



**CHALMERS**  
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# **Early Contractor Involvement in Large Civil Engineering Projects**

## **Implications for the Contractor's Business Model**

Master's Thesis in the Master's Programme Design and Construction Project Management

KARIN BLAD  
MARKUS JOHANSSON



MASTER'S THESIS E2015:063

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ABSTRACT

Early Contractor Involvement (ECI) is a two-stage project delivery approach engaging contractors in the design phase. It is a new concept on the Swedish market for large civil works and as there are two large upcoming projects using this delivery model, contractors are analysing what role ECI can have in their project portfolios. To support contractors in their decisions regarding ECI, as well as clients in their design of ECI, this thesis aims to identify factors that are decisive when a contractor chooses to tender for an ECI project by investigating what effects ECI has on the contractor's business model. Empirical data was collected by interviewing 14 representatives for contractors (both Swedish and UK) and clients. The analysis discusses the results in relation to components in a business model framework. The thesis identified a number of decisive factors which concerned the contractor's organisation, the procurement design and the contractual design. New competences need to be involved in the contractor's tendering process, and the project delivery requires employees with a collaborative mindset. When designing the procurement route it is perceived as crucial that a project cost estimate is excluded from the tender document and that the fee is not given a too high weight. Otherwise ECI risk losing much of its purpose as tendering costs increase and the fee becomes a dominant factor in the evaluation. A problem in relation to the contractor's business model is the long lead time for the design phase, when the contractor's turnover is low. This can be managed by beginning earlier with time critical works or sub-dividing the project into smaller phases. To create the right motivation and prevent opportunism, the size and the basis for contractors' compensation also have to be carefully managed. By considering all these factors clients can offer a project which is attractive to contractors and in that way benefit from increased competition. ECI projects can further improve the efficiency of the construction industry while providing more predictable revenues for the contractor.

Key words: Business model, Construction, Early Contractor Involvement, Incentives, Large civil works, Project portfolio, Procurement, Two-stage tendering.

Early Contractor Involvement i stora anläggningsprojekt  
Konsekvenser för entreprenörens affärsmodell  
*Examensarbete inom masterprogrammet Design and Construction Project Management*

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### SAMMANFATTNING

Early Contractor Involvement (ECI) är en metod för att genomföra projekt två steg som involverar entreprenören i projekteringsfasen. Det är ett nytt koncept på den svenska marknaden för stora anläggningsprojekt och eftersom två stora projekt planeras genomföras med ECI analyserar nu entreprenörerna vilken roll ECI kan ha i deras projektportfölj. Denna uppsats syftar till att identifiera de faktorer som är avgörande för entreprenörens beslut att lämna anbud på ett ECI-projekt genom att undersöka hur ECI påverkar entreprenörens affärsmodell. 14 intervjuer genomfördes med svenska beställare samt entreprenörer från både Sverige och England. Resultatet analyserades i relation till teori om affärsmodeller. Ett antal avgörande beslutsfaktorer identifierades, som berörde entreprenörens organisation samt utformningen av förfrågningsunderlag och kontrakt. Entreprenörens organisation måste anpassas så att andra kompetenser involveras i anbudsarbetet och projektgenomförandet kräver medarbetare med hög samarbetsförmåga. När upphandlingen utformas är det viktigt att förfrågningsunderlaget inte inkluderar en uppskattning av projektkostnaden och att arvodet inte ges alltför hög vikt. Annars ökar anbudskostnaderna och arvodet får en avgörande roll i utvärderingen, vilket innebär att ECI riskerar att förlora stora delar av sitt syfte. Ett problem i relation till entreprenörens affärsmodell är de långa ledtiderna i projekteringsfasen, då entreprenörens omsättning är låg. Detta kan med fördel hanteras genom att antingen börja med tidskritiska arbeten tidigt eller dela upp projektet i mindre faser. Principerna för entreprenörens arvode måste analyseras noggrant för att skapa rätt drivkrafter och undvika opportunist. Genom att överväga alla dessa faktorer kan beställare erbjuda ett attraktivare projekt och därmed öka konkurrensen. ECI kan även förbättra effektiviteten i byggbranschen samtidigt som det erbjuder en stabil och förutsägbar grund för entreprenörens verksamhet.

Nyckelord: Affärsmodell, Byggande, Early Contractor Involvement, Incitament, Stora anläggningsprojekt, Projektportfölj, Upphandling, Två-stegsupphandling.

# Contents

ABSTRACT	I
SAMMANFATTNING	II
CONTENTS	III
PREFACE	V
GLOSSARY	VII
1 INTRODUCTION	1
1.1 Background	1
1.2 Aim and problem statement	2
1.3 Scope and limitations	3
1.4 Method	3
2 FRAME OF REFERENCE	5
2.1 Collaborative contract forms	5
2.2 Phases and effects of Early Contractor Involvement	5
2.3 Procurement and tendering	7
2.4 Commercial arrangements	7
2.4.1 Fixed-price and cost-based contracting	7
2.4.2 Target price and pain/gain share	8
2.4.3 Other incentives and bonuses	9
2.5 Business model framework	10
2.6 Theoretical summary	11
3 METHODOLOGY	13
3.1 Feasibility study	13
3.2 Main study	14
3.3 Analysis of empirical data	16
4 RESULTS AND ANALYSIS	19
4.1 Early stages	20
4.1.1 Clients' motives for choosing Early Contractor Involvement	20
4.1.2 Key activities	20
4.2 Tendering	21
4.2.1 Key resources	21
4.2.2 Customer relationships	22
4.2.3 Cost structure	23

4.3	Project delivery	23
4.3.1	Key activities	23
4.3.2	Key resources	24
4.3.3	Customer relationships	25
5	DISCUSSION	29
5.1	Early stages	29
5.2	Tendering	30
5.2.1	Evaluation criteria	30
5.2.2	Cost of submitting tenders	31
5.3	Project delivery	31
5.3.1	Creating a desired level of trust and collaboration	31
5.3.2	Possible problems when developing a target price	32
5.3.3	Different reimbursement models and incentives	32
5.3.4	Long lead times with low turnover in phase 1	33
6	CONCLUSIONS	35
7	REFERENCES	37

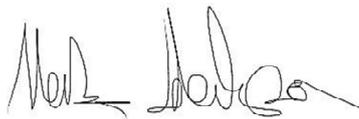
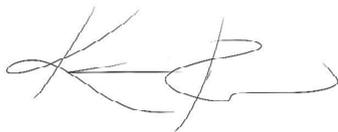
## Preface

This master's thesis was conducted during the first six months of 2015 at the Department of Technology Management and Economics at Chalmers University of Technology. Associate professor Anna Kadefors supervised the work of this thesis and supported us through helpful advice. The thesis was done in collaboration with Skanska Sweden and their department for large civil works. Our contact person at Skanska was Per-Ola Svahn who showed great interest in our work and has helped us greatly throughout this study.

We would like to send great thanks to both Anna Kadefors and Per-Ola Svahn for their engagement and guiding during this thesis. Further, we would like to thank all interviewees that contributed to our study with their time, thoughts and knowledge.

Göteborg June 2015

Karin Blad and Markus Johansson





# Glossary

Alterations and additions	Ändrings- och tilläggsarbeten
Business model	Affärsmodell
Civil works	Väg- och anläggningsarbeten
Cost-plus	Löpande räkning
Design-bid-build contract	Generalentreprenad, AB04
Design-build contract	Totalentreprenad, ABT06
Fee	Arvode
Fixed-price	Fastpris
Hit rate	Träffsäkerhet, andel vunna anbud
Non-price criteria	Icke-priskriterier/mjuka parametrar
Open book accounting	Öppna böcker
Price criterion	Ekonomisk parameter
Weighting	Viktning av utvärderingsparametrar
Reimbursement model	Ersättningsmodell
Target price	Riktpris
Tender document	Förfrågningsunderlag
Tender	Anbud



# 1 Introduction

A contractual arrangement between a client and a supplier is normally built on three pillars: contract form, reimbursement form and collaboration form. Combinations of these result in different risk allocations and motivations. When deciding which projects to tender for, contractors have to consider possible consequences of the contractual arrangements and whether the project can fit their portfolio. Introducing new contractual designs and procurement routes requires careful analysis from all involved parties. Contractors have to evaluate the profitability and available space in their project portfolio and clients have to analyse how to obtain satisfactory value and competition. At the time being, a new project delivery approach named Early Contractor Involvement (ECI), with origins in the UK, is being introduced on the Swedish market.

## 1.1 Background

Separation between the design and the construction phase in the traditional model for organising construction projects was identified as a major problem in the construction industry already in 1960's (Mosey, 2009). Alternative models started to evolve in the US in 1988, where construction related disputes were prevented by using a form of partnering, which in turn was inspired by Japanese management philosophies. In the UK, recommendations in two influential reports on how to reform construction procurement (Latham, 1994; Egan; 1998) created a basis for a two-stage procurement and contractual route with open books (Mosey, 2009).

This route was adopted in 2001 by the British Highways Agency under the name Early Contractor Involvement (ECI) as an attempt to eradicate adversarial relationships between clients and contractors that originated from a 'bid low, claim later' attitude among contractors (Bourn, 2007; Mosey, 2009). Today, ECI is frequently used in the UK and has been embraced in other countries as a delivery system for large complex projects with high risk profiles (Rahmani et al., 2013). In contrast to design-build and design-bid-build contracts, the contractor is involved jointly with the client in the design phase to establish an agreed target price (Nichols, 2007). As a result contractors can contribute with their inputs at an earlier stage, which is argued to increase constructability and provide more reliable cost estimates (Eadie et al., 2012; Nichols, 2007; Rahman, 2012; Sødal et al., 2014). Contractors benefit from reduced tender costs, as no design or cost estimates have to be made in the tendering process, and from lower project risk, as risk is shared between the client and the contractor (Nichols, 2007). However, trust and openness within the project organisation is mentioned as a crucial element and perceived as one of the greatest challenges in ECI (Eadie et al., 2012; van Huuksloot, 2014; Rahman, 2012).

In Sweden, the ECI concept is still a fairly unknown and unused construction project delivery approach. However, other forms for early involvement of the contractor have been used and in building projects various methods for collaborative contracting are common. In early 2015, only one civil engineering ECI project had been procured: the experimental research facility European Spallation Source (ESS) that is being built in Lund. As of now, the Swedish Transport Administration (STA), who is the main public client in Sweden for civil works, plans to execute two of the subprojects in a larger railway tunnel project ('Västlänken', or 'the West Link') using an ECI

approach during the coming years (Trafikverket, 2015). Both ESS and the two ECI projects in the West Link have high degrees of complexity. ESS is being built in parallel with research which means that production has to be adapted to the latest updates in research for the final building to be as customised and up-to-date as possible. The ECI projects in the West Link programme imply large challenges regarding constructability and logistics, as much of the production will take place in close connection with existing road, train and tram infrastructure (Brunbäck, 2014). In all three of these ECI projects the prerequisites would be too difficult to specify in terms of a design-build fixed-price contract. Thus, early involvement of the contractors has been considered a necessity.

ECI does not contain strict rules neither for the procurement evaluation model nor for contractual design (Mosey, 2009), and therefore the procurement and contract design is unique for each project. As mentioned above, trust between the parties is crucial for ECI to be successful. Hence, the tender specifications need to be designed to ensure that the best collaboration partner is procured for the specific work (Walker and Lloyd-Walker, 2014). Further, the client has to consider how attractive the project is to contractors to ensure high competition.

