to a DB contract and a reason for them not fully leaving the DBB contract setting.

The perceived challenges for implementing the DB contract strategy are connected to culture, responsibilities and information. This is applicable for both the client and the contractors, as the DB contract setting is new for the client and the domestic contractors, and the demands from the client regarding information in this project delivery system is new for the foreign contractors.

5.2 Working with an increased number of foreign contractors

RQ2 concerns how the implementation of the strategy based on working with foreign contractors been perceived by both the client and the foreign contractors. The initial part of the strategy to increase the number of foreign contractors in the Swedish infrastructure sector could be described as a positive outcome. A public authority cannot award a contractor a contract if they have not first submitted a tender; therefore a public client needs to attract new contractors and see that the procurement is commercially interesting enough. There are, however, challenges identified by both actors regarding establishing and working in Sweden after a contract has been awarded.

There seems to be a need to extend Porter's (1980) model of entry barriers to better suit infrastructure projects to include the risks identified by Han et al. (2004), Ozorhon et al. (2007), Xiaopeng and Pheng (2013), Odediran and Windapo 2018). By also adding business competence and intra-lingual competence (Paper 3), as well as access to subcontractors and domestic staff as well as networks (Paper 2), it could be used as a basis for multi-national construction projects. Porter's (1980) model is based on entering a market close to a firm's current market but, by adopting and extending it with risks and the findings in paper 2 and 3, it will give a broader perspective when working with a new foreign entry in a complex sector such as the infrastructure.

Table 5 below combines Table 2 from the theory chapter with the findings regarding perceived challenges from the appended papers (2, 3, and 4).

Table 5: Perceived challenges when entering the Swedish infrastructure sector.

Challenge category	**Identified challenges in appended papers**
Economic challenges	Switching costs (Paper 2) Cost disadvantages independent of scale (Paper 2)
Political challenges	Regulations and practice (Paper 4) Governmental policy (Paper 2)
Procurement-related challenges	Product differentiation (Paper 2) Selection of contractor and its personnel (Paper 4)
Social challenges	Expected retaliation (Paper 2) Inter-cultural business competence (Paper 3) Clan control (Paper 4)
Project-related challenges	Access to subcontractors, domestic staff and consultants (Paper 2) Intra-lingual transactional competence (Paper 3) Approving materials (Paper 4) Inspecting documents (Paper 4)

Table 5 summarises the identified challenges from the appended papers. The challenges connected to *Economic challenges* could be additional cost that is connected to a client switching supplier (Paper 2). There are empirical data in Paper 4 stating that the site controller has been more expensive for the client than budgeted for due to working with a new contractor. The cost disadvantages independent of scale from Paper 2 are the problems of utilising the foreign contractor's own in-house design team (accessing know-how in the

local market), and getting access to raw materials in the local market or getting a reasonable price at the rock crushing plants that are owned by competitors.

Political challenges could be the client's reliance on regulations and practices that are connected to rules, such as the bridge regulations that are pinpointed explicitly in Paper 4 as causing confusion for foreign contractors. The extensive and context-specific regulations, norms, and standards in Sweden are difficult to grasp and understand for foreign contractors (Paper 4). The problem is twofold because firstly, the sheer volume of documents that the client refers to in the tendering documents is massive, and secondly they are country specific and different from similar standards and codes in Europe (Paper 2). Many respondents at the client mentioned misunderstandings and misinterpretations based on foreign contractors' lack of knowledge about Swedish norms, regulations and practice.

Procurement-related challenges include handling demands from the client, contractors describing feeling that the client wanted to award a contract to a specific contractor and, therefore, having written the demands towards that end (Paper 2), and uncertainties with submitting a tender, such as getting access to subcontractors (Paper 2), and how the client demands competence at partner selection in the procurement (Paper 4).

