PROCUREMENT IN THE CONSTRUCTION INDUSTRY: FROM THE MAIN CONTRACTOR'S PERSPECTIVE

by

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ABSTRACT

Construction industries hold an important place in the economies of countries. Those industries work with projects and key players in the delivery of those projects are main contractors. They deliver the projects by procuring services and materials from suppliers and subcontractors. Procurement therefore plays a vital role in the level of success which construction industries achieve. The focus of this research study is the procurement which those main contractors execute. Such a study is important because although its critical importance for the successful delivery of the projects is obvious, main contractors' procurement has been neglected in the existing literature. The aim of this study is therefore to fill that gap in the literature on construction procurement from the main contractor's perspective by developing a framework for construction procurement and testing it with empirical data. The conceptual framework was developed by combining the existing literatures for procurement and for the construction industry. In the research approach adopted in this study, a case study on the Costain company - one of the major companies in the UK construction industry - was used. The framework was tested with empirical data from this company. In addition to testing the framework, a further aim is to provide recommendations to the Costain company with the purpose of improving its procurement function. A thematic structure in alignment with the procurement steps was followed throughout the study so recommendations for the company are provided in the discussion and recommendations chapter after the relevant themes have been explored. The findings from this research show that construction procurement follows a similar procurement approach to those of other industries, although the unique features of the industry affect the entire procurement process. In particular, client's role and design issues have an important place among these features. Because of its dramatic importance and unique features, a focused effort should be provided for procurement in the construction industry.

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- My wife Ezgi, for being supportive in this long and tiring journey under all circumstances.

Without their support, it would not be possible to complete this dissertation.

DECLARATION

I have read and understood the rules on cheating, plagiarism and appropriate referencing as outlined in my handbook and I declare that the work contained in this assignment is my own, unless otherwise acknowledged.

No substantial part of the work submitted here has also been submitted by me in other assessments for this or previous degree courses, and I acknowledge that if this has been done an appropriate reduction in the mark I might otherwise have received will be made.

Signed candidate____

Project definition for my degree (as copied from http://www2.warwick.ac.uk/fac/sci/wmg/globalcontent/general/project/requirement/)

The project should relate to a logistics related topic e.g. purchasing/outsourcing, material/production control, inventory reduction, material flow, warehousing and distribution, supply chain management or transport planning.

My project relates to this definition in the following way:
This project concentrates on procurement in the construction industry from the main contractor's perspective. The outcomes of the thesis will provide a validated framework for procurement practices in the construction industry and some suggestions for improving those practices. It is therefore directly related to the logistics-related topic procurement.

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CHAPTER 1: INTRODUCTION

This chapter introduces the research study by providing background and company information, explaining the value and defining the research aim and objectives.

1.1 Introduction

This chapter introduces the main arguments of the thesis by providing some preliminary information. First, section 1.2 discusses the background of this thesis which is the role of procurement in the construction industry. It explains first why procurement has a strategic role for companies and then how big the construction industry is. These two aspects clearly show the critical importance of procurement in the construction industry. Section 1.3 gives some general information about the Costain Group – this dissertation's focus company – and describes its procurement process particularly for the water sector. The group is delivering large-sized projects in the water industry and therefore executing huge procurement activities. These procurement activities bring with them huge challenges. Section 1.4 therefore focuses on the specific challenges that Costain is facing in its procurement process in the water sector. Although most of the challenges are common in the construction industry, Costain has some unique problems due to the structure of its procurement process. After this clarification of the challenges, Section 1.5 underlines the value of this dissertation. For the construction industry, the focus in the existing literature is primarily on the procurement of projects and the supplier part is largely neglected. This dissertation fills that gap. After explaining the value of this study, Section 1.6 explains the main aim of this dissertation and sets out three objectives which will enable this dissertation to reach its specified aim. Section 1.7 introduces the structure of the dissertation.

1.2 Background of the Thesis

The construction industry holds an important place in the UK economy and procurement plays a vital role in the level of success that the construction industry achieves.

1.2.1 Why Procurement is Important

Procurement is the activity for the acquisition and the management of both goods and services in a cost-effective way (Johnson *et al*., 2003). It is a vital activity standing at the beginning of the logistics chain from a buyer's perspective. It accounts for a large percentage of the total economic activity of a company. For instance, for companies in private industry, purchasing represents more than 50% of the total turnover value, and depending on the type of the company and industry, it can go up to 90% in some companies (De Boer *et al*., 2001).

Its effects are even more dramatic than its share. According to a case study on Mercedes Benz, decreasing the costs of the procured goods by only 1% had the same positive effect as increasing sales by 20% (Puschmann and Alt, 2005) because whilst an increase in sales is increasing profits just as much as gaining additional sales, a decrease in the cost of procured goods affects 100% of the sales. That study clearly shows the importance of procurement. Even a minor improvement in procurement is extremely beneficial for an organisation. In spite of the critical importance which it has, it was seen as an unimportant role for many years by senior managers (Spekman et al., 1994; Carr and Smeltzer, 1997). It started to gain strategic importance a decade ago (Johnson *et al*., 2002). Although there are still many companies in which strategic procurement decisions are made by managers such as the operations manager, marketing manager or commercial manager but not by the procurement manager, and worse, many of them do not have a manager or other employees dedicated to procurement, there is an increasing focus on how procurement plays a role as a strategic success enabler (Zheng *et al*., 2007). It is now an important activity which is taken into account when developing company strategy.

1.2.2 The Construction Industry from a Macro-Economic Perspective

Construction is an industry which touches the quality of our lives. It does this by constructing the places in which we live and also by constructing non-residential areas, infrastructures and industrial areas. At the same time, it also creates great value for the economy. Although the 2008 recession had negative effects on construction as it did for other industries, construction still contributes to the Gross Domestic Product (GDP) of the UK by more than 6% (*see* Figure 1.1). Since GDP is a great indicator of a country's total economic size, an industry which has more than 6% share is clearly of vital importance. It also stands for 6% of the UK's employment capacity in 2013's figures, which is more than two million jobs (Rhodes, 2014). It is therefore playing a major role in fostering the UK economy.

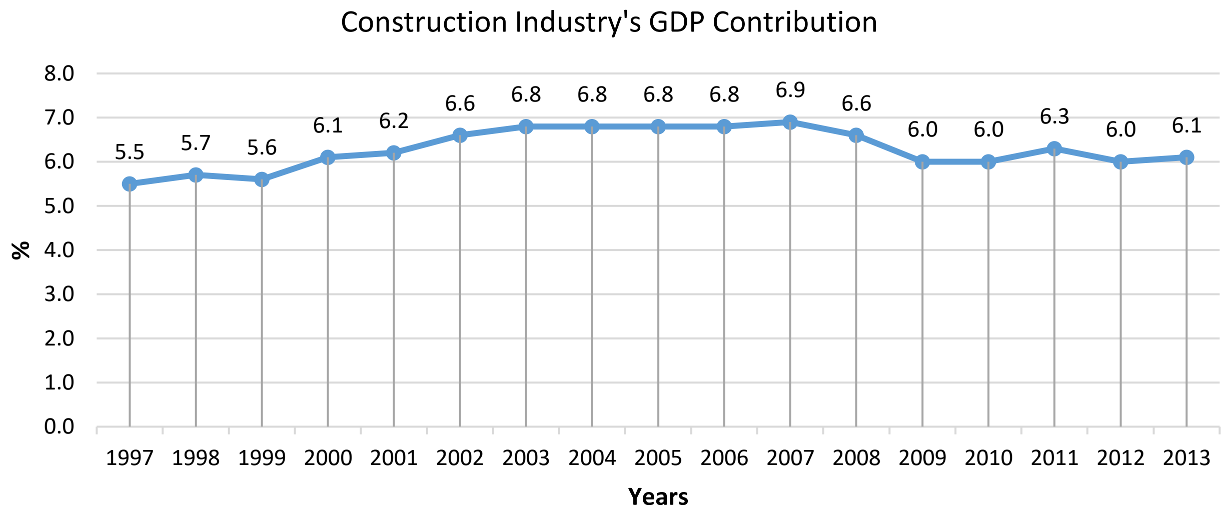

Figure 1.1 The Construction Industry's Economic Contribution (Rhodes, 2014)

In addition to the current importance of the industry, there is a huge growth expectation in the world population, predicted to reach nine billion in next 40 years, which will drive a lot of construction projects and consistently, the construction industry is anticipating a bright future with a growth expectation of 70% in the next ten years (HM Government, 2013).