One major change that ECI entails is that a contractor is involved already in the design phase and is normally reimbursed on an hourly basis with a possible additional percentage fee, similarly to a consultancy firm (Mosey, 2009). As a contractor's business model is built on reimbursement from production and not on return from employees' salaries, contractors' have to review their existing business model if aiming to follow out ECI successfully. However, a business model consists of several interdependent factors and a fundamental change to one of these requires adaptations of the others (Osterwalder, 2004). Consequently, the radical change that ECI entails (Song et al., 2009) may require adjustments in several components of the business model.

## **1.2 Aim and problem statement**

Contractor engagement in two phases, with various payment mechanisms and joint risk management, generate different cost structures and revenue streams (Mosey, 2009). Obviously, taking risks implies possibilities of higher profits and, as the risk is shared between the client and contractor, the profit from ECI projects cannot be expected to be as high as in successful fixed-price contracts (Nichols, 2007). However, how the two-staged nature of ECI should be evaluated in relation to a contractor's project portfolio and business model has not been sufficiently understood and explained.

The ability to understand what impact different contractual arrangement can have on the business model enables companies to leverage their core business to their advantage, while also delivering maximum value to the client (Johnson et al., 2008). More importantly, it makes it possible to foresee whether or not a specific project can be profitable.

The aim of this thesis is to identify the factors that are decisive when the contractor chooses whether to tender for an ECI project by investigating what effects ECI has on the contractor's business model. The purpose is to support contractors in their decisions regarding ECI as well as clients in their design of ECI for the Swedish market.

The thesis aims to answer the following research question:

*What factors are decisive for the contractor's choice of including an ECI project in their project portfolio?*

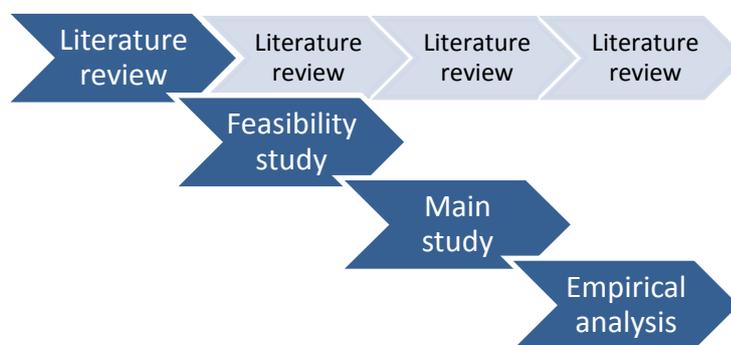
### 1.3 Scope and limitations

The thesis was conducted in collaboration with Skanska Sweden's department for large civil works, one of the major Swedish civil engineering contractors. Managers of this department were interested in a deeper investigation of ECI's potential adaption on the Swedish market and the implications for their business model. Skanska UK has long experience from ECI projects and therefore works in close collaboration with Skanska Sweden in developing their knowledge in this area. Skanska UK is also involved in the first civil ECI project in Sweden, the European Spallation Source (ESS) mentioned above, for which Skanska was awarded the main contractor contract in 2014. ESS is an approximately 16 billion SEK project, planned to open in 2019 and achieve full operational capacity in 2025. Skanska is further a potential contractor for the two planned ECI projects in the West Link.

Since this thesis was performed in collaboration with Skanska no other contractors are included in the interview studies. Further, neither foreign clients nor any foreign projects are included due to time restrictions. The focus in this thesis will primarily be on what impact involvement in a design phase would have on the main design build contractor's business model. Only the client-contractor relationship is studied even though ECI aims to also involve consultants and subcontractors. As most projects of the department of large civil works today are design-build contracts, ECI will primarily be compared to a design-build project.

### 1.4 Method

The research method was divided into four stages as showed in Figure 1. The research started with a literature review which continued throughout the study. Along with the literature review an interview study was conducted, including 14 interviews divided into a feasibility study and a main study.



**Figure 1** The data collection and analysis process.

The review was conducted through scientific data bases such as SCOPUS, ScienceDirect, Google Scholar etc. accessed through Chalmers University of Technology using the following keywords: business model, contractor, construction, early contractor involvement, ECI, incentives and procurement. Abstracts, keywords and conclusions were examined in order to evaluate the articles' relevance. Articles relating to multiple of the keywords were primarily selected, followed by assessment based on number of citations and the extent of the bibliography. References in the selected articles and articles citing to them were considered as well. This resulted in over 100 different sources comprised mainly by scientific articles and reports but also books, handbooks, guidelines, laws, standards and web pages. A software called Mendeley was used to create a database of all digital sources and were used to process the theoretical data. The feasibility study, main study and empirical analysis are described in Chapter 3.

## 2 Frame of reference

Early Contractor Involvement (ECI) is sometimes used as a generic term for involving the contractor at an early stage. However, in this thesis ECI is defined as the two-stage procurement approach used in the UK as described by Nichols (2007) and Rahmani et al. (2013). Additional to the theory of ECI a business model framework is introduced in the final section of this chapter. As defined by Osterwalder and Pigneur (2010, p. 14) “*a business model describes the rationale of how an organisation creates, delivers and captures value*” and will therefore be used for analysis of the empirical results.

### 2.1 Collaborative contract forms

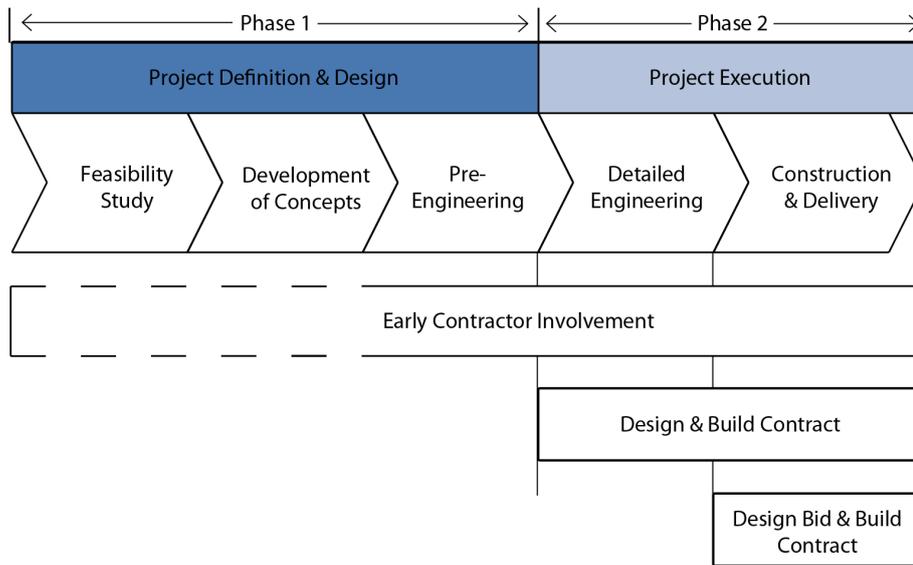
As already stated, ECI has its origins in partnering. It is a two-stage procurement approach that aims to increase the value for money (Eadie and Graham, 2014; Nichols, 2007; Rahman, 2012). Both prior to and alongside with ECI, partnering and other forms of collaboration have emerged. In the US two new project delivery models, Construction Management at risk and Integrated Project Delivery, have been developed (Kadefors and Eriksson, 2015), while Project Alliances have become common in Australia (Walker and Lloyd-Walker, 2015). The implications in practice of the term ‘Early Contractor Involvement’ as a collaborative project delivery approach has however evolved differently in for instance UK, Australia, the US, the Netherlands and New Zealand (Rahmani et al., 2013). In the UK, ECI has since its introduction in 2001 become an increasingly popular procurement route (Rahmani et al., 2013), as early involvement of contractors has shown great benefits for innovation, risk and value management, cost and project duration (Nichols, 2007; Walker and Lloyd-Walker, 2012).

### 2.2 Phases and effects of Early Contractor Involvement

At what time the contractor is involved in an ECI project varies and ranges from the initial design phase to the pre-engineering phase as shown in Figure 2 (Walker and Lloyd-Walker, 2014). The scope and responsibility of work for the contractor hence differs depending on when the involvement occurs. Normally, a contractor is awarded the contract in Phase 1 and develops a design jointly with the client (Rahmani et al., 2013). A target price for the design is also estimated and if the results fulfil the client’s requirements the same contractor is normally awarded the contract for Phase 2 and will proceed with executing the agreed design. Often the client includes a go/no go clause in the contract, enabling both parties to exit the collaboration if not agreeing on the target price and allowing the client to procure another contractor for Phase 2 (Walker and Lloyd-walker, 2014). Contractual targets can create stronger commitment for the end product as the contractor needs to fulfil requirements agreed in Phase 1 to be awarded Phase 2 (Mosey, 2009).

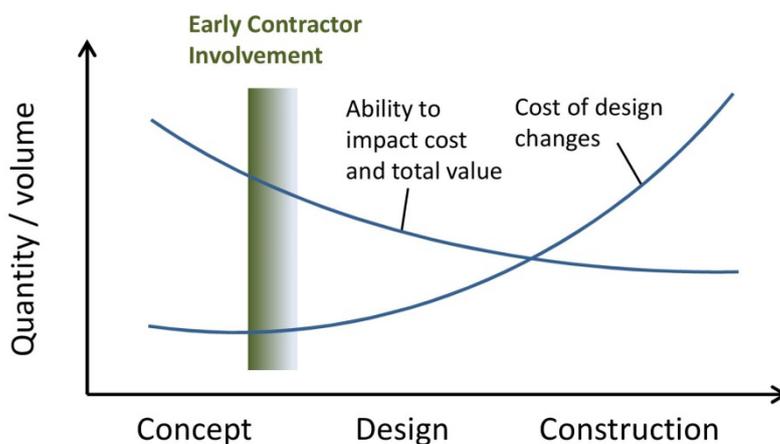
Figure 2 shows the contractor involvement in design-build and design-bid-build contracts compared to in the ECI delivery approach. It should be noted that many projects may not be worth the effort that ECI entails due to their limited size or complexity (Mosey, 2009). In smaller and simpler projects the contractor’s knowledge might not be as needed in the early phase and the design can be set without involvement of the contractor. Further, some clients might not want to be

involved in the whole project and prefer to just state performance requirements and let the contractor execute the project as in traditional design-build contracts.



**Figure 2** Project activities in relation to contractor involvement in different delivery approaches (adapted from Walker and Lloyd-Walker, 2014).

Involving contractors in the design phase enable them to contribute to more realistic and accurate cost and time estimations, as well as providing higher constructability and optimised designs at an early stage (Eadie and Graham, 2014; Lahdenperä, 2012; Nichols, 2007; Song et al., 2009; Sødal et al., 2014). At an early stage the possibility to affect the project outcome is greater and the cost of implementing changes is lower, as illustrated in Figure 3 (Lahdenperä, 2010). Furthermore, design errors are believed to be reduced (Rahman, 2012) and ECI has been shown to increase focus on value and quality (Eadie and Graham, 2014; Rahman, 2012). This benefits all project participants, including contractors, as they are responsible for the construction works and can obtain better cost control and reduce their administrative costs (Rahman, 2012).