Social challenges are also found, such as differences between how domestic labour functions in relation to a foreign contractor's staff (Paper 3). Hiring local people has also been an identified challenge because of the new foreign contractor not being perceived as a secure employer due to them being entirely new and thus experiencing difficulties in recruiting from other, domestic contractors (Paper 2). There are also challenges identified with how the domestic contractors see to it that knowledgeable staff do not get recruited by the new contractor (Paper 2). The way the client demands collaboration (clan control) has been a new way of working for the foreign contractors as they are accustomed to a different setting, one where the actors pursue their own interests (Paper 4).

Project-related challenges are evident in Paper 3 when it comes to using a foreign contractor's in-house design team. More factors related to different types of control systems in Paper 4 could be classified as challenges. This could be, for example, formulating joint objectives if the contractor perceives the client's demand for this type of collaboration as less positive. Many of the bureaucratic control system targets have been identified as problematic by foreign contractors due to them not being accustomed to a client using this type

of control system, such as document inspections, in a DB setting, as concluded in Paper 4. The control system used by the client could be regarded as another type of challenge; the contractor must learn how the client oversees the project. It is not possible to simply translate the demands from one language to another (shortage of intra-lingual competence) or import work methods from the contractor's own native country (regulations and practice) (Paper 3). That the client demands specific materials (Paper 4) is also a challenge, as the contractor needs to buy material directly from the client. As pointed out in Paper 2, there is a need to subcontract a large portion of the actual project execution to subcontractors, which could be a challenge when being new to the sector.

6 CONCLUSIONS

The purpose of this thesis has been to explore the implementation of two strategies — increasing the number of DB contracts and working with foreign contractors — with a focus on the perceived challenges for both client and contractors. Long-term relationships and transfer between projects, as suggested by Ingemansson Havenvid et al. (2016) as a method for client-driven innovation, could be difficult for a public client to fully utilise. Long-term relationships are hard to establish for public clients, such as the STA, due to the Public Procurement Act (SFS 2016:1145). A public client, therefore, needs strategies that are more generally applicable to stimulate innovation, regardless of which contractor the client procures.

Challenges connected to the two implemented strategies have affected the possibilities for executing a successful project. Due to the implementation of strategies occurring in the projects (Loch & Kavadias, 2013), the project outcome could be one indicator of how successful the strategy implementation has been. The DB contract setting has not resulted in the expected end-result due to the actors not fully working with the contract type as intended.

The perceived challenges when working with an increased number of foreign contractors have been identified and structured in line with Table 2 in the theory section. The result in this thesis is that these challenges are connected to economic, political, procurement-related, social, and project related challenges. A client that wants to increase the number of new or foreign contractors to their sector needs to be prepared for the complexity of the tendering process as well as the establishing and working with a new contractor from abroad. There is both a need to oversee as well as communicate in a new way that requires resources for both the client and also the contractor.

6.1 Theoretical contributions

The theoretical contribution is connected to the client's role in how strategy implementation could be carried out in an inter-organisational relationship. That a client should stimulate innovation has been established, but how this could be done is less researched. This thesis focuses on two strategies for how the path towards innovation could look, from both client and contractor perspective, resulting in a theoretical contribution to the client-driven innovation literature.

A theoretical contribution to the construction management literature is made by connecting control systems (Ouchi 1979) with changing contract type, (or changing structure, as the change from DBB contracts to DB contracts could be regarded as), as investigated by e.g. Cacciatori and Jacobides (2005). The bureaucratic control system (Ouchi 1979) are suitable with DBB contracts, and the market control system (Ouchi 1979) should work better with a DB contract, therefore there is a contribution to the organisational control literature as well.

Earlier research has studied the entry modes, entry decisions, or entry barriers, but has overlooked the processes involved when an actor establishes a position in the construction sector. By extending, and combining, Porter's (1980) entry barriers with risks in the construction industry Han et al. (2004), Ozorhon et al. (2007), Xiaopeng and Pheng (2013), Odediran and Windapo 2018), thereby creating a list of challenges, a contribution is made to the construction management literature. The perceived challenges for both the client and the contractor when working together during the execution of a project have been emphasised in this thesis. By not only focusing on the contractor's view and decision regarding entering a new foreign sector, but instead adding the strong client setting in the Swedish infrastructure sector, an additional contribution is made.