These figures clearly show how critical the industry is, and hence its supply chain because supply chains play a vital role in the success of all industries. They also link industries with other industries which increases the total economic activity in an industry's supply chain. For instance, the construction industry creates £124 billion of intermediate consumption through its supply chain (HM Government, 2013).

On the other hand, the construction industry is facing major problems. The performance within the industry is not satisfactory. The main KPIs for the construction industry are cost, time and quality and the industry is facing challenges in terms of all these criteria. According to a recent survey of over 525 construction industry professionals, more than 90% of the participants stated that they had worked on projects which were not delivered on time or in budget (CIOB, 2010). The sample size of 525 professional is good to reflect many different experiences in the industry. More than half of all projects end up with dissatisfaction for either client or the contractor, or sometimes both (Yeo and Ning, 2002). There is also a large waste issue in the construction industry which harms every player in the supply chain from clients to suppliers (Cox and Ireland, 2002). Waste occurs even if everything goes well in the project (Vrijhoef and Koskela, 2000).

Moreover, better quality and service expectations are growing for clients due to the increasing competition in recent years (Masi *et al*., 2013). To satisfy these expectations, procurement plays a vital role, because;

- Effective procurement reduces costs and also avoids late deliveries hence delays in the project (Ronen and Trietsch, 1988), and
- Procuring high-quality materials and services directly affects and improves the quality of the projects.

1.3 Costain and Its Procurement Approach

Costain is one of the major companies in UK construction industry, delivering large sized projects for many years. It has a very fragmented procurement approach in the water sector giving responsibility to different players for different types of process without any alignment among them.

1.3.1 Costain Group

Costain is a UK-based engineering and construction company, founded in 1865 in Liverpool. It operates in six sectors – rail, highways, power, oil and gas, water, and nuclear – providing innovative and sustainable solutions with more than 3,000 employees across the UK. To give an example of its successes, the Channel Tunnel is one of its big and successful projects; Costain was a member of the consortium which built the tunnel between England and France. Also, *New Civil Engineer* magazine awarded Costain 'contractor of the decade' in 2010 (Lea, 2011).

1.3.2 Supply Chain Management in Costain

Costain's supply chain focuses on sustainability, efficiency and innovation. It checks its 100 suppliers' performance quarterly and takes action in cases of low performance because it expects the same high standards from its suppliers as from its own organization (Costain, 2014b). It also classifies its suppliers as verified, preferred or strategic partners in order to develop different relationships. According to its annual report, some of Costain's mitigation strategies for supply chain and procurement risks are (Costain, 2014a):

- Putting pre-concert procedures for planning and preparation for tenders and contracts,
- Applying different approval levels for tenders,
- Paying attention to the preparation of bids by using experienced and skilled staff,
- Avoiding over-dependency on a single supplier,
- Monitoring suppliers regularly.

Costain also emphasises collaboration in its supply chain. It therefore defines key suppliers (partners) and develops close relationships with them.

1.3.3 Procurement in the Water Sector of Costain

Costain's procurement process starts after the agreement between the client and Costain for a project. Depending on the terms and conditions of the project, it clarifies the requirements for that project and starts the process. Costain carries out the procurement process in two different ways:

- For plants and materials, buyers have the responsibility and they execute the procurement,
- For subcontracts, quantity surveyors (QS) have the responsibility and they execute the procurement.

Here, buyers and QSs belong to two different functions in the company. Buyers are responsible to accountants and QSs are responsible to commercial managers. Neither of them are in a relationship with procurement or supply chain functions.

In addition to these issues, Costain also has some client agreements which mean that the client chooses the suppliers from whom Costain has to procure. This is the case for some materials and plants. In this kind of procurement, the client gives a list of two or three suppliers for each type of plant or product, and then Costain's buyers go and procure from them. For mechanical, civil and electrical subcontractors – which is a strategic area for Costain – the client has no interference; QSs make the decisions.

In addition, if the work is to be done in a local area far from the mainland, Costain seeks local suppliers and subcontractors. If there are SMEs in that local area which are willing for improvement, Costain trains them in its Supply Chain Academy and starts long-term relations with them.

1.4 Problems in the Procurement of Costain's Water Sector

Costain's procurement processes are facing challenges mostly due to the strategy and structure of procurement. It is far from being integrated or aligned in its water sector.

In the water sector, Costain delivers about 80% of its projects through its supply chain, so its success in the projects is highly dependent on procurement success with subcontractors and materials. However, in procurement practices, Costain faces some problems and managerial challenges which are causing performance issues.

In the light of the information given in section 1.3.3, the major cause of Costain's procurement problems seems to be the QSs. They are not procurement officers, so they are looking at procurement only from the cost perspective. When they arrange subcontracts, some of which are strategic for Costain, they do not discuss every aspect of the contract with them and they do not give all important bits of the information. So as a result, the subcontractor agrees the contract without adequate information. Therefore, when the subcontractor goes to the construction site and starts the job, it finds that the actual work is not going to be as it thought, but is different from what was agreed. It then becomes very hard for the subcontractor to deliver the job on time and with the expected quality. When the relationship starts like this, it also becomes very hard to form and maintain long-term relationships with subcontractors.

In addition to this major problem, QSs' only initial-cost based decisions cause some other problems. QSs' price-based decisions lead to problems in terms of quality, health and safety and management.

These will eventually cause additional costs to Costain so initial cost-savings inevitably change into cost problems in the long term.

Costain also faces over-dependence on its suppliers. In the water industry, there are not large numbers of suppliers in the market. This situation gives power to the suppliers because when there are not many alternatives, companies canalise to particular suppliers. This dependence situation gets even worse for Costain with the client agreements because in those agreements, Costain cannot see the terms and conditions or the rates. The client decides all of them and Costain is obliged to go and procure from those suppliers under the conditions agreed by the client.

There is also a problem in the structure of the procurement process. It is done in two different ways as stated before, by buyers and by QSs; buyers report to an accountant and QSs report to commercial managers. They have no connection. Therefore they have different goals, they never communicate with one another and worse, supply chain or procurement departments have no power or responsibility over them. Although there is a supply chain manager in the water sector, neither QSs nor buyers are responsible to that manager. For the strategic electrical, mechanical and civil subcontractors, although supply chain managers build the relationships, since QSs have no connection with those managers and decide the terms and agreements in contracts, they do it in their own way and are resistant to the advice from supply chain managers. The process is broken.

1.5 The Gap

In the light of the challenges described above, the first target of this dissertation is to focus on the procurement function of Costain, to explore its processes and relationships with its suppliers and subcontractors and to provide some recommendations for improvement.

Apart from Costain, there is also a gap in the literature about procurement between main contractors and their suppliers and subcontractors. In the construction industry, suppliers and subcontractors deliver about 80% of the projects (Eriksson and Westerberg, 2011). This shows that main contractors are taking a more management position rather than carrying out project works in-house. Most of the jobs are done through suppliers and main contractors. For main contractors, procurement is the major link between them and their suppliers and subcontractors.