**Figure 3** Cost and ability to impact the design (Lahdenperä, 2010).

Both Nichols (2007) and Eadie et al. (2012) describe how ECI requires a different culture than design-build contracts. Accordingly, commitment to common objectives is identified as one of the biggest challenges in ECI (Rahman, 2012; Rahman and Kumaraswamy, 2005). Furthermore, establishment of trust is mentioned as essential (Rahman, 2012; Sødal et al., 2014). Communication is another reoccurring topic and necessary sharing of vital information between the client and contractor is seen as a major challenge (Eadie et al., 2012; Rahman, 2012).

## **2.3 Procurement and tendering**

The procurement of public civil works is restricted by EU procurement regulations, which compel clients to select contractors either based on lowest price or on the most economically advantageous tender (CIPFA, 2013). The most economically advantageous tender means that clients shall value tenders based on award criteria, which shall be specified in the tender documents and allows clients to evaluate contractors on both price and quality (Lahdenperä, 2013). If including a range of non-price award criteria, the challenge for clients is to specify criteria that may be objectively assessed to motivate the contract (Bower, 2003) and the process is generally more demanding than selection based on lowest price only (Mosey, 2009). The use of non-price criteria is further argued to “*yield valuable information that will assist the client in making the right choice and that will be consistent with two-stage procurement*” Mosey (2009, p. 72). Furthermore, Lahdenperä (2010) suggests that competence and cooperation should represent a large part of the tender evaluation in order to pursue better economy in the project and that the procurement should aim to put the best possible team together. In project alliances, which are similar to ECI in many respects, price should not be given a percentage exceeding 20 - 30% (Lahdenperä, 2010). Similarly, Rahman and Kumaraswamy (2005) found in their study on the importance of different criteria in contractor selection that price was ranked as number 14 out of 22 factors. Price was well behind the top three factors: timely project delivery, approach to joint problem solving and quality of works.

## **2.4 Commercial arrangements**

This section contains a short introduction to the two main reimbursement models in the construction sector and further explains target price contracting, a model which is often associated with ECI. General information about the payment mechanisms was found in handbooks and guidelines as the academic articles gave scarce information in the detailed level that was requested.

### **2.4.1 Fixed-price and cost-based contracting**

There are generally two types of contract strategies: fixed-price and cost-based contracts (Bower, 2003). In fixed-price contracting a fixed price is submitted in the tender and the actual costs are not audible by the client. Fixed-price contracting is a way for clients to transfer most of the risk to the contractor (Bower, 2003). By using this reimbursement model, clients obtain high certainty in the total project cost, provided that the level of detail in the tender document is complete. The more risk transferred to the contractor, the higher risk allowance added to the estimated costs and thus an increased potential for contractors to achieve high profits.

In cost-plus payment agreements the contractor is compensated for the actual costs incurred plus a fee for overheads and profit. This requires open book accounting so all costs are audible by the client (Bower, 2003; CIPFA, 2013). Open book accounting is further recommended in projects where the client aims to create proactive attitudes, improved commercial performance and sustainable long-term business relationships. The opportunities for cost reductions with open book accounting increases with project risk and potential for increased efficiency (CIPFA, 2013). Mosey (2009) argues that cost-based contracting results in better value and says:

*“In the long run it is better value for a client to pay for risks that actually occur during the construction phase of a project rather than to agree on a price based on what a contractor thinks might occur”* (Mosey, 2009, p. 10).

The opinions on whether the contractor should be reimbursed for participating in Phase 1 or not differ in the literature (Mosey, 2009). Contractor contributions at no cost in Phase 1 can result in insufficient resource allocations by the contractor and move focus from the intended aims with Phase 1 to quickly reaching Phase 2 whatever the cost to the client. On the other hand, getting reimbursed as a consultant at an hourly rate can instead incentivise the contractor to increase the scope of the project. However, Mosey (2009) argued that the best way to secure value for the clients is to reward contractors appropriately for their contributions to the project instead of basing their rewards for Phase 1 on the achievement of Phase 2.

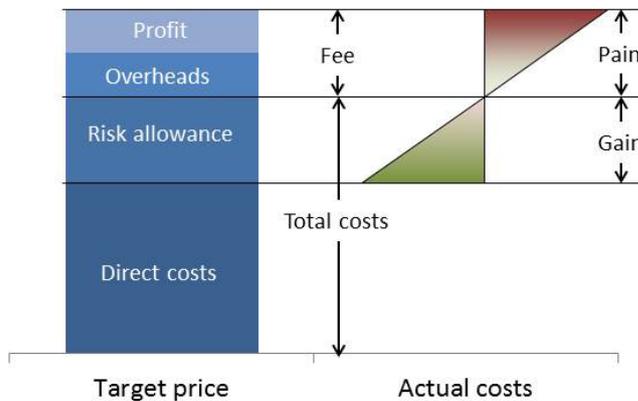
#### **2.4.2 Target price and pain/gain share**

Target price contracting is recommended for high-risk and complex projects and where a high degree of collaboration between the contractual parties as well as flexibility is sought (Bower, 2003). Target contracts are believed to be most straightforward to achieve improved commercial targets (CIPFA, 2013) and are by many practitioners considered essential to create and support joint goals in collaborative contracts (Kadefors and Badenfelt, 2009). A target price is an estimated probable cost for a specific scope of work. In ECI it is developed and agreed during Phase 1 and is adjusted for major changes during the Phase 2.

A target price includes the four elements; direct cost, risk allowance, overheads and profit. The direct costs and risk allowance represents the estimated final project cost and the overheads and profit represents the contractor’s fee. Direct costs are the estimated costs for materials, site workers, subcontractors and equipment for a given scope of work (CIPFA, 2013; Eriksson, 2015). The process to decide the size of the risk allowance includes risk definition, identification, assessment, allocation, planning and management. Target price contracting further includes arrangements of how these risks should be shared between the client and the contractor (CIPFA, 2013), a process which in ECI is carried out jointly during Phase 1 (Mosey, 2009).

The fee of the target price contract can be set as either a percentage of the actual costs or an agreed fixed sum (Bower, 2003). Additionally, target price contracts often include a share formula for over and underspending against the target price. Figure 4 illustrate how deviation from the target price results in either a ‘pain’ or ‘gain’. The ratio of how the pain or gain is shared can be designed differently for savings and overspend and it is common to set limits (Kadefors and Badenfelt, 2009). This allows for a more equal share of risk compared to cost-plus, when the client carries the risk for cost overruns, and in fixed-price contracts, where the contractor does so. However,

a pain/gain share mechanism might result in discussions about what changes that should adjust the target price (CIPFA, 2013). Contractors benefit from increasing the target price as that can increase the size of gain share. It is argued that such discussions may divert attention from solving the actual issue at hand and it is therefore recommended that the contract contains a clearly defined procedure for adjusting the target price as the project proceeds into Phase 2 (CIPFA, 2013).



**Figure 4** Principles of target price contracting.

### 2.4.3 Other incentives and bonuses

Darrington and Howell (2011) argue that the choice is not whether to have incentives or not since there will always be an incentive structure present that drives behaviours. Therefore, one can either choose to design incentives to support desired goals or passively accept the incentives attached to traditional contracting. The main purpose of adding incentives to contracts is to motivate certain preferred behaviours (Bower, 2003). Incentives rewards desired behaviours and/or punishes unwelcome and are often referred to as a ‘carrot and stick’ approach with the main goal of reaching performance improvements. Furthermore, incentives should benefit all parties, be tangible, realistic, measurable and auditable (Bower, 2003; CIPFA, 2013; Kadefors and Badenfelt, 2009). Incentives are most commonly linked to cost, schedule, quality, and safety, but can be linked to any non-price criteria. When designing the incentive arrangement, it is important to consider the sought customer-supplier relationship, as incentives can encourage self-interest instead of motivating the project team as a whole (Bower, 2003; CIPFA, 2013).

There are researchers claiming that incentive schemes within construction often are too inconsistent in their design and further, researchers within psychology question if financial incentives are the best way of promoting collaboration and motivation (Kadefors and Badenfelt, 2009). In research about incentives and motivation there is a separation of intrinsic motivation and extrinsic motivation (Darrington and Howell, 2011; Kadefors and Badenfelt, 2009). Intrinsic motivation is when we do something because of our own desires and values (Darrington and Howell, 2011) whereas extrinsic motivation is a result from a motivation that is disconnected from the activity itself (Kadefors and Badenfelt, 2009). Extrinsic rewards have been shown to interact with and affect the intrinsic motivation and therefore it is important to design the contractual incentives carefully (Darrington and Howell, 2011; Kadefors and Badenfelt, 2009).

## 2.5 Business model framework

This section presents the origin and definition of the business model framework developed by Osterwalder (2004). The components in his business model are explained as this framework functioned as a tool in analysing the results.

Business models first occurred in academic literature in 1957 (Osterwalder et al., 2005); however the concept did not gain world-wide recognition until the 1990's. Today, business model is a well-known term and recurs with slightly different definitions in work by various authors (Magretta, 2002; Mokhlesian and Holmén, 2012; Pekuri et al., 2014). Even though there is no agreed definition, different authors generally seem to refer to the same concept; the logic of how a company is being operated to deliver value and profit. One of the most cited authors is Alexander Osterwalder (Mokhlesian and Holmén, 2012), who defines a business model as:

*“...a conceptual tool that contains a set of elements [components] and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.”* (Osterwalder et al., 2005, p. 17).

Osterwalder (2004) presents a business model framework based on a literature review, where common denominators, or components, are comprised into a framework. These components were, as illustrated in Figure 5, further categorised under four pillars, written in capital letters, and each pillar and component represents essential components of a company's business model.

INFRASTRUCTURE MANAGEMENT		PRODUCT	CUSTOMER INTERFACE	
<b>Key Partners</b> Defines which partners are necessary to make the company's business model work.	<b>Key Activities</b> Describes the most important activities the company does.	<b>Value Proposition</b> Describes the bundle of products and or services the company is offering.	<b>Customer Relationships</b> Defines what relationship the company establishes with its customers.	<b>Customer Segments</b> Defines who the company aims to deliver value to.
	<b>Key Resources</b> Describes the most important assets of the company.		<b>Channels</b> Describes how the company reaches its customers and delivers value.	
<b>Cost Structure</b> Describes all cost incurred from running the defined business model.		<b>Revenue Streams</b> Describes how the company gains their income.		
<b>FINANCIAL ASPECTS</b>				

**Figure 5** The Business Model ontology (Osterwalder, 2004)

The pillar Product describes the component Value Proposition the business is offering to their customers and defines what business the company is engaged in (Osterwalder, 2004). In order to deliver a certain product the company needs the pillar Infrastructure Management, which includes the components representing their internal Key Activities, Key Resources and external Key Partners. Further, these components generate costs described by the component Cost Structure under the pillar Financial Aspects. The pillar Customer Interface describes who the intended customer is, their established relationship and how the product reaches the customer in terms of communication and value delivery, which are represented by the components Customer Segments, Customer Relationships and Channels. The Product pillar, in combination with the Customer Interface pillar, generates Revenue Streams under the Financial Aspects pillar. The Revenue Streams together with the Cost Structure describe the revenue model of running a certain business.