6.2 Practical contributions

The practical contributions are connected to the identified challenges when establishing a position in a new sector. These identified risks, or challenges, are demanding for a new entrant and should warrant attention by both the client and the foreign contractors. A client that seeks new entrants to the market

should try to remove or lower the threshold whenever possible. Being aware of the challenges makes handling them possible, and a client could ease a contractor's situation and therefore enable them to focus on innovation and improvements. A client should allocate resources to handle the challenges identified in this thesis, such as building contextual communicative competence.

6.3 Suggestions for further research

From this thesis, there are different themes for further research that could be suggested. The first relates to the second part of the strategy implementation – has the intended goal of these two strategies to stimulate innovation been reached or not? If the answer is no, then the subsequent question could be how the strategy could have been implemented differently in order to reach the objectives. This thesis is focused on the implementation of the two strategies without making a connection to the actual supply-led innovation from a client's perspective. A possible next step in my PhD studies, therefore, could be focused on innovation. A reasonable question following this study could be how the strategy to shift to DB contracts has affected the actual innovation possibilities in the inter-organisational relationship. Is giving a contractor the opportunity to create innovation enough to satisfy the client's wish for stimulating innovation in the sector?

There is a challenge identified in this thesis regarding the use of a foreign contractor's in-house design-team. The client's interest in working with foreign contractors has been connected to utilising designs from abroad to enhance knowledge and competence. However, if the in-house design team cannot draw up designs that accord with the client's rules and regulations in Sweden, and instead subcontract the same design companies as the domestic contractors, this part of the strategy is not working as intended. Further research could therefore investigate this in more detail.

There are limitations regarding the analysis and theoretical frameworks in this thesis. There has been a selection regarding what perspective to use to explain the perceived challenges and perceptions of changing to DB contracts. Other perspectives and other theoretical frameworks could have been used, and thus produced other conclusions. For example, identifying enablers, and not just challenges or constraints, could have resulted in another description of how

client and contractor representatives perceived the implementation of the two strategies.

Another suggestion for further research could be how the identified challenges in this thesis could be managed, specifically also how it has been managed by the client and the effect this has had. In this thesis, the focus has been on constraints only, and so a next step could be exploring the enablers for strategy implementation.

In this thesis, the client's decision to implement these two strategies has been the focus, along with how they are perceived at the project level. Other levels and other perspectives could be relevant to study, such as other clients and their choice of strategies for increasing the innovation rate. The findings in this study are connected to the Swedish Transport Administration, meaning that there could be other factors that are important for other clients. Transferring the knowledge from this context to other parts of the infrastructure sector, even in Sweden, could be difficult, even with the dominant status of the STA in this sector. A comparison between other clients and their strategy implementation could result in a broader understanding of better or less suitable strategies for supply-led innovation. There could also be an interesting tension between the decision-making level at the client and the project-level, where implementation is carried out, as the project-led organisation could create a distance between the vision and the implementation.

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APPENDIX A

Example of interview guide

Respondent (name)

Organisation

Role in project

Respondent background

General project description

1. Describe the project and its characteristics (in terms of complexity, uncertainties, degrees of freedom, duration and contract sum, work site conditions, external influences (municipality, political, citizens)?
2. What were the major challenges in the project and how did you work with these?
3. Have any major changes occurred that affected the project's initial goals / time / cost?
    a. If so, how has this affected the project?
4. Did the project have any explicit focus on sustainability? If so, what were the consequences?