In the existing literature for the construction industry, however, the focus in terms of procurement is on project procurement which occurs between the client and the main contractor (London, 2004). A recent partnering approach which targets increasing effectiveness in the industry also focuses on the relationship between clients and main contractors (Bygballe *et al*., 2010). Although partnering is not all about procurement, it is a wider concept and procurement is one of the issues which it focuses on.

As a result, in the construction industry literature, there is a lack of focus on procurement between main contractors and their suppliers and subcontractors. Although there are some studies which have focused on procurement from the contractor's perspective, they have not covered the procurement process from a broad perspective, from the very beginning (determination of the needs) to the end (supplier selection and relationship). It is therefore possible to say there is a gap in the literature on construction industry procurement from the contractor's perspective. This dissertation's second target is to fill that gap.

1.6 Research Aim and Objectives

In the light of the information given in section 1.5, the aim of this dissertation is to fill the gap in the literature on construction procurement from the main contractor's perspective and to improve Costain's procurement function. In order to achieve this aim, the objectives of this dissertation are;

1. From the literature, to develop a conceptual framework of the procurement practices in the construction industry and to reveal the success drivers increasing the performance of these practices,
2. To refine and validate the framework through empirical testing with one case study in the Costain company,
3. To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function.

1.7 Dissertation Structure

This dissertation has six chapters. The structure of the dissertation is shown in Figure 1.2.

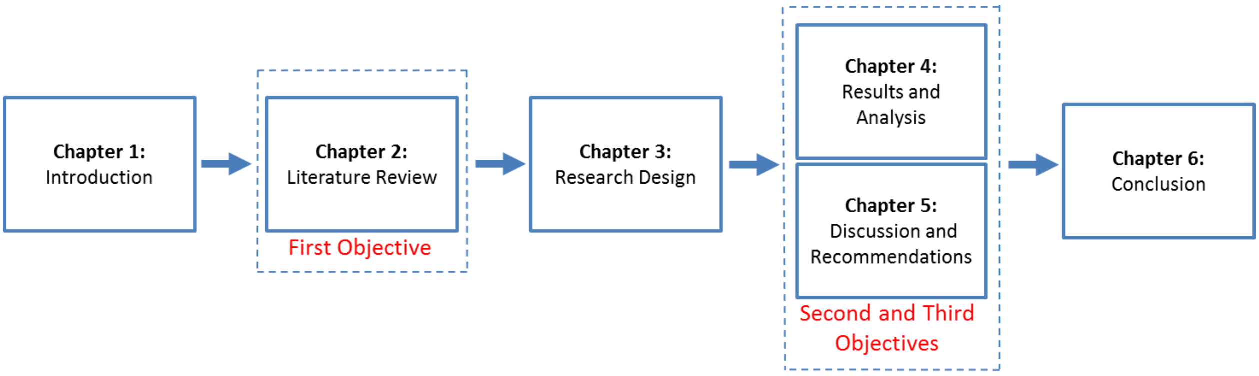

Figure 1.2 Dissertation Structure

Chapter 1 first introduces the background of the thesis by explaining procurement and the construction industry separately in order to show procurement's role in the industry. This chapter also introduces the case study company. After that, this chapter shows the reason why this subject was selected by presenting the value of the thesis. Finally, this chapter defines the research aim and objectives.

Chapter 2 introduces procurement in general in its first section and describes a procurement process which will form the structure of the following chapters. The second section explores features of the construction industry. The third section then focuses on procurement in the construction industry. It both combines the first two sections and also shows the existing literature addressing that issue. Chapter 2 finally provides a conceptual framework for procurement in construction industry and achieves the second objective.

Chapter 3 describes the research design. It justifies the selected philosophy, strategy, data collection and analysis methods, and also discusses the validity and reliability of this research. Finally, it explains the limitations of this research.

Chapters 4 and 5 show the results of the empirical research and combine them with the findings from the literature review. These two chapters together achieve the second and third objectives of the thesis.

Chapter 6 is the final chapter. It concludes the research objectives and the achievements of those objectives. This chapter also gives recommendations for future research.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the literature on procurement and on the construction industry separately, then combines them in order to provide a conceptual framework for procurement in the construction industry.

2.1 Introduction

This chapter presents a review of the literature. The literature is reviewed under three sections;

- Procurement in general,
- Features of the construction industry, and
- Procurement in the construction industry.

Section 2.2 focuses on procurement from a general perspective without considering any particular industries. It first provides a definition and then discusses its strategic importance. After clarifying its importance and supporting this with figures, this section then explains procurement strategy and the steps in a general procurement process. These steps form the backbone of results & analysis and discussion chapters.

Section 2.3 discusses the main features of the construction industry. The prominent features are its fragmented structure with high uncertainty and risks. This section covers other features and factors which also have considerable influence on effective practices in the industry.

Section 2.4 develops a conceptual framework for procurement in the construction industry by using both the existing literature specific to it and then the issues covered in sections 2.2 and 2.3. This section fulfils the first objective of this dissertation.

2.2 Procurement

Procurement is a vital activity which affects the performance of companies directly. In order to achieve success in this activity, they should provide a clear procurement strategy aligned with their unique business needs and then follow a very well-structured procurement process in the light of that strategy. It is key to success.

2.2.1 The Importance of Procurement

Today, the business environment is highly competitive and volatile and in this environment, being a strong company alone is not enough for success. As Christopher (2011) stated, the competition is not between companies today, it is between supply chains. In order to survive, organisations need strong supply chains (Presutti, 2003). In a supply chain from a company's perspective, suppliers are the key players and their success is as important as the success of the company itself, and maybe more because suppliers can create a real difference in a company's final product (Monczka *et al*., 2005). If they have that power to create a difference, it is obvious that at the same time they can also collapse a business. Whilst suppliers are that important for companies and lead them to both success and failure, procurement is important too because procurement is a company's door to the world of suppliers (Ballou, 1987). It is the basis of their contact and relationship with the suppliers. With the connections it provides, procurement links the different members of supply chains (Coyle *et al*., 2003).

It is important to define procurement clearly in order to understand it better. In a narrow perspective, procurement can be seen as the purchasing of materials and services (Novack and Simco, 1991). Johnson *et al*. (2003) expanded this definition from the management perspective and defined procurement as the acquisition and management of goods and services in a cost-effective way. The key problem with this definition is that it emphasises cost as the major concern in procurement, but today value is replacing cost. Procurement focuses not only on cost advantage, it mainly aims to find best value and then purchase it for the organisation (Dimitri *et al*., 2006). Rajagopal and Bernard (1993) detailed that value in their definition. According to them, procurement considers issues such as quality, innovation and technology in addition to the cost. When all the definitions above are combined, there is still a lack of a broad perspective as it is still limited to purchasing goods and services. Zheng *et al*. (2007) took a wider perspective and defined procurement as a general concept that includes one-off purchasing, outsourcing, supplier selection and management. As a result, procurement can be defined as the execution and management of different activities such as purchasing, outsourcing, supplier selection and processes within those activities in a cost-effective and value-adding way.

To clarify its importance better, it is necessary to look at its potential benefits also. Along with its obvious direct benefits such as cost savings and quality improvements, it also has some indirect effects such as reducing rework, providing latest information about the marketplace, improving efficiency, increasing customer satisfaction and improving the performances of other players in the supply chain (Flynn, 2011). These improvements can carry a supply chain to a better position. It also plays a major role in terms of information sharing among the supply chain partners (Spekman *et al*., 1994). When it is considered that many organisations are suffering from the lack of proper information sharing, it can be said that this role of procurement is just as important as its other roles.

There is another reason which makes procurement more important than it was in the past. Procurement faces the effects of recent trends such as globalisation, e-business, outsourcing, sustainability and high time pressure (Zheng *et al*., 2007; Christopher, 2011). These all necessitate continuous improvement and dynamism, and also cause reconfigurations in the procurement processes. Among these, especially outsourcing has a leverage effect for the critical importance of procurement. Many companies are outsourcing to suppliers some of the activities which they used to perform in-house. As supplier selection and management are procurement activities, now those companies' successes in outsourced activities are also dependent on their success in procurement.