All components in the business model are interdependent and if one of them changes, the other components have to be adjusted as well (Pekuri et al., 2014). However, Johnson et al. (2008) argue that companies struggle to identify when a new business model is necessary and that they need to consider if the effort of doing so is actually worth it. Further, change in the business model can start from different places and depending on where the starting point is the change can be identified as resource driven, offer driven, customer driven, finance driven or multiple-epicentre driven (Osterwalder and Pigneur, 2010).

## **2.6 Theoretical summary**

ECI entails several changes compared to a design-build fixed-price contract. The conditions for both winning and delivering a project change, which affects the contractors' business model. The tender is evaluated mainly on non-price criteria and price should only stand for a minor part of the evaluation basis. Further, the contractor and client will work jointly in Phase 1 to develop a design and cost estimates together and hopefully agree on a target price. Once in Phase 2 the contractor will practice open book accounting, giving the client full insight in their economy. In Phase 2, the collaboration between the client and contractor will continue and promote everyone involved to work for the project's common objectives. It is important that the commercial arrangements support these objectives to not introduce any self-interest. Several components of the business model are affected by the differences ECI entails and, as all components are interdependent, these will in turn affect surrounding components.



## **3 Methodology**

The research process started with a literature review for which the method is described in Section 1.5. The literature review was followed by the feasibility study and the main study. Both studies consisted of interviews with three and eleven interviews respectively. All interviews, except from Derek Walker and Skanska UK, were held in Swedish and therefore most quotations were translated from Swedish.

The business model concept, which is further described in Section 2.5, was used throughout the study as a support in both creating questions and analysing the data. It was used as a tool to interpret what changes ECI might entail for the contractor and thus assisted in identifying what conditions potentially would have an effect on the economic viability of ECI. Further, it shaped the structure of our results, as we decided to categorise the result to the corresponding component.

### **3.1 Feasibility study**

As a complement to the literature research, a feasibility study was conducted. The purpose of the feasibility study was to develop an understanding of the subject area, identify related issues and be able to create relevant research questions. The feasibility study included interviewing three managers with different roles and experiences, several meetings with both the industry and university supervisors and participation in two seminars on the studied subject, see Table 1. The interviews and seminars contributed with insights in the current level of knowledge and collected experiences, opinions, concerns and expectations on collaborative contract forms.

In the explorative interviews only a few questions were prepared and the interviews were designed to cover certain predetermined themes. The reason for this was to decrease influence on the interviewees (Bryman, 2012). In addition, this allowed the interviewees to openly share their experience on the themes, why the interviews can be classified as either unstructured or semi-structured (Bryman, 2012). The interviews were conducted to clarify information found in the literature review and to identify concerns and expectations regarding ECI. The interviews also served as a pilot study where the authors had a chance to try the questions and practice in conducting interviews (Silverman, 2013). This resulted in better designed interview guides for the main study as well as more timely and flexible interviews. During all interviews both authors attended, one was responsible for questioning and the other for taking notes and asking follow up questions.

The participants were chosen based on their field of work and experience. They were either suggested by the industry supervisor or found through Skanska's internal database and then recommended by the supervisor. This ensured that the interviewees were knowledgeable and could contribute to our study. A compilation of participants in the feasibility study is presented in Table 1 and is followed by a short list motivating why they were chosen.

**Table 1** Participants in the feasibility study.

<b>Interviewee</b>	<b>Organisation</b>	<b>Department</b>
Commercial Manager	Skanska Sweden	Civil
Regional Manager	Skanska Sweden	Building
Bid Director	Skanska UK	Civil
<b>Participant</b>	<b>Organisation</b>	<b>Department</b>
Per-Ola Svahn, Technical Manager	Skanska Sweden	Civil
Anna Kadefors, Associate Professor	Chalmers University of Technology	Service Management
Derek Walker, Professor	RMIT University, Australia	

- The Commercial manager for civil works was believed to provide good insights in the project evaluation process and expectations and concerns regarding ECI.
- ECI has arisen from the partnering concept, and the Regional manager for the Skanska building department was interviewed as he was highly experienced in this collaboration form.
- The Bid director from the UK was chosen because of his experience from the UK and his involvement in the ESS project.

The two seminars, arranged by the university supervisor Anna Kadefors, were held by Professor Derek Walker from RMIT University in Australia. In the first seminar Walker held a two hour presentation about his research and findings on Alliancing in Australia. In the second seminar, we held a presentation about the current state of our study and both Walker and Kadefors gave valuable response on the methodology and research purpose.

### **3.2 Main study**

The main study consisted of eleven interviews and focused on two different target groups: clients and contractors. It further included two reference projects, the European Spallation Source (ESS) and the West Link project. These were chosen as they are the two first and only ECI projects for civil works on the Swedish market.

Each interviewee was only interviewed once in the main study, which can therefore be seen as having a cross-sectional design (Bryman, 2012). In order to obtain comparable results while remaining flexible the interviews were designed as semi-structured. The interview questions were developed based on findings from the feasibility study. Most were standardised questions to ensure that the data from different interviews were comparable, but they contained small variations depending on which target group the interviewee belonged to. The interviews followed the interview guide unless the answers on previous questions made it advantageous to adapt the order or asking follow-up questions. Follow-up questions provided the

opportunity to further investigate interesting topics during the interviews (Bryman, 2012; Creswell, 2014).

The interviews in the second stage were executed in a similar way as the explorative interviews, with both authors attending and one of the authors asking questions from the interview guide and the other responsible for follow up questions. However, these interviews were all recorded and transcribed why only brief notes were taken during the interview to allow us to carefully listen to the interviewees' answers. These interviews had a stricter interview guide as they had a more focused purpose than the explorative interviews. The major themes in these interviews were: challenges regarding ECI, procurement and tender, reimbursement models, lead times and the contractor's business model. However, the order of the questions was often adapted to what the interviewee initially brought up. This allowed a better flow and focused on what the interviewee put emphasis on without the authors influencing. As a result the interviews had a conversational style where the interviewees were encouraged to speak openly (Silverman, 2013).

The interviewees were selected based on suggestions from the participants in the feasibility study and main study, as well as from the industry supervisor. We aimed to cover different views on ECI by purposefully selecting interviewees with different standpoints and experiences (Creswell, 2014). A complete list of the interviewees is found in Table 2 and an explanation of the selection procedure is presented below.

**Table 2** Interviewees in the main study.

<b>Contractor interviewee</b>	<b>Organisation</b>	<b>Department</b>
Partnering Leader	Skanska Sweden	Buildings (West)
Partnering Leader	Skanska Sweden	Buildings (Gbg)
Commercial Manager	Skanska Sweden	Civil
Regional Director	Skanska Sweden	Civil
Project Director	ESS / Skanska Sweden	Civil
Bid Director	ESS / Skanska UK	Civil
Commercial Manager	Skanska UK	Civil
Work Winning Director	Skanska UK	Civil
<b>Client interviewee</b>	<b>Organisation</b>	<b>Department</b>
Division Head	ESS Conventional Facilities	Civil
Project Director	West Link / STA	Civil
Head of Procurement	West Link / STA	Civil

#### *Interviewees from Skanska*

- The Partnering leaders were chosen based on suggestions from the Regional manager for the building department.
- The Commercial manager (also interviewed in the feasibility study) was selected to give additional understanding of the project evaluation process at Skanska and their expectations and concerns regarding ECI.
- The Regional director for civil works was also highly involved in the decision making processes and was interviewed to increase our understanding of Skanska's perception of ECI.
- The Bid manager was the other interviewee who was also interviewed in the feasibility study as his experience from the UK and insights in ECI were seen as highly valuable.

#### *Interviewees from ESS*

- At time of the study, ESS was the only Swedish ECI project. Therefore we aimed to interview one manager from each of the client's and contractor's organisations to identify differences in their perceptions of the purpose of ECI and how the project progressed.

#### *Interviewees from the West Link*

- As the West Link project had just entered prequalification at the time of the interviews, only the client could be interviewed from this project. For the same reason, STA did not want to answer some questions or answered vaguely. The STA Project director was chosen as he was assumed to have the best overall knowledge of the project and the Head of procurement as she was believed to be most knowledgeable regarding their specific reasoning on what the design of the procurement and contract aimed to fulfil.

### **3.3 Analysis of empirical data**

After each explorative interview in the feasibility study we complemented notes taken during the interview by individually listening to the recordings and summarising what had been said. The results were not transcribed, as the main reason for the feasibility study was to support the development of the thesis's purpose and the main study.

The analysis of the empirical data from the main study was made by using the qualitative data analysis software 'NVivo' which is commonly used for qualitative studies (Silverman, 2013). Silverman (2013) argues that software like NVivo is time-saving, as a large amount of data can be assessed effectively which is advantageous for validity and reliability reasons. Another advantage mentioned was rigour, as the software allows all data to be processed and prevents the authors from only selecting data that support their preconception. Creswell (2014) suggests a process of how the coding in NVivo should be performed, but also recommend users to adapt it in accordance to their specific studies.

The analysis process has been organised as illustrated in Figure 5. All interviews from the main study were first transcribed, as recording and transcribing interviews allowed for qualitative validity controls and ensured that the results corresponded correctly to the raw data (Creswell, 2014). The transcriptions and the notes from the feasibility study were then inserted into NVivo and text segments were thematised according to a

predetermined conceptual scheme of categories or ‘nodes’. Examples of nodes used in this analysis are ‘procurement’, ‘incentives’, ‘reimbursement’ etc. As none of us had previous experience of coding and thematising interview data of this extent the initial coding was complemented and slightly re-categorised later on. When the coding was finished NVivo retrieved all segments on each node on separate sections, which formed the basis for compilation of the results and the nodes were basis for subheadings in the result section.



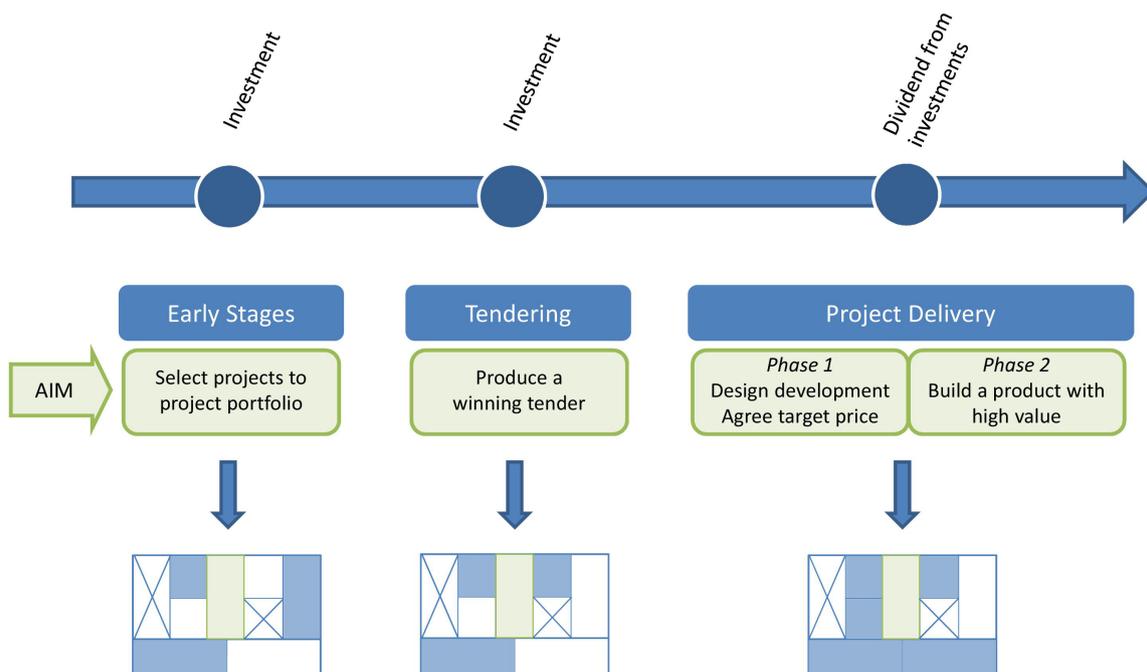
**Figure 5** The empirical data analysis process.