Procurement strategies

5. How and by whom was the procurement conducted? (What roles participated and in what way?)
6. What procurement strategies have been used and why?
    a. Type of contract
        i. In what phase was the supplier procured?
        ii. Who was responsible for the design and how was it conducted?
    b. Reward system (fixed, target, incentives, bonus, penalty)
    c. Bid invitation (open, prequalification)
    d. Bid evaluation (price, soft parameters e.g. competence, organisation, social demands, environmental demands)
        i. How were soft parameters monitored during the execution?
    e. Collaboration model
        i. What collaboration activities/tools were carried out (e.g. joint project office, joint goal formulation and follow up, partnering manager, conflict resolution model)
7. Why did you choose these procurement strategies?
8. Do you think the goals (time, cost, quality, environmental) were communicated clearly within the project organisation?
9. How did you experience the different procurement strategies?
10. What are the advantages and disadvantages of the choices made above?
11. Would you have taken a different approach with your current knowledge, why and how?
12. What components of the procurement strategy are most important to create opportunities and drivers for foreign suppliers to submit tender in our contracts?
13. What components of the procurement strategy are most important to create opportunities and drivers for the foreign suppliers to work efficiently and be innovative in our projects?

Work methods and organisation

14. Do work methods differ in projects with foreign suppliers compared with Swedish suppliers?
    a. If so, how does it differ?
15. How has the cooperation (in general how they have worked together) worked with foreign suppliers?
    a. Is it any different compared to Swedish suppliers?
    b. Can you describe the communication (e.g. how was it conducted, between which people)?

16. What are the major challenges when working with foreign suppliers?
17. Have cultural differences been a challenge?
    a. If so, how have these differences been handled in the project?
18. How have the foreign suppliers handled our demands regarding work environment/safety and social requirements?
    a. Do we need to improvement our work/methods in these areas linked to our foreign suppliers?
19. What did your project organisation look like in this project?
    a. Is this in any way different from projects with Swedish suppliers?
    b. Do you see any key roles for these projects to work successfully?

Innovation (these are not questions for the procurer)

20. How did you work with innovation and development in the project?
    a. What kind of improvement work did you focus on (process, product, organisation)?
    b. Did you focus on developing completely new solutions or enhancing existing ones?
    c. What drivers and opportunities does the supplier have to develop innovations in the project?
    d. Were there any specific barriers for implementation of innovation and improvement work?
21. Describe a couple of specific important innovations that were developed and implemented within the project
    a. What was the reason for the development? (driver, opportunity, problem solving)
    b. Who was the initiator?
    c. Who were involved?
    d. How was the development work performed?
    e. Is this solution only for this project or could it be used in future projects as well?

Final questions

22. Was this a successful project? Why/why not (time, cost, quality)
23. What were the top three most important factors (decisions/work methods) that positively affected the project?
24. What were the top three most important factors (decisions/work methods) that negatively affected the project?
25. What would you have done differently if you were to redo the project?

APPENDIX B

Information on interviews and respondents

Respondent	Case	Role	Actor	Duration (min)
1	A	Project manager	Client	49
2	A	Procurement officer	Client	65
3	A	CEO/Project director	Contractor	36
4	A	Project manager	Contractor	27
5	A	Project engineer	Contractor	46
6	B	Project manager	Client	90
7	B	Procurement officer	Client	60
8	B	Project engineer	Client	40
9	B	Project director	Contractor	90
10	B	Design manager	Contractor	35
11	B	Project support	Contractor	60
12	B	Project manager	Client	45
13	B	Site controller	Client	30

14	C	Project manager	Client	113
15	C	Procurement officer	Client	-
16	C	Project director	Client	73
17	C	Project manager	Contractor	40
18	C	Contract manager	Contractor	65
19	D	Project manager	Client	121
20	D	Procurement officer	Client	33
21	D	Project director	Contractor	93
22	D	Contract manager	Client	58
23	E	Project manager	Client	73
24	E	Procurement officer	Client	53
25	E	Project director	Contractor	55
26	E	Project director	Client	65
27	E	Site manager	Contractor	62
28	F	Project manager	Client	139
29	F	Project director	Client	70
30	F	Procurement officer	Client	41
31	G	Project manager	Client	100
32	G	Procurement officer	Client	-
33	G	Project engineer	Client	30
34	G	Project director	Contractor	70
35	G	Site controller	Client	40
36	H	Project manager	Client	103
37	H	Assisting project manager	Client	70

38	H	Project director	Contractor	74
39	H	Design manager	Contractor	58
40	H	Site controller	Client	22