To understand procurement's effects more clearly with figures, Table 2.1 shows a comparison of different improvements in a company. As can be seen from the table, even a minor improvement in the procurement process has major reflections in profits. This table can be criticised since it focuses on the cost factor and avoids value, however cost is an objective and quantifiable parameter suitable for comparison. It can be measured without any bias. As the table proves, procurement is a key process which has great potential for a company's improvement. A strategic procurement approach can have a dramatic impact on a company's performance (Paualraj *et al*., 2006).

Table 2.1 The Importance of Procurement (Ballou, 1987)

Point	Action	Result
Sales	Increase 100%	100% Profit Increase
Selling Prices	Increase 15%	100% Profit Increase
Labour Costs	Decrease 33%	100% Profit Increase
Overhead Costs	Decrease 33%	100% Profit Increase
Purchasing Prices	Decrease 8.5%	100% Profit Increase

2.2.2 Procurement Process

The procurement process basically reflects how procurement is done. The steps in a procurement process may vary from business to business and procurement to procurement depending on several factors such as types of the goods or services, total value, whether the item is new or purchased before. It is therefore not possible to say that there is a one-size-fits-all procurement process. However, organisations mainly follow similar steps, and generally the differences occur within the steps.

Weele (2000) suggested a five-step model including the pre-selection, selection and after-selection periods but he did not provide a separate step for pre-evaluation of the possible suppliers. In today's competitive market conditions with thousands of suppliers in each area, pre-evaluation is of high importance. Kim and Shunk (2004) suggested a four-stage model comprising information, negotiation, settlement and after-sales. Their approach is too general and needs some sub-stages to clarify the process more. Monczka *et al*. (2005) suggested a more detailed seven-step procurement process which focuses on supplier pre-evaluation and selection by providing four steps dedicated to them, however their process ends with supplier selection and does not mention after-selection activities such as supplier management. As can be seen, the literature addresses the same process in different forms and some of the suggestions lack a broad perspective. Therefore, in order to cover the whole process, Novack and Simco's (1991) eleven-step detailed model was taken here as a reference and steps covering similar issues were consolidated into one step (*see* Figure 2.1). The approach to consolidating their model is shown below;

- Defining user requirements is a part of identification of the needs,
- Make-buy and type of purchase decisions are part of the procurement strategy,
- Analysing markets to find possible suppliers by using broad criteria is supplier pre-evaluation,
- Detailed evaluation of the remaining suppliers can be included in supplier selection,
- Activities after the selection of the supplier are related to supplier management.

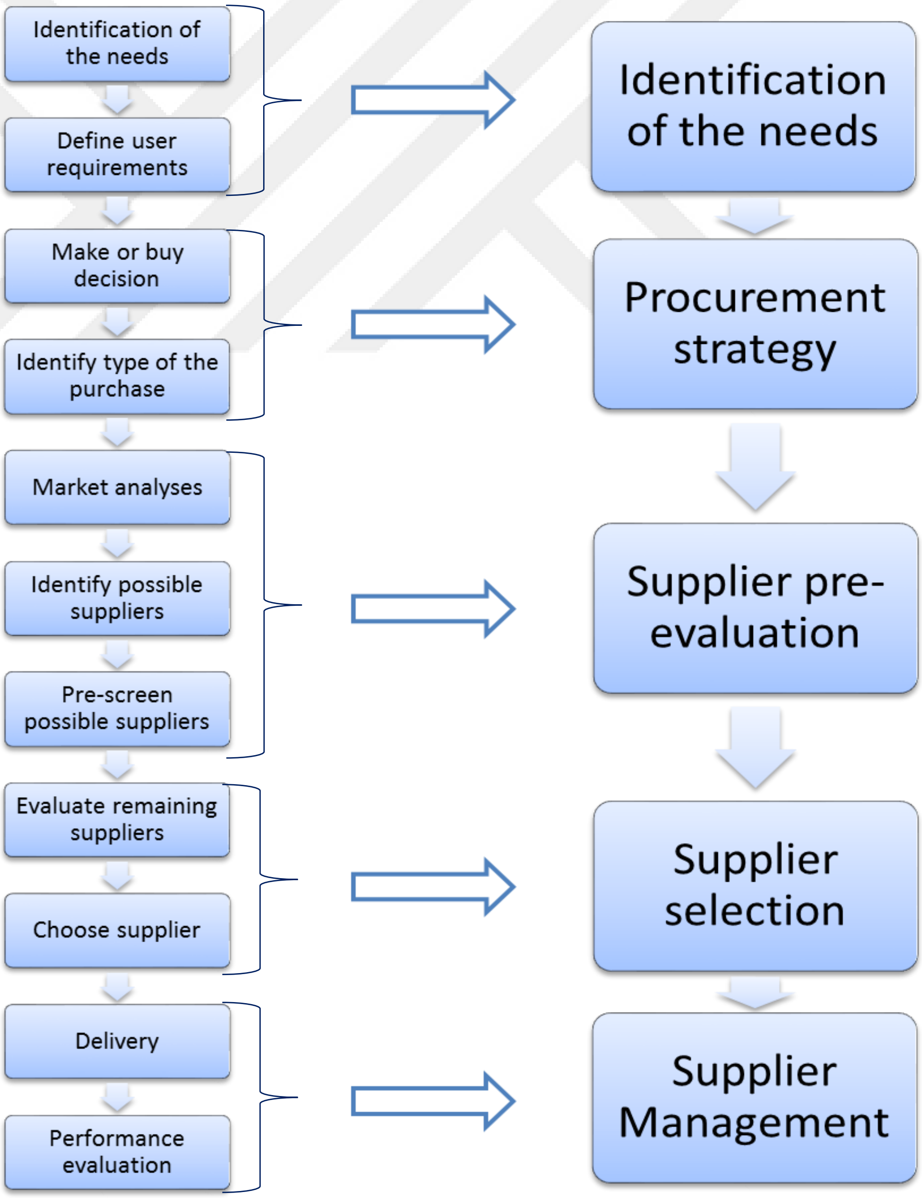

Figure 2.1. Procurement Process (adopted from Novack and Simco, 1991)

After this simplification, the sequences of identification of the needs and procurement strategy were changed because companies determine their procurement strategy before. It has interactions with each of the other steps and clarifies the ways in which companies execute those steps. Procurement strategy can therefore be seen as a general complementary step affecting the whole process. For only supplier management, a procurement strategy's role is more than clarifying the execution. In fact, supplier management is a part of procurement strategy (Zheng *et al*., 2007) so supplier management was analysed as an enhancement of the procurement strategy.

The latest version of the procurement process spans the whole cycle from identification of the needs through to the supplier management in the light of procurement strategy (*see* Figure 2.2). Success in these steps contributes to the success of the company itself and hence its supply chain too (Coyle *et al*., 2003).