Another central tool in the analysis of the empirical data was the business model and its different components. The results summarised under each subheading was matched with one or more components of the business model. This provided a clear division of what affect the different findings had on the business model. However, further clarification was perceived as needed to better communicate our results. Therefore the analysis process continued with an additional thematisation, inspired by findings from the feasibility study, which provided three separable stages: Early Stages, Tendering and Project Delivery. The empirical data was finally matched with one of the three stages depending on when it comes to impact the contractor. This process is further described in the beginning of Chapter 4.



## 4 Results and analysis

The results from the feasibility study showed that a contractor's decision making process regarding tendering for projects is complex. To easier understand what effect ECI can have on the contractor's business model, the results were, as illustrated in Figure 6, divided and analysed in three separate stages: Early Stages, Tendering and Project Delivery. The Early Stages represents the activities that occur at an early stage prior to procurement and the Project Delivery represents the processes in Phase 1 and Phase 2. Nevertheless the contractor cannot be awarded the contract if not Tendering for a project by submitting a winning tender. The three stages are below presented as separate analysis with respect to the business model framework presented by Osterwalder (2004), but should be interpreted as a whole when analysing the effects of ECI. For a careful description of how the business model framework should be interpreted, see Section 2.5. The business model component Value Proposition was interpreted as the aim for each stage and is illustrated by the green boxes in the figure below. The components Key Partners and Channels were considered irrelevant as the study was limited to the client – customer relationship only and channels were not seen as relevant for services.



**Figure 6** Illustration of the division into three separate stages which all were analysed separately with respect to the business model framework.

In the Early Stages, the contractor invest resources in selecting and evaluating projects on whether or not they can match the business unit's project portfolio. During this stage the business model pillar Financial Aspects is only affected by the Cost Structure that this stage generates, but can be seen as investments. In the Tendering stage, additional investments are made in the resources that are required for producing a competitive tender. Provided that the submitted tender is successful, it is not until

the stage Project Delivery the contractor will get a Revenue Stream and contractor aims to deliver high value to the client and will in return obtain a profit from all their investments.

## **4.1 Early stages**

Before engaging in any type of project, both the contractor and client need to perform an analysis of the prerequisites for each specific project. The analysis of the empirical data in relation to the business model framework assumes that the business model component Customer Segment consist of clients who have chosen ECI as their preferred project delivery approach for a project. It was found that the Key Activities in this stage was to select and prioritise projects based on an evaluation of several factors. In the Early Stages, before the tender is released, the contractor also communicates with the client in order to create good relations and to possibly affect the design of the procurement route and contractual arrangements.

### **4.1.1 Clients' motives for choosing Early Contractor Involvement**

All interviewees agree that the contractor's expertise in constructability and general input are key reasons for choosing ECI. Another reason was the amount of contingencies in the project. Both the West Link and ESS are said to be too large and complex for the client to provide sufficient descriptions in tender documents for a design-build contract. If procuring these projects as design-build fixed-price arrangements, the interviewees agreed that it would force contractors to add unreasonably large risk allowances to their price to avoid taking too much risk themselves. Consequently named projects would become too expensive if not using the ECI delivery approach. More value for money was by both interviewed clients mentioned as another argument for choosing ECI, but they were also careful to mention that they aim to compensate the engaged contractor reasonably.

Several interviewees also emphasised that it is more fun to work in a collaborative environment where problems are solved jointly instead of wasting energy and time on finding a scapegoat. One of the partnering leaders said that *"in the partnering projects we have a completely different potential for development of our own staff ... Additionally it is normally a more pleasant working environment ... and if we are going to attract a younger workforce, we do not want to have solely fixed-price projects."* Both the Partnering leader and the STA Project director argued that contractors need to change how they do their businesses in order to stay attractive on the market. Contractors who do not change their mindset will not be able to compete for competent workforce and stay attractive to the younger competent generations.

### **4.1.2 Key activities**

Communication with the market was mentioned as an important activity prior to the tendering process by the Division head at ESS. He argued that having a dialogue about how procurement routes and contractual arrangements should be designed for upcoming projects was very important. By understanding what kind of project the client wants, the contractor can decide whether the project is interesting or not. At the same time, communication in early phases was argued to enable clients to understand how contractors would like the contractual arrangements to be designed.

According to the Commercial manager much of the focus in the early phases was on selecting projects to ensure they match the project portfolio and the business unit's strategy. This process includes analysis of the project characteristics as well as analysis of competition and which projects the contractor is most likely to be awarded. To meet the department's budget, all projects undertaken by Skanska need a business model that delivers a gross margin that covers central administrative costs (CAC) and the required net margin. Therefore, the financial potential of a project is described by the Commercial manager as the most decisive criterion when prioritising projects. He further reasoned regarding their project selection that "...*basically we would bid on a project if we think we can make money. Then there is always a trade-off between risk, safe money and how much money we can earn*". The CAC are usually given as a percentage for each department's turnover and as Skanska is a large organisation the CAC are described as substantial.

As ECI entails a lower risk, several interviewees further reasoned that ECI could result in more reliable revenues, but the profit potential were believed to be lower than in design-build fixed-price contracts. The UK Commercial manager said that "*ECI projects are a good basis to run the business on*" and further argued that a reliable income gives the opportunity to enter riskier projects with higher profit potentials. This last statement was also supported by several other managers who also emphasised the importance of having the right mix of projects. The UK Commercial manager further reasoned that as fixed-price projects are more profitable these are prioritised, and that ECI is a beneficial complement when having spare staff. This was explained to be because of the lower revenue streams associated with Phase 1.

The contractors' views on their business model in combination with ECI was met with some criticism by the STA Project director who argued that "*the construction industry has requested this type of collaborative projects and therefore contractors have to do something within their own organisation and their shareholders if aiming for a long-term change.*" The Project director further noted that the short term focus entailed by a quarterly reporting, which public limited companies are obliged to, can be an obstacle for contractors to enter a two-stage project delivery approach.

## **4.2 Tendering**

The Early Stages for a selected project can be seen as finished once the tender documents have been released. In the Tendering stage, the aim and Value Proposition is to be awarded the project contract for the tendered project. Tendering for an ECI project was by interviewees believed to require other Key Resources compared to design-build fixed price projects. The range of Key Activities that have to be performed during the tendering was believed to depend on which design the client chooses for the tender evaluation and will, together with the Key Resources, generate costs in the Cost Structure. Further, the tender evaluation criteria constitute the basis for the future Customer Relationship to the client as these criteria communicate project values.

### **4.2.1 Key resources**

Several interviewees noted that tendering processes primarily based on non-price evaluation criteria require other activities and resources. The challenge of delivering information with clarity was identified by both Skanska and clients as one of the

biggest challenges in the procurement process. In order to stay competitive it was mentioned that contractors need employees who can provide well-defined descriptions of working procedures.

#### 4.2.2 Customer relationships

Most interviewees emphasised the importance of carefully designed tender documents. The Head of procurement at STA identified this as a great challenge and clarified that the aim when designing the tender documents is to find the right partner. The criteria that are included should reflect what the client considers important for the specific project. Further, transparency in the evaluation was mentioned as important for the tenderers to understand what the scoring is based on.

All interviewees agreed that in the procurement of ECI, non-price criteria should have a higher weight than the price criterion as the purpose is to get the most competent and collaborative partner. The most common non-price criteria mentioned were organisation, work methods, competence and previous experience. The Work winning director further emphasised that the most important factor to consider when procuring an ECI project is not the CVs of the team, but their practical collaboration skills.

When discussing the weighting of the price criterion most interviewees suggested a maximum of 20 – 25 %, while a few ranged it up to 30 % and one as low as 10 %. Everyone agreed that if exceeding these weightings there would be a risk that price could be a too determining factor in the evaluation of the most economically advantageous tender, and the procurement and contractual arrangement would risk losing much of its purpose. One reason to why the weight should not exceed these limit was by the Commercial manager argued to be that *“If you tender for a project of 1 billion SEK and it is the bidders’ fee differing between 2 – 3 percentage points you compete with, that is not what is important. It is that the 1 billion SEK are used as efficiently as possible you should compete with and that is probably done by choosing a contractor who has a good building process, decision making, planning and can meet the client’s requests.”*

The interviewees disagreed whether the fee should be represented in the tender evaluation at all. Some argued that the fee is important, while others suggested that the client can decide a fixed price fee in the tender documents instead, a model that was used for a Swedish tunnelling project. The STA Project director was sceptical to this idea, as he referred back to the reasons for choosing ECI and questioned that if the project is too complex to price, it would be equally hard to set a correct fee; the same question was asked by Skanska’s Regional director. The STA Project director further argued that large contractors like Skanska, who know they are a competent contractor and have high CAC, reason this way because they are afraid to be outcompeted on price by smaller, but necessarily not less competent, contractors.

In the procurement of ESS, the fee had a weighting of 20 % and the tendering contractors had to suggest a percentage fee between 7 – 10 %, where 7 % gave maximum points and 10 % lowest. The Project director at ESS explained that this range was believed to be reasonable for a contractor as they additionally had a pain/gain share agreement in the contract, enabling a higher profit if fulfilling the project’s targets. Stating a reasonable fixed range for the fee was described by the ESS Project director to signal that the client understood the contractor’s budget and indicated that they wanted a serious contractor. In the tender document an additional option called “any other approach” was added to each non-price criteria that enabled

contractors to present unique ideas. The ESS Project director believed this demonstrated that the client was willing to try new approaches.

### **4.2.3 Cost structure**

The cost of submitting a tender differs compared to fixed-price contracts, as the tender for ECI typically does not require work from design engineers or any cost estimates. However, ECI instead requires other sorts of work, which a few interviewees and particularly the Work winning director emphasised as important to not underestimate. The Commercial manager estimated the tender costs for fixed-price contracts to vary between 0.5 – 1 % of the project cost, with 0.8 % as a mean value, while the estimate of Regional director for civil works was a little higher: in the range of 0.7 – 1 %. For ECI the two managers had expectations that the tender cost could be reduced by up to 50 % of a fixed-price tender. This estimation was however conditional on that the client does not include an estimated target price in the tender document since the contractor would then need to confirm the plausibility of this estimate, which would require resources.

Another important aspect of the cost structure is the project hit rate: how many tenders that are submitted before every successful tender. One of the Partnering leaders ranged their hit rate for building projects in her region to approximately 50 %, but aimed to reach 70 % year 2015. The Regional manager for another building department claimed that they already had a hit rate of 70 % in their partnering projects where the fee had a low weight in the evaluation. However, in partnering projects where the fee was weighted high, the hit rate was only 20 % and for their fixed-price projects the hit rate was 25 – 30 %, which was only slightly higher than the hit rate for the department of large civil works which was 20 – 25 %.