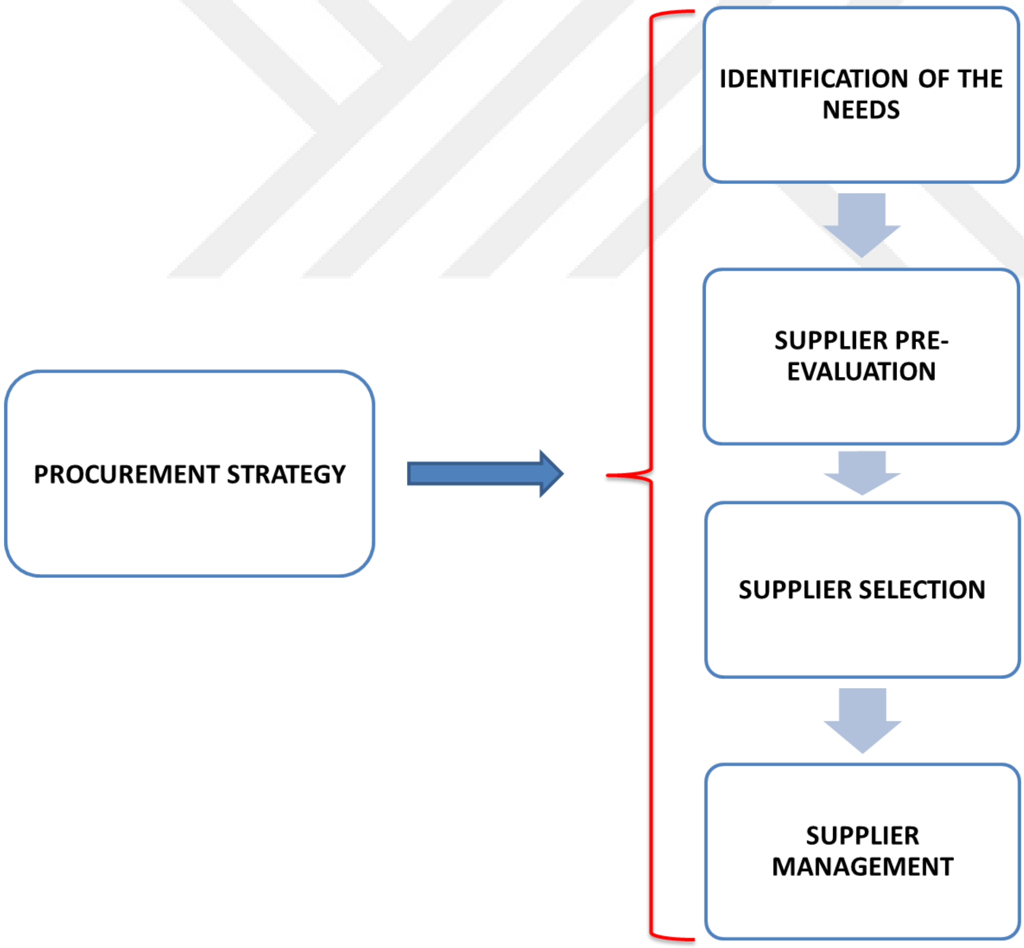

Figure 2.2 Flow Chart of Procurement Process (made by the author)

2.2.3 Procurement Strategy

Today, global market conditions make it possible to procure goods and services from anywhere in the world, therefore the number of qualified suppliers and consequently the options in a procurement decision are excessive and still increasing. In order to change this complex diversity in the world of suppliers into an opportunity, companies need clear procurement strategies.

Carr and Smeltzer (1997) defined procurement strategy as the sum of specific decisions for procurement in order to achieve the objectives of that function. This definition has a very critical problem. The aim of a procurement strategy cannot be only to achieve the procurement function's objectives, it should also aim to achieve the business objectives. Procurement strategy is useless unless it has alignment with the company's business strategy. Gloucestershire County Council (2002) drew attention to this point in its procurement strategy report by aligning its vision and strategic objectives with its procurement strategy. There are three vital strategic decisions in a procurement strategy (Gadde and Håkansson, 1994):

1) Make or Buy,
2) Supply Base Structure,
3) Nature of the Relationship.

These decisions should be made in alignment with the business needs and they should be also checked regularly because the unique needs of a company and therefore its unique needs for procurement might change at any time in today's dynamic business environment (Monczka *et al*., 2005).

Make or Buy

As is obvious, companies first have to decide whether to produce the required asset or service in-house or to procure it from suppliers. The sum of these decisions clarifies the procurement boundaries of the companies (Cousins *et al*., 2008). Although it was shown under procurement strategy by Gadde and Hakansson, it is in fact a decision made under business strategy. The result of that decision determines whether it is a procurement issue or not.

Supply Base Structure

Supply base structure decision-making is a strategic issue for companies (Kumaraswamy *et al*., 2000; Baily *et al*., 2008). Weele (2000) defined supply base management as the decision on the number of suppliers but it is not possible to limit a supply base decision to the number of the suppliers, the organization of the suppliers is also a major issue in that decision. Companies also decide for tier-1s, tier-2s, even tier-3s in some cases. The recent trend in this strategic decision is a reduction in the supply base (Holmen and Pedersen, 2007; Cousins *et al*., 2008), especially in tier-1s. This can be done both by eliminating some suppliers (number) and by transferring some tier-1 suppliers into tier-2 (organization). The aim of this trend is to develop better relationships with a reduced number of suppliers which are directly in touch with the company (Gadde and Håkansson, 1994; Cox, 2001; Cousins *et al*., 2008). With a reduced number of suppliers, it would be easier for companies to allocate enough time and other resources to the relationships.

However, for deciding the supply base structure, there is critical point to consider: the power balance between the buyer and the supplier. This balance directly affects the relationship between the supplier and the company. Cox *et al*. (2000) developed a matrix showing four different power-related situations between buyer and supplier (*see* Figure 2.3).

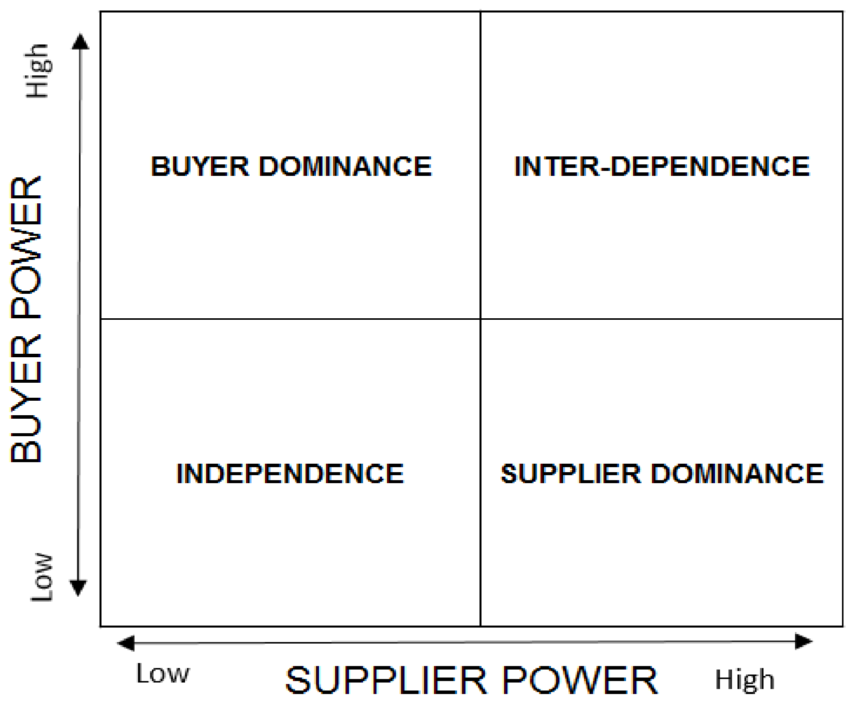

Figure 2.3 *The Power Matrix* (Cox, Sanderson and Watson, 2000)

This segmentation is of critical importance in terms of supply base structure decisions. If the company is under supplier dominance according to this matrix, then it should increase the number of suppliers in order to reduce dependency on particular ones (Cox and Ireland, 2002) because in that kind of situation, a company is not able to control its suppliers and manage the relationship. This generates a dramatic risk in the procurement process (Micheli, 2008) because the power is with the supplier and unless the company has alternative suppliers, it has to play the game by its supplier's rules. Having many suppliers is controversial with the current supplier base reduction trend, but in its specific conditions, it is necessary.

On the other hand, according to this matrix, the most preferred situation for buyers to manage the relationship with their suppliers is buyer dominance. If the situation is like that, then it is possible for buyer companies to manage a reduced number of suppliers from a safer position. This position facilitates successful management.