## **4.3 Project delivery**

The Tendering is finished once the project contract is awarded to a contractor. The Value Proposition during the Project Delivery is two-fold; in Phase 1 the aim is to deliver a design including an agreed target price and in Phase 2 the aim is to construct the chosen design within time and according to or below budget. Also the Key Activities for the Project Delivery are two-fold, where Phase 1 was believed to include a range of differences compared to design-build fixed-price and Phase 2 was interpreted as more according to the traditional working procedures. The client's choice of reimbursement and basis for compensation create different behaviours among the project team members and will affect what Customer Relationship the contractor will have to the client in the specific project. A favourable relationship was believed to be one of the key success factors for ECI and several times related to the project governance. Therefore it was argued as essential to also consider the Key Resources which was interpreted as the appointed project team.

### **4.3.1 Key activities**

The development of a target price in Phase 1 was for both ESS and the West link interpreted as difficult as these are large and complex projects with several contingencies that complicate the estimation of costs. For ECI, managing risks is a major part of the target price development. The STA Project director explained that the client has responsibility to present, communicate and assign the risks to the party

who can impact them and let that party price them. The ESS Project director states that the work required from the client can easily be underestimated. For instance, a monthly invoice from the contractor to the client can host over 1000 accounting rows. As a consequence the client needs to decide if they trust the contractor or if each row has to be verified. The STA Project director said that *“it might not require a larger involvement but rather a more active one ... as we have to be more active in the process of developing specifications.”* One important aspect of the contract mentioned by two other interviewees was what costs that are included. What costs the project and the contractor respectively should account for are important to specify in detail, a time consuming but important process in order for both parties to enter the partnership on mutual grounds. The ESS Project director said that *“the question in this type of arrangement is what [costs] we do not get compensated for at all. If being a little inattentive and forgetting to include all costs, the fee will fairly quickly be undermined by things such as computers, traveling, educations etc...”*

It was further explained that at ESS the target price was set so the contractor could be reasonably compensated. The Bid director from the UK explained that the target price should be set with the fee in mind, where a lower fee requires are more generous target price and vice versa. Interviewees from STA recognised that if the target price is set too low and without a corresponding fee, the contractor might try to find other creative ways of obtaining compensation to reach their budget. The STA’s Project director comments on this and states that if this occurs, ECI has failed.

Both Skanska and STA recognise that when using a target price with pain/gain share, the contractor can benefit from increasing the target price in Phase 1 as their profit in absolute numbers would get higher. This can cause problems as the contractor and client are to develop the target price together and some interviewees argued that such behaviour would likely ruin any trust built up with the client. Further, one of the motives for choosing ECI was that it allows identification of innovations in Phase 1. Some interviewees did however argue that the contractor during this phase might want to withhold cost reducing innovations until Phase 2 if being reimbursed with target price and pain/gain share, as presenting these innovations in Phase 1 could reduce their compensation. A few interviewees suggested that setting a target price in the beginning of Phase 1 would allow the client and the contractor to share all cost reductions from innovations later in the Phase 1. However, as the difficulty in estimating an accurate target price before tendering was one of the motives for choosing ECI, this was by others deemed incredibly difficult, if not impossible. The Division head at ESS explained that they solved this problem by reasoning that *“the solution you [the contractor] came up with has generated a cost saving of 30 million SEK and therefore this should perhaps be added to the target price”*. In other words they could treat the innovation as if it was conceived in Phase 2 and got an impact on the pain/gain share incentive. Another suggestion was to incentivise innovations by using bonuses connected to time targets, as innovations usually are more time saving than cost saving.

### **4.3.2 Key resources**

All interviewees agreed that the major and most important challenge was to supply ECI projects with the ‘right’ personnel. ECI requires a different mindset, where focus has to be on jointly solving problems instead of arguing about whom to blame and how much this party should pay. The Work winning director further explained that

ECI requires a cultural and behavioural change in order to achieve the sought win-win solution and stressed that the amount of work and difficulty behind this often is underestimated.

### 4.3.3 Customer relationships

Achieving a good relationship between the client and the contractor was mentioned by almost all interviewees as a necessity for ECI. Creating a trustful relationship, which by almost every interviewee was mentioned as a key success factor, requires both parties to realise and understand the other party's motivations. The contractor must understand the client's targets for quality, time and limited budget, while the client in return must understand that the contractor has to be allowed to earn a reasonable compensation in order to run a profitable business. Apart from trust the interviewees emphasised the importance of good and clear communication. The parties must dare to communicate about everything concerning the contract that could possibly have a negative effect on their relationship if bypassed. The earlier good communication arises, the better the organisation is prepared if facing more complicated problems later on, since similar scenarios might have been previously discussed.

When discussing the contractor's budget the STA Project director said that "*the keyword is to speak about equitable or reasonable return ... understanding this probably provides a good platform to work from. However, if aiming for maximising the profit ... one is probably not ready to enter an ECI contract.*" Several contractor interviewees argued similarly and said that ECI is about agreeing on mutual objectives which gives both parties the feeling of contributing to and benefiting from the project. The ESS Project director explained how different reimbursement models can inflict different behaviours: fixed-price one type of behaviour and cost-plus another. The STA Project director said that there is no general solution to how the contractor should be reimbursed and emphasised the importance of a project-specific analysis to identify what targets the client wants to incentivise. Most interviewees further recognised the risks for opportunistic behaviours resulting from poorly designed incentives and bonuses. The Partnering leaders from the building department therefore emphasised the importance of analysing the effects of different reimbursement models to ensure that the chosen model supports a collaborative process and prevents opportunism.

Regarding the pain/gain share incentive, there seemed to be a consensus it can constitute a security for the client as it allows the contractor's profit to depend on their performance, which motivates the contractor to keep down costs and consequently contribute with project rationalisation. Interviewees with experience from ECI seemed to be more favourable towards this incentive, while the partnering leaders as well as the Commercial manager and Regional director were more doubtful. The Partnering leaders had much experience from two-stage partnering projects in the building department and one of them stated that "*I can see it crystal clear that it is much easier to eliminate any self-interest without this kind of incentive*". They all suggested that one solution basically is to offer the right compensation from start since other arrangements can trigger ingenuity on how a desired profit can be achieved. Getting compensated as a cost-plus contractor without incentivising bonuses was however discouraged by the Regional manager as it can leave too much freedom for the contractor. Additionally the Regional director argued that contractors who do not have other projects waiting for employees from the ECI project may try to

increase the length of the project to maintain a cash flow. The ESS Project director added that this reimbursement model does not push development in the construction sector, nor the development within the own company. However, the same interviewee argued that a client can find it beneficial as no risk allowance has to be paid to the contractor, which theoretically, in a longer perspective, should result in lower costs.

The Commercial manager and Regional director explained how their preference of reimbursement model had changed. One year ago, both would have preferred a target price with pain/gain share and attached incentives. Today however, they are concerned that this model may entail opportunistic behaviour, which counteracts the foundation of trust in ECI and thus the chances of a successful project. One of them reasoned that *“I’m not sure that target price is the best way to incentivise, maybe it is schedule initiatives or another criteria that should be met instead and then drop the target price discussion. Of course we should have a budget and an economic target to aim at as our customers most often have government funded projects. We must be able to forecast the cost, that’s not what I’m talking about. It’s just that maybe the profit should not be based on the target cost but on something else”*. The consensus was that the target price only should be used as a budget and not be a basis for rewards and punishments and suggested cost-plus fixed-fee as a better reimbursement model, provided that the fee was reasonable. This model was commonly used in the partnering leaders’ projects and they argued it is more aligned with partnering and ECI as it prevents opportunism and shifts focus from financial to quality aspects. The Commercial manager argued that even though cost savings under a fixed-fee agreement mainly would benefit the client, it does incentivise the contractor to keep costs down as it would increase their project margin. In a similar way, the Regional director explained that *“if having a fixed-fee model the contractor does not want the project to elapse for too long, because that would dilute the margin.”* The STA Project director, however, was concerned that cost-plus fixed-fee could result in attempts to increase the fee similarly to how alterations and additions often increase the price in fixed-price design-build contracts. However, the Commercial manager suggested that a fixed-fee tentatively should come with a clause saying: *“This project is expected to cost one billion SEK. The target cost can differ 20 % both up and down and you still get 100 million SEK. In addition to this, you can get some bonuses if you achieve certain targets. I believe that this is the kind of ECI business model I would prefer.”* In combination with well formulated bonuses a fixed-fee was believed to better prevent opportunistic behaviours than pain/gain share connected to the target price.

The ESS project applied target cost contracting with a fee set to 7%, pain/gain share and other non-price bonuses. The ESS Division Head was fully aware that merely a 7 % fee, the project will not become a loss for Skanska, but without pain/gain share or bonuses the project will impede them to meet their internal budget. If predetermined targets are fulfilled and cost savings are made, the contract is therefore said to support Skanska to receive additional compensation. Interviewees from Skanska as well as the clients agreed that regardless of using target price with or without pain/gain share, the reimbursement model should allow contractors to receive additional compensation through incentives and bonuses if the project is successful.

All but one interviewee were positive towards additional bonuses as they can motivate to reach a specific goal. Recurrent target parameters for bonuses that were mentioned during the interviews were: time, safety, quality, work environment and environmental parameters. These could be reconciled on a quarterly basis and if kept

give the contractor extra compensation. The far most mentioned parameter was time, as it was argued that if the project is staying on time it is also likely to stay within budget. One interviewee suggested that solely time bonuses could entail the same security to the client as pain/gain share, but with a lower risk for opportunistic behaviour. Additionally, earlier completion of one of the stations in the West link was mentioned to be of great public value and therefore the bonuses should be designed to promote this goal. However, it can also result in the contractor wanting to finish the project as fast as possible and consequently neglect quality. The STA Project director further mentioned the importance of having a fair individual bonus system for everyone in the project organisation based on project's results and not bonus systems dedicated to managers only. Personal bonuses were however discouraged by three other interviewees who argued that such bonuses can create self-interests and gaps between the individuals in the project organisation.

Finally, the Partnering leaders argued that the usage of pain/gain share as an incentive is connected to the client's maturity in collaborative contracting. They said that first-time users of target price contracting often add this incentive, but as they become more experienced and have more faith in the contractor they realise that the contractor has other motivations. One motivation was mentioned by the Commercial manager who said that the trademark "Skanska" does not allow behaving in an irresponsible way. Skanska's long-term perspective incentivise their employees to perform well in all contracted projects as "*Skanska has its values which permeate the entire organisation and function as a 'carrot and stick' in the projects*". The STA Project director stated that "*...in the ultimate theoretical picture of ECI, financial incentives would not be needed. In ECI we need people who are driven by accomplishing the project to the lowest cost possible...*" Similarly, most interviewees mentioned the personal motivation for doing a good job as a strong incentive in all sorts of projects.

### ***Low turnover in Phase 1***

Skanska's business model is built on having a high turnover to make up for low margins. In an ECI project, the contractor normally only gets compensated for the employees' salaries plus an agreed fee in Phase 1, which means that the turnover during this period will be much lower than for construction works. Most interviewees from the civil department showed concerns regarding the cash flow in Phase 1 as it may stretch over a couple of years for large civil engineering projects. The interviewees from the building departments did however not show as much concerns as the civil interviewees which they believed was related to their much shorter lead times for Phase 1, often lasting less than six months. The Project director at STA argued that "*... it is a shared responsibility to ensure that it [Phase 1] gets short enough so they don't need to be concerned about it. We have a rough plan for the implementation of Phase 1 and a planned construction start, which we, based on our experiences, think is reasonable but there are always possibilities to make it shorter.*"

Provided that the contractor is reimbursed according to a cost-plus model and a percentage fee in Phase 1, interviewees from both the client and the contractor argued that the fee possibly should be higher in Phase 1 than Phase 2 in order to increase the contractor's revenue during this phase. However, one Partnering leader further reasoned that increasing the contractor's compensation in Phase 1 can consume more of the budget for Phase 2, but could anyhow be a solution as it generates a more even cash flow over both Phase 1 and Phase 2. Nevertheless, the Commercial manager added that if the go/no go clause has to be applied and another contractor is procured

for Phase 2, they might not accept the lower fee for Phase 2 and further commented that, “*if having to use the no go exit, the project already has failed.*” According to the ESS Project director, a higher fee in Phase 1 would indeed be more reasonable for the individuals engaged in that period, for which the Commercial manager countered that such arrangement may be difficult to motivate to tax payers who often are the funders for public projects. The Project director at ESS did however argue that as the contractor is being reimbursed on an hourly basis they are not losing money. Instead, he advocated that focus should be on identifying costs that are not included in the contract and thus not compensated for at all. Further, one of the partnering leaders argued that “*...involvement in Phase 1 has much potential that is not shown in the revenue streams...*” and referred to the potential of developing staff and attracting younger generations.

### ***Sub-division of Phase 1 and Phase 2 and time critical works in Phase 1***

As a solution to the low cash flow in Phase 1, the interviewees from both STA and ESS mentioned that time critical construction works could start without formally initiating Phase 2 and hence not be included in the target price. Both the client and contractor further suggested that these works can have a slightly higher fee since the contractor loses the opportunity to beat the target price and obtain further compensation for these works.

The ESS project was divided into sub-phases, which allowed production to start before the complete design and target price were finished. Sub-division implies that the project is divided into separate units for each sub-phase and that the project has to agree on a separate target price for each sub-phase. This arrangement originated in the nature of the project, where research on how the facility should be designed to best fit its purpose is constantly ongoing. To be able to have an operational facility within deadline, this sub-division was deemed necessary. Several interviewees believed that a sub-division of Phase 1 can decrease the total lead time of the project as it allows Phase 2 to start earlier. Another advantage was mentioned by the Commercial manager who argued that sub-division of Phase 1 and Phase 2 provides the project team with information on how well the process and the agreements work. In addition to the sub-division of Phase 1 and Phase 2 at ESS, time critical works started before the target price for the first sub-phase was set, which resulted in a regular cash-flow earlier in the project.

The Project director at STA was however critical to a sub-division of the phases as “*...then the go/no go exit would be lost. The idea is that the contractor shall feel responsible for the final product by not guaranteeing them Phase 2.*” Both the Project director at STA and the Project director at ESS argued that the go/no go exit is harder to enforce as the project elapses since the contractor gets more incorporated in the project the more they build. The Commercial manager was however doubtful in whether a go/no go clause really is beneficial for the project. Another concern for the client was that a sub-division implied that construction would start before the final target price is known. The uncertainty of not knowing the final cost was seen as especially sensitive for public clients as politicians are trying to do the most out of taxpayers’ money and media often communicate project costs and possible overruns to the public which can cause much resistance. For this reason STA was cautious to start construction works before knowing the project’s cost.

## 5 Discussion

The structure of the discussion will follow the same themes as the result chapter, where each of the three stages will be discussed in separate sections. Each stage will be discussed in relation to how it is affected by ECI and the entailed effects. Interviewees from both Skanska and the clients recognised that if ECI is to be a viable option, contractors must be fairly compensated. The potential profit generated from projects was further by Skanska interviewees seen as central in their project selection. For this reason, focus has been on changes in the revenue streams and cost structure components of the Business Model framework, as well as on changes originating from other components with clear impacts on the financial aspects.

### 5.1 Early stages

In both literature (Mosey, 2009; Rahmani et al., 2013) and the interviews ECI is seen as a solution for clients that need to construct large projects with high levels of complexity. As it is the client's decision of how to procure projects, the introduction of ECI on the Swedish market can be seen as customer-driven innovation (Osterwalder and Pigneur, 2010). However, all business model components are interdependent (Osterwalder, 2004) and even though the change is customer-driven it will affect other components as well. This study has identified that adaptations of the business model components are necessary for a contractor to stay competitive and be successful in ECI. The extent of these adaptations will however depend on how the client chooses to design the procurement and contractual arrangement for a specific ECI project.

The adoption of ECI in the UK has had a positive trend since it was first introduced (Rahmani et al., 2013) and as partnering concepts in general are increasing in construction projects, it is quite likely that ECI may become increasingly popular in large complex projects in Sweden as well. Therefore, preparations and adaptations of the business model towards ECI and similar approaches should be worth the effort as questioned by Johnson et al. (2008).

Relationships permeated by mutual trust was mentioned in both the interviews and literature (Rahman, 2012; Sødal et al., 2014) as important for project success. However, the amount of hours and cost for creating these relationships were noted as often being underestimated in ECI projects, an aspect which was seen as putting the projects at risk. The effort, arrangement, responsibilities and cost sharing for these activities was mentioned as important that both parties consider before choosing the ECI approach. For this reason, early communication with the market was said to be necessary in order for the contractor to understand the client's intention and requests. Similarly, communicating and getting to know the client was described as one action that can help the contractor in selecting and prioritising between potential projects, as the client is an important factor when evaluating the project's attractiveness.

Even though the financial aspects were described by interviewees as the most important factors when a contractor decides whether to tender for a project, ECI was considered to entail indirect values, for both contractors and clients, which cannot be measured in monetary terms. As the involved parties work jointly, individuals from both the contractor and the client can learn new skills and develop a deeper

understanding for each other. ECI was also believed to result in a more enjoyable working environment which could further attract new employees.

## **5.2 Tendering**

The importance of clear and easy to understand communication in the tendering process was mentioned by interviewees from both the contractor and the clients. Since neither Skanska Sweden nor STA have significant experience from this type of procurement route, it is a challenge for both parties. Firstly, the client does not know how contractors will interpret the tender document and, secondly, contractors do not know how STA will interpret their tenders. As a result, there are risks for misunderstandings which could affect both parties negatively. Therefore, clear and open communication is essential in the procurement of ECI (Rahman and Kumaraswamy, 2005) and was by several interviewees mentioned as a key success factor.

### **5.2.1 Evaluation criteria**

In agreement with Lahdenperä (2010) the interviewees believed that non-price criteria should be given the highest weighting in the procurement of ECI. Lahdenperä (2010) further argued that competence and cooperation should be emphasised in the evaluation and although these terms were not used in the suggestions from the interviewees, their answers still seemed to encompass the same contents. As an example, the criterion considered the most important was organisation, in which the client might choose to evaluate the contractor's organisation based on their know-how and ability to cooperate. Lahdenperä (2010) also mentioned putting the best possible team together as a goal of the tendering process, which is well aligned with the interviewees' opinions. Our interviewees as well strongly emphasised having the right people in the project as a critical success factor. In Rahman and Kumaraswamy's (2005) study, the approach to joint problem solving was ranked as the second most important criteria, which can be argued to depend very much on the people in the project organisation.

Several interviewees argued that if the fee exceeds a certain weighting, ECI would lose much of its purpose. At what weighting this would happen was by most interviewees set to around 20 – 25%, which corresponds well with the range of 20 – 30% presented in literature (Lahdenperä, 2010). Although that range was given for the procurement of project alliances it is still relevant in the procurement of ECI, as both ECI and project alliances build on close collaboration during the project and the evaluation should therefore be based on non-price criteria. As stated above these weightings were seen as upper limits and several interviewees had an opinion that fee should have as low weight as possible, which could be argued to align with findings by Rahman and Kumaraswamy's (2005) who ranked the fee in the bottom half of importance factors.

Setting a reasonable range for the fee in the tendering process, as done at ESS, was described by the ESS Project director to indicate that the client desired a serious contractor. If the lower part of the range is set at a fair level it further prevents the “bid low, claim later” approach described by Bourn (2007). A reasonable range enables all contractors to obtain an equal maximum score on the price criteria and instead end up competing on non-price criteria.

## **5.2.2 Cost of submitting tenders**

Most of the interviewees believed that the ECI tender costs will be significantly reduced compared to fixed-price contracts provided that no design or cost estimates are needed. On the other hand, an ECI tender includes more non-price criteria which require different organisational resources, the extent and costs of which can easily be underestimated. Nevertheless, the consensus was that the additional tendering costs would not exceed the savings and that even cost savings of a percentage point can be substantial for such comprehensive projects that the department for civil works are undertaking. Another aspect that is important to consider when merging the costs for all tendered projects is the number of awarded contracts in relation to all tenders submitted. The results showed that the Skanska building department has higher hit rates when the fee has a low weight and vice versa. This confirms what the STA Project director emphasised about large organisations like Skanska not being most competitive on price, but on other criteria. It can also be an indication that the building department is more careful in the selection of projects and prioritises projects where the fee weighting is low. Additionally, the relationships to the clients offering these projects might be more mature and, as they have more experience from collaborative contracts, the building department is probably skilled at answering the requests in the tender documents. For these reasons it is not unlikely that the Skanska civil department can have a development in a similar direction if deciding to prioritise ECI projects. Nevertheless this comparison has to be made with caution as the number of partnering projects with early contractor involvement in the building sector is higher than ECI projects for civil works. Thus, the building department has a greater variety of projects to choose from and can therefore be more careful in their selection of projects.

## **5.3 Project delivery**

Increased constructability and general contractor input was mentioned by both the interviewed clients and the literature as a reason for using ECI (Eadie and Graham, 2014; Nichols, 2007; Song et al., 2009). Furthermore, both the ESS project as well as the two ECI West Link projects were described as large and complex which aligns well with the literature where Mosey (2009) describes how ECI require a certain size and complexity to be of value.

### **5.3.1 Creating a desired level of trust and collaboration**

The importance of understanding each other's objectives (Rahman and Kumaraswamy, 2005) was a reoccurring topic in almost all interviews. Both Skanska and the clients explained that the contractor must be allowed to make sufficient profit from the project and at the same time they must respect the client's vision and budget. Even though the interviewees said they were aware of the importance of such mutual understanding it is however uncertain if they will share the same opinion of what is a reasonable compensation. To avoid misalignments, most interviewees, as well as the literature, recognised that communication is essential for an ECI project to be successful (Eadie et al., 2012; Rahman, 2012). Further, the interviewees with experience from ECI described that organising a wide range of people and making them achieve a desired level of communication, collaboration and trust requires hard work from all parties. These goals were also identified in the literature, where equal commitment to common objectives was also mentioned and that overcoming these

goals requires involvement from both the contractor and the client (Eadie et al., 2012; Rahman, 2012; Rahman and Kumaraswamy, 2005; Sødal et al., 2014). It is therefore important that none of the parties underestimate their involvement and what the collaboration form requires from them. Although STA thought that it might not require a larger involvement than normal, the Project Director emphasised that their participation during Phase 1 would need to be more active. Exactly what this referred to was not clear, but according to the literature the client needs to take a larger role in for instance managing risks and developing specifications. Furthermore, once the target price has been agreed and the project proceeds to Phase 2, there still is a risk that the ECI project in Phase 2 gets similar to fixed-price contracts which are often characterised by discussions about alterations and additions. To avoid this, CIPFA (2013) recommends that target cost contracts should include a clear procedure for when and on what bases the target price is adjusted (Phase 2).