Nature of the Relationship

This third strategic decision is for the determination of the level of the relationship between the company and its suppliers. It can be at any point between arm's-length relations to strategic partnership. This decision is closely related to the supply base decision because, as explained before, the aim of reducing the supply base is to develop close relationships with the remaining suppliers. The details for buyer-supplier relationships will be presented in the supplier management step.

When determining the strategy, companies should also know that it is not effective to treat all procurement processes and all of the suppliers in the same manner because the complexity and potential benefits of each procurement and each supplier are different. Some procurements necessitate much more effort and attention due to their effect on a company's competitive advantage. It is therefore extremely important for companies to categorise products and suppliers and to provide the right procurement approaches for each of them (Bensaou, 1999). It is obvious that focusing on suppliers of items which have little impact on the company is useless and a waste of time because it is not possible to compensate the effort and resources consumed in that effort, rather companies should put that focus and align more resources into managing strategic items' suppliers and improving the relationship with them. They should clearly separate a strategic procurement which has huge impacts on the company from the procurement of a routine item which has nearly no impact. For that kind of segmentation, companies might use portfolio analysis tools. Kraljic's (1988) portfolio purchasing model is a famous tool for aligning different procurement strategies for different kinds of product. It facilitates the determination of both supply base structure and the nature of the relationship. This model classifies products according to two factors: their impacts on the profit and the risks in supplying them, and puts them into four categories (*see* Figure 2.4) which necessitate different strategies. De Boer *et al*. (2001) confirmed the importance of these two factors in their extended literature review on supplier selection methods.

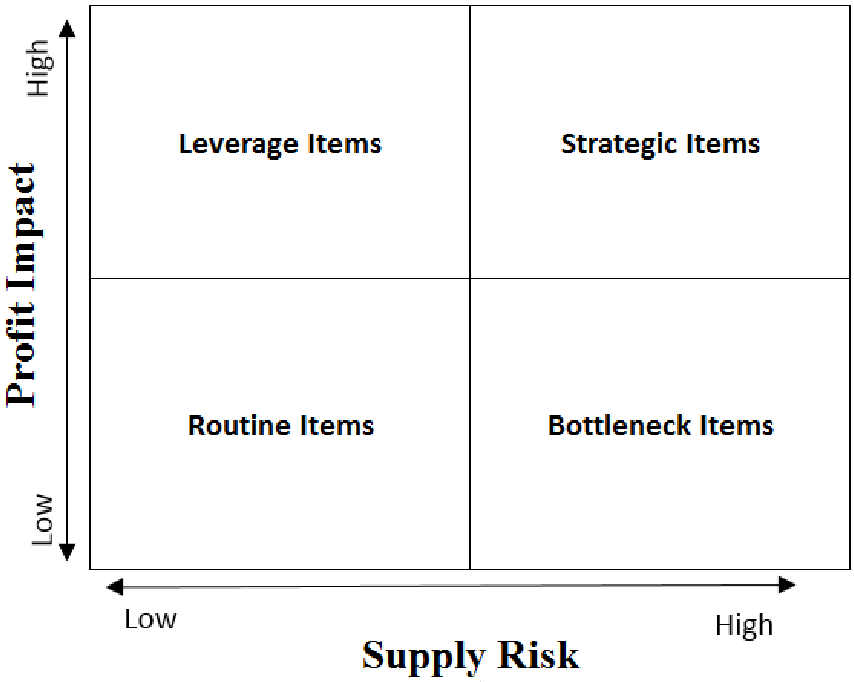

Figure 2.4 Portfolio Purchasing Model (Kraljic, 1988)

To give examples of these four categories, leverage items necessitate short-term contracts with suppliers since shifting between suppliers can provide high savings due to the impact of those items and there are always many capable suppliers in the market to satisfy the needs. Although having many suppliers is not a problem, consolidation of similar products or the same product for different locations is beneficial for leverage items (Cousins *et al.*, 2008). However, strategic items need an opposite strategy. For strategic items, it is better to have few suppliers – even one supplier for some of the products – and maintain a long-term relationship with those suppliers because shifting is not easy. Furthermore, the number of suppliers capable of delivering those items is fairly low in the market. Many benefits can be ensured by collaboration with the supplier of these kinds of product.

On the other hand, for routine items, although there are many suppliers capable of supplying them, it is not efficient to put a lot of effort into the procurement process as they have a limited effect on a business and finding a better supplier and implementing a better procurement cannot compensate the resources consumed in that process (Monczka *et al.*, 2005). Most companies therefore consolidate different routine items and assign them to as few suppliers as they can (De Boer *et al.*, 2001). By doing this, they increase the efficiency by reducing transactional costs and administrative efforts. For bottleneck items, although the impact on the profit is low, it is hard to find capable suppliers. Sometimes it is not even a choice for companies and they canalise to a particular supplier or a few suppliers. For these items, having long-term contracts is preferable for companies (Cousins *et al.*, 2008) because it is not easy to change the existing suppliers.

There is a critical point about this matrix. Companies should use this matrix in a dynamic way. For instance, an item might be strategic or leverage for a company for some time with its impact on profits, but with innovation, a better new item might replace that item in the market, and as a result it might become routine or bottleneck. Similarly, a leverage or routine item with many suppliers in the market might suddenly become strategic or bottleneck due to some new regulations or restrictions imposed by the government. Companies should therefore be aware of the latest market conditions and update their portfolio regularly.

As a result, a good procurement strategy facilitates an effective procurement process and enables companies to select and retain suitable suppliers in a more efficient way.

2.2.4 Identification of the Needs

Every purchasing process starts with the identification of the needs. This can be either a routine, recurring or a strategic new need. This need can also be either an internal need of the company or an external need from customers (Coyle *et al*., 2003). No matter what it is, this step is extremely important from two perspectives:

1. If the need defined is not in fact necessary for the company, then the whole process becomes useless, or
2. If the need is correct but the description of the details and specifications of the need is unclear, this may lead to the procurement of wrong goods or wrong quantities.

For simple products and services, it is easy to describe what exactly is needed with some measurable definitions at the beginning of a procurement cycle, but for complex procurements, it is not (Arlbjørn and Freytag, 2012). So in complex procurements, unless the company is very clear and precise about the specifications of what is needed, costly misunderstandings are very likely to happen (Rushton *et al*., 2014). The issue which is indicated by cost is not only the wrong items which are procured, but also not procuring actual needs which results in many other costly issues. For instance, it can delay projects, stop production or cause unsatisfied customers.

2.2.5 Supplier Pre-Evaluation

After the identification of the needs, the next step is the pre-evaluation of suppliers. This step is actually for deciding which suppliers are applicable from a broad level. Except in monopolistic markets where there is only one and oligopolistic markets where there are a few large suppliers (Novack and Simco, 1991), there are hundreds, sometimes thousands of suppliers ready to satisfy the company's needs due to the enhanced marketplace with globalization (Micheli, 2008). There are various ways to find them. An organisation can use specialist journals, web pages such as the Thomas Register or the yellow pages, and can also check whether a supplier has certification from reliable organisations such as the International Standards Organization (Benton, 2010). Also, many suppliers, especially the strong ones, advertise themselves through different platforms. Furthermore, using the experiences of other organisations to eliminate unreliable suppliers and determine the best ones can also help companies. On the other hand, if it is an existing need for which companies already have a supplier or suppliers, they can use historical data, monitoring results and their own experience for the pre-evaluation.

Especially with the help of the power of the internet, it is very easy today for organisations to find suppliers throughout the world, although that does not necessarily mean that it is easy to reach the right ones. Finding the best ones requires some intelligent research. Companies should invest some resources in that process if they are looking for really good suppliers. At the end of this step, companies end up with a list of suppliers which are quasi-capable of satisfying their needs. They are only ‘quasi-capable’ because no detailed evaluation is done in this step.