### **5.3.2 Possible problems when developing a target price**

As recognised by most interviews, the development of a target price is one of the key activities in Phase 1 (Nichols, 2007). However, the interview study identified two concerns that can occur if applying pain/gain share to the reimbursement model, where the contractor during Phase 1 might try to benefit from the arrangement of the target price in Phase 2. The first was that the target price can be pushed unreasonably high and the second that the contractor can withhold cost saving innovations until reaching Phase 2, as both strategies can increase their output from the gain share incentive positively. These possible outcomes are in direct contradiction to the motives for choosing ECI, where the contractor's expertise in constructability was believed to help reduce costs and increase accuracy of cost estimations (Nichols, 2007; Rahman, 2012). The solution used for ESS, where the cost savings due to an innovation were estimated and then partly subtracted from the target price, can be a good way of incentivising early innovations. However, it requires resources for cost estimation for both the innovation and the traditional solution in order to estimate the size of the cost saving. This can be argued to be wasteful, since the resources required could be used more efficiently, but nevertheless it can be a way for the client to show appreciation towards the contractor's contributions and incentivise them to continue. Apart from earning trust from the client, the contractor gets a relatively low compensation during Phase 1 for spending their time, knowledge and ingenuity to reach aims that are important to the client. Therefore the ESS solution can be argued to be an efficient way to overcome the two concerns that were identified in this study. Nevertheless, a careful specification of what costs the fee includes was by the ESS Project director emphasised as more important than worrying about the two concerns described above.

### **5.3.3 Different reimbursement models and incentives**

One interviewee explained how different reimbursement models drive different behaviours. Regardless of how the reimbursement model is arranged it will always generate some kind of incentive (Darrington and Howell, 2011). In the literature there is a separation between extrinsic and intrinsic motivation (Darrington and Howell, 2011; Kadefors and Badenfelt, 2009). Although these terms were not explicitly used during the interviews, several interviewees argued for the importance of analysing each project's specific characteristics and to consider possible embedded motivations

before deciding the final design of the reimbursement model. Nevertheless, the interviewees from the building department emphasised the significance of intrinsic motivation more than other interviewees, which can be explained by that they have seen consequences from a broad range of incentive arrangements in their previous collaborative projects. Both these interviewees strongly stressed that the people who are involved in these projects must have a mindset that encourages their personal motivation of doing a good job.

Several interviewees argued for not having a target price arrangement with a pain/gain share in collaborative projects. The UK interviewees however did not seem to have considered alternatives to pain/gain share as this incentive was standard for the UK adaption of ECI. The Swedish Partnering leaders related the use of a pain/gain share to the client's maturity in collaborative arrangements: more mature clients tend to abandon such incentives. However, the UK construction industry has been using ECI for 15 years and is still only doing contracts with a pain/gain share incentive. In addition there were Swedish interviewees also arguing for the use of a pain/gain share incentive.

At ESS the target price was deliberately set so that the contractor would receive some additional compensation if the project fulfilled certain targets, referred to as making up for the low fee (7 %) in the project. It was further described that the client can design this arrangement in different ways with a higher fee and a lower target price instead. When Skanska tendered with a 7 % fee they knew that there would be opportunities to increase the compensation if they performed well. However, as Skanska is not satisfied with 7 % this will force the contractor project team to focus on all outcomes that can affect their profit. As a result, the project's objectives could risk being neglected. The risk that the contractor, in the target price development, deliberately tries to arrange the target price to allow for extra compensation if delivering according forecast, was however never mentioned by STA. Those who did recognise this risk suggested that the common goals can be achieved by incentivising for instance time, quality, safety; incentives that also were found in the literature (Kadefors and Badenfelt, 2009).

### **5.3.4 Long lead times with low turnover in phase 1**

Long lead times in Phase 1 was a concern for several Skanska interviewees, while others, both from Skanska and clients, argued that this aspect should not be a barrier to ECI. Even if long lead times were expressed as a big concern by several managers, neither the literature nor Skanska UK recognised this as a major problem. One explanation can be that it was about 15 years ago ECI was introduced to the UK market and today has become common practice among their civil works (Rahmani et al., 2013a). The concerns might only arise when a two-stage delivery approach is launched on a new market and is less apparent after a few years, when contractors have multiple ongoing ECI projects in Phase 1 and Phase 2 which allow them to even out the revenues and obtain a steady cash flow. The non-existence of concerns for long lead times in the literature can be explained by that the Swedish market might differ from the market where the existing ECI studies have been made. Further, the interviewed managers from Skanska might have been excessively worried about what impact low revenues in Phase 1 can have on their budget as they had not yet examined it carefully themselves.

As a target price can be problematic to develop early for large projects with high levels of contingencies, the ESS project split the project into several design and construction phases with separate target prices. It was however found that this sub-division did not only facilitate ESS to be built, but also provided the contractor with a better cash-flow, as the time spent solely in Phase 1 was decreased. This was never mentioned by the ESS Project director, which can be seen as an indication on that the period with low turnover was short enough to satisfy the contractor.

With sub-division the client has to agree to start construction works without knowing the final price, which the STA saw as a major drawback. As a public client they try to create best possible value to the public and if the final price is unknown it is impossible for the STA to evaluate which of their project investments that would provide most value for money for the tax payers. Mosey (2009) argues that paying for the actual occurred costs in the long run is cheaper. Provided that the client trusts the contractor a sub-division can therefore be the most efficient way to deliver a complex project with more value. Another effect of sub-division is that the scope of each target price is smaller and the planned activities are closer in time. These smaller and more current scopes of work are naturally easier to design and evaluate compared to larger and more distant scopes of work. In addition, contingencies are easier to price. Together, these effects can reduce the risk of overspending as well as lower the target price and reduce the client's costs. However, the contractor will suffer from a reduced opportunity of outperforming the target price through the pain/gain share mechanism. Another benefit with sub-phases is that it prevents the contractor from deliberately trying to increase the target price at an early stage as the client can find out how accurate the first estimates were before the project is finished. This additionally provides the client with information about the contractor's performance, but also decreases the client's option to use the go/no go clause and replace the contractor if not satisfied. However, the client can hopefully avoid these issues by procuring the 'right' contractor and, further, the sub-division can help the client identifying a 'wrong' contractor at an early stage before too many Phase 2 sub-projects are initiated.

## 6 Conclusions

Using the Business Model framework (Osterwalder, 200), this thesis has identified five major factors that are decisive in the contractor's choice of submitting a tender for an ECI project. One concerns the contractor's own organisation, two the procurement design and two the contractual design. Even though all these factors concern different stages in a project lifecycle, it is important to note that all factors below have to be evaluated in the early stages in order for the contractor to be able to take a decision on a specific project.

### *The contractor's available team*

- The first decisive factor is the team available for the project, and if this team is suitable for ECI. However, contractors have to be prepared with the right personnel if selecting to submit a tender for an ECI project. Even though the main activity, which is to develop a tender, remains, this process is different from design-build fixed-price contracts. Since the evaluation is primarily based on non-price criteria, no design or cost estimates are necessary. Instead, the tender should comprise descriptive answers to the tender document's non-price criteria, descriptions that require other competences than tender processes normally involve. Further, as the activities in especially Phase 1 are carried out jointly and in a collaborative manner, ECI requires people who have both high competence and collaborations abilities. The involved parties need to have a different mindset where they focus on what is best for their current project instead of for the company in which they are employed.

### *Procurement design*

- The second factor is the issue of a project cost estimate in the tender documents. Provided that the client excludes this, the contractor does not need to perform a cost estimate and tendering costs are then reduced. Additionally, as cost estimates are moved to Phase 1, contractors are compensated for the costs of these activities. Exclusion of project cost estimates in the tender documents can thus contribute to an increase in construction industry efficiency as it reduces the amount of double work carried out by contractors in the tendering process.
- The third decisive factor is what weight the fee has in the tender evaluation. This study confirmed statements in the literature and recommends clients not to give fee a higher weight than 20 %. One of the reasons for clients to choose ECI is to benefit from contractors' competence and experience; therefore they should compete with these two factors and not with a fee. Additionally, giving fee a low weight avoids unserious actors who exploit the 'bid low claim later' approach from winning the bid.

### *Contractual design*

- The fourth decisive factor is for how long the contractor has to bind valuable resources in the project without having profit-generating production activities. For large projects with a long Phase 1, clients should consider either starting time critical works before the target price is completed or splitting Phase 1 and Phase 2 into sub-phases with different target prices for each sub-phase. Such subdivision

is accompanied by both benefits and drawbacks for both the contractor and the client. The adaptations that contractors have to make in their business model are less comprehensive, while clients get more accurate cost estimates. Even though clients' opportunities to use the go/no go exit decrease as the project proceeds and a sub-division decreases the possibility to take advantage of pain/gain share, a subdivision enables both parties to learn from the previous phases and make improvements to the next. Further it prevents opportunistic behaviours from contractors, such as intentionally increasing the target price in Phase 1.

- The fifth and last factor is the arrangement of the reimbursement model. In order to avoid opportunism in the project contractors have to be reasonably reimbursed for their contributions to the project. This enables contractors to support clients' objectives without being concerned about their compensation. Further, it is essential that the choice of reimbursement model, additional incentives and bonuses are carefully analysed and preferably selected in consultation with the chosen contractor before starting with the main activities in Phase 1.

By considering the factors that are decisive for the contractor when designing ECI, the attractiveness of the project to contractors can increase and in return provide clients with higher competition. The ECI approach further reduces duplication of tender work, results in more elaborated and constructible designs and hopefully reduces the time spent on claims, which together can increase industry efficiency. Despite scarce revenues in Phase 1 and a reduced profit potential, it can decrease contractors' overheads since Phase 1 can be seen as a partly paid tender and Phase 2 generates a predictable and stable cash flow. It is therefore, as one interviewee argued a good basis to run the business on, and constitutes a good complement to other contractual arrangements in the contractor's project portfolio. However, ECI will bring a great challenge in managing the appointed organisation to reach the required level of trust and collaboration.

### ***Limitations and further research***

This thesis has been performed in collaboration with Skanska which implies that only one contractor have been included in the study. This has made the results more specific than general, which might have reduced the relevance for other contractors. Further, only Swedish clients have been involved which means that none of the interviewed clients had any previous experience of ECI. This also applies to most of the contractor representatives. As a consequence, some of the issues identified may be non-issues that will be resolved naturally once the project begins. Some final criticism is that both the situation and culture in Sweden and the UK seem to be rather far apart, so all experiences of Skanska UK may not be relevant in a Swedish context.

Since this thesis only investigated one contractor and ECI is new to the Swedish market we recommend further studies that consider other Swedish contractors as well. As this thesis focused on the design of contractual arrangements, further studies of the execution of ECI-projects are recommended to see how the contractor is affected in practice.

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