2.2.6 Supplier Selection

Supplier selection is seen as one of the most important processes for procurement managers (De Boer *et al*., 2001; Micheli *et al*., 2008). According to an extensive literature review on procurement models, companies give most attention to this step (De Boer *et al*., 2001). However, the success of this step is strongly dependent on the success in previous steps as they form the basis of the entire procurement process, so it is not possible to omit the previous steps and only focus on supplier selection.

There are various techniques for supplier selection but most companies use cost-based techniques which are not complicated and are easy to implement. Competitive bidding and negotiation are the two major techniques. The aim of competitive bidding is to select the most qualified supplier, mostly using the cost criterion, by using requests for bids from suppliers. In order to use competitive bidding effectively, there are three main requirements (Monczka *et al*., 2005):

- The volume of the procurement should be high enough for suppliers to compensate their costs of bidding,
- The qualifications and specifications of the products or services should be clear enough for suppliers to estimate the cost of producing those items or providing those services,
- There should be enough suppliers in competition which are willing and able to satisfy the needs of the organisation.

If these criteria are met, then competitive bidding can provide good value for the organisation. It usually lets the procurer secure the real market price, sometimes even lower (Dimitri *et al*., 2006) because it allows more suppliers to take part in the competition. However, when the main requirements set out above are absent, or for strategic reasons such as developing a new product by establishing a partnership with suppliers, organisations use negotiation rather than competitive bidding. This is simply a communication between the buyer and the supplier, mainly focusing on cost, but also on various other criteria if necessary.

It is important to be prepared before negotiation takes place. The buyer company should determine the unique objectives of the negotiation process (Weele, 2000). The negative side of negotiation is that when complex criteria in addition to cost are added to the negotiation, it becomes harder to execute the process. Sometimes negotiations between the buyer and supplier last long and become costly (Tunca and Wu, 2009) compared with competitive bidding. However, even though competitive bidding requires less time, this does not mean that it can be done properly in very limited time periods. There needs to be enough time especially for the suppliers' preparation of a quotation.

On the other hand, some organisations try to use both methods together, although there is a great risk in that. If an organisation is known for using negotiation after competitive bidding, then suppliers tend not to bid the cheapest price they can offer because they want to leave space for negotiation as well (Burt *et al*., 2010). Therefore, the organisation loses the price reduction power of the competitive bidding and competitive bidding becomes an unnecessary step, consuming time and resources without adding any value.

However, competitive bidding and negotiation are not necessarily used only in price-based decisions, they can also be used for the price determination step in more complex decision processes. In addition, many procurement practices – especially those with higher impact for the company – require multi-objective approaches which involve a variety of criteria (Weber and Ellram, 1993). It is widely accepted that purely price-based decisions are not suitable in those cases (Micheli *et al*., 2008). Using only price is insufficient to find value for the company. Also, price is just an apparent part of the costs in procurement, in fact there are many other costs which can be increased by only focusing on price and ignoring other factors.

For the implementation of complex criteria, companies commonly use weighted supplier selection tables. With these tables, decision-makers evaluate suppliers' different aspects, prioritise the organisations' own expectations and as a result, allocate a total mark to suppliers. Here, the decision makers should be very careful about two key points;

1. They should be objective about allocating marks to different qualifications of suppliers without any bias,
2. They should decide which criteria are priorities for their organisation.

These two aspects might be criticised as the weakest side of decision tables, because if they are not decided successfully, decision tables become useless. Companies should therefore be very careful while using decision tables.

Companies can also decide some minimum levels for specific criteria, which is called a non-compensatory model (De Boer *et al.*, 2001). By doing this, even though a supplier performs well in most of the criteria, if it is below the level in those specific criteria, it can be eliminated.

Although the importance of each criterion changes from business to business, and even procurement to procurement for the same company (Weber and Ellram, 1993), many businesses give priority to some common criteria. Ho *et al*. (2010) examined 78 published articles in order to find the most important criteria in supplier selection, and they found that quality, delivery and cost were the most-mentioned criteria, in that order. An earlier review of 74 articles published between 1966 and 1990 had found similar results that quality had the greatest importance, followed by delivery, cost and technical capability (Weber *et al*., 1991). It is clear that the same criteria maintain their importance for many years. However, even though both of those reviews went through articles from several industries and found similar results for the top criteria, it is still not possible to generalise their findings to all companies. As already discussed, it changes from industry to industry and from company to company. For instance, in food supply chains, the most important factor for supplier selection is food safety (Strohbehn and Gregoire, 2003). Therefore, decision makers should carefully decide in the light of their organisation's own unique expectations. They should also carefully decide the number of the criteria because if it increases, complexity increases as well. A sample supplier-selection table is shown in Table 2.2.

Table 2.2 Supplier Selection Table (made by the author)

CRITERIA	**Weight (Total 100)**	**Supplier A (Over 10)**	**Supplier B (Over 10)**	**Supplier C (Over 10)**	Weighted Score		
					A	**B**	**C**
Quality	20	7	6	6	140	120	120
On-Time Delivery	17	4	8	7	68	136	119
Cost	15	5	4	3	75	60	45
Reliability	12	6	8	7	72	96	84
Sustainability	10	0	8	5	0	80	50
Safety	8	4	7	7	32	56	56
Financial Status	7	5	3	8	35	21	56
IT Systems	5	6	4	7	30	20	35
Experience	3	7	8	6	21	24	18
Relationship Ability	3	5	3	5	15	9	15
TOTAL					488	622	598
Supplier scores (0: no qualification - 1: poor - 10: perfect)							

According to Table 2.2, Supplier B best matches with the expectations of the organisation. Even though it is not the most advantageous supplier according to the cost criterion which is assumed as the only criterion by many companies, overall it has the highest score and seems to be the best among those three suppliers. There is another important issue regarding cost. Although many companies only take initial costs into account, the total cost of ownership which includes whole costs arising in the life-cycle of a service or product (Micheli, 2008) is gaining more importance day-by-day. It does not matter whether it is an aircraft worth millions, or a car, or even a washing machine, the total cost of ownership is very critical in decision-making (Lynam, 2015) because a procurement with short-term cost-advantage might turn into the very opposite in the long term and that procurement then become costly for the company, or similarly, a procurement with a high short-term cost might be much more cost efficient in the long term due to factors such as legal, operating and maintenance costs.

It is obvious that using that kind of table rather than taking cost as the only criterion is much more time- and resource-consuming (Dimitri *et al*., 2006) because it increases the complexity of the process and requires more resources and effort. Companies therefore make the trade-off whether using this kind of tables is worth it and the results can compensate the resources consumed in this process or not. However, the need for these kinds of complex evaluation techniques increases with the complexity of the purchase. For the table, there is one more important point for companies. It is beneficial to use this kind of table in a cross-functional way to ensure that the selected criteria and their weight aligns with the objectives of every department and hence the entire company's objectives.

2.2.7 Supplier Management

The procurement process does not end with the selection of a supplier; the management of the suppliers is also a procurement-related issue.

One important part of supplier management is measuring the performance of the supplier. This helps the buyer to answer whether the performance satisfies the needs and provides opportunities for better decision-making, better communication, better motivation (Novack and Simco, 1991). More importantly it shows the existing performance of the supplier so that the buyer can detect improvable points in that supplier (Monczka *et al*., 2005). This is the case even for well-performing suppliers because the supplier does not necessarily underperform in order to have some improvable points, there is always room for improvement even in a great performance.

This measurement must be objective. Therefore, since it is hard to evaluate qualitative criteria objectively, companies mostly do this using quantitative criteria. According to Monczka *et al*. (2005), there are three main areas that can be measured objectively: delivery performance, quality performance and cost reduction. These are shown with their sub-categories in Table 2.3. The performances in these categories can all be measured quantitatively and objectively so they can be reliably compared with either the historical performance of the same company or the performance of other companies within the same industry.

Table 2.3 Performance Measurement (Monczka et al., 2005)

Measurement Category	Sub-Category	Details
Price	Target Prices Achieved	Difference between actual and planned prices.
	Price to Market Index Comparison	Difference between actual and published market prices.
Cost Effectiveness	Cost Changes	Change in the actual cost of an item due to change in purchasing strategy
	Cost Avoidance	Difference between an actual price and a price which might have occurred unless the organisation makes a specific effort.
Quality	Defects	Maximum number of defects acceptable in a particular product.
	Defects per Supplier	Number of defects from each supplier in order to compare them.
	Field Failure Rates	Number of failures after the sale of the product by the organisation (about customer satisfaction)
Time	Time to Market	Time consumed between the start of developing a new product and its first delivery
	On-time Delivery	Percentage of deliveries which arrived on-time.
	Lead Time	Time between placing an order and its delivery.

Cousins *et al*. (2008) suggested that supplier performance and customer satisfaction are also important for measurement, although they also acknowledged that it is hard to measure these two areas objectively since they require qualitative evaluation. Therefore they are not as reliable as the criteria shown in the table above.

Another important part of supplier management is the implementation of the nature of the relationship between the buyer and suppliers which was decided in the procurement strategy. In the traditional adversarial approach, companies and suppliers see each other as competitors and as a result, one's success naturally means the loss of the other (Virolainen, 1998). Adversarial relations cannot add any value to the process. It obviously becomes a win-or-lose environment; if company wins, supplier loses or *vice versa*. However with the collaborative approach, it is possible to improve the performances of both sides (Carr and Smeltzer, 1999; Chen *et al*., 2004). Managing especially the key suppliers through collaboration provides cost and quality improvements in the long term (Cox, 2001). So with collaboration, it becomes a win-and-win environment. Success is shared and in this type of environment, with collaboration rather than an adversarial relationship, both parts gain more than each can gain separately.

To ensure collaboration, there are some requirements (Rushton *et al*., 2014):

- Alignment of the cultures of both partners,
- High level of trust,
- High level of information sharing,
- Financial convenience to both partners, and
- Will for a partnership approach in both partners.

Discussing similar issues, Ellram (1995) also emphasised the importance of senior management support. This is important because without that kind of support, it is not possible to develop and retain collaboration. The support of senior decision-makers is vital for collaboration.

Among these requirements, the will for a partnership is essential to ensure collaboration because, although high levels in some of these requirements might compensate low levels in others, it is not possible to introduce collaboration unless both partners are willing. In order to ensure and maintain willingness, incentives play a critical role. Appropriate incentives can create an interest for the suppliers (Cox and Thompson, 1997). Also, having buyer dominance in terms of the power balance mentioned in the procurement strategy section can be a facilitator for collaboration.

2.3 Construction Industry

The construction industry has some predominant features such as highly fragmented structure, high levels of uncertainty and client's intervention. Along with these features, there are also other factors which all affect supply chain practices and hence procurement.

Before discussing the features of the construction industry, it will be helpful to show the basic structure of its supply chain to make clear where the focus of this dissertation lies. Construction industry supply chains consist of the client, contractor, subcontractor and suppliers. Figure 2.5 shows the schema of a simple construction supply chain and relationships between the players. Although it seems very simple, the unique requirements of each project make it unpredictable how many supply chains will be integrated to form a specific project supply chain (Cox and Ireland, 2002). A project supply chain actually consists of several supply chains with multiple layers of subcontractors and suppliers (Kumaraswamy *et al*., 2000).

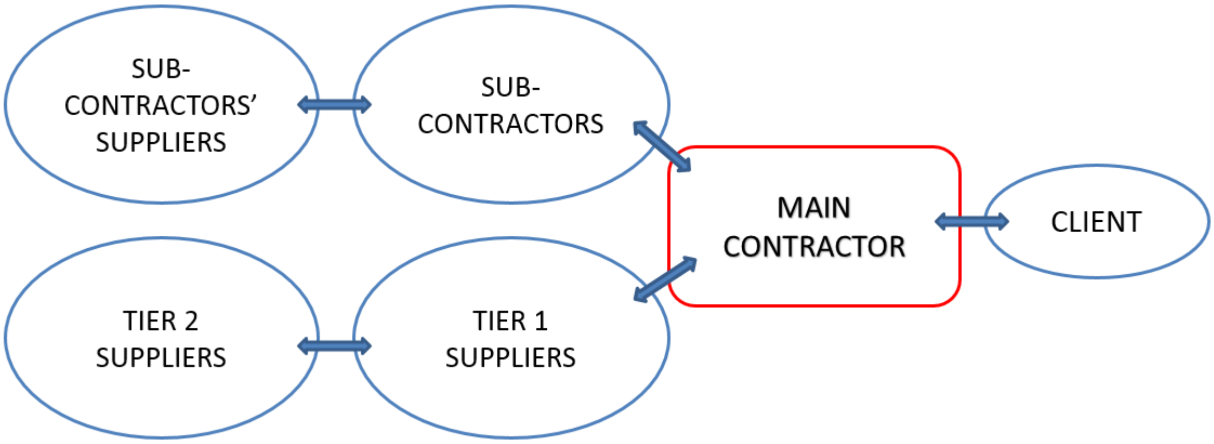

Figure 2.5 Construction Industry Supply Chain (made by the author)

In these supply chains, there are two different procurement practices;

- Procurement of projects (between client and main contractor),
- Procurement of goods and contracts due to the projects (between main contractor and subcontractors and suppliers).

This dissertation focuses on the latter practice which is procurement from the main contractor's perspective. For a main contractor, supply chain management in the construction industry can be defined as the management of goods, information and activities by involving both upstream client and downstream suppliers and subcontractors under the uncertainty of the project environment. The aim of that supply chain is obvious: it is to deliver the projects on time and within budget while also ensuring high quality (Zhou and Lowe, 2003). To achieve this aim, procurement plays a vital role because a main contractor delivers 80-90% of the projects through its supply chain, namely with its suppliers and subcontractors.

2.3.1 Features of the Construction Industry and Its Supply Chain

Features of the construction industry and its entire supply chain are discussed in this section. The features explained in this chapter are not mutually exclusive, they are interactive, so some of them overlap with one another. The most influential features of the construction industry are:

- The fragmented and complex structure of the industry,
- Higher uncertainty and risks,
- Dependence on the client,
- Price-based decisions,
- One-off projects.

Fragmented and Complex Structure

The construction industry has a very fragmented structure which affects its supply chain and procurement practices. Suppliers and subcontractors deliver about 80% of the projects (Eriksson and Westerberg, 2011). So for an average big project which is about £20 million, main contractors generally have more than 50 suppliers and subcontractors, and for a typical project which is about £10 million, it is still not less than 40 (Department of Business, 2013). However, they are only tier-1 suppliers and subcontractors. When suppliers of these suppliers and subcontractors are included, construction supply chains include hundreds of players (Briscoe and Dainty, 2005). In addition to these huge numbers of suppliers and subcontractors, the supply chains of the construction industry have other players such as designers, and building and maintaining teams, which increases the fragmentation and makes the industry extremely complex (HM Government, 2013).

From the main contractor's perspective, this fragmented and complex structure with large numbers of subcontractors and suppliers results in (Department of Business, 2013):

- Management difficulties,
- Higher transaction costs,
- Increased prices due to low volume purchases from different suppliers.

Especially the management difficulties here should be taken into consideration very seriously because they can cause several other problems. Management of this fragmented structure requires large amounts of resources (Saad *et al.*, 2002). Also, this fragmented complex structure makes the implementation of collaboration (the importance of collaboration was discussed in the procurement strategy and supplier management sections) very hard because it is not easy to align all these different players to the same target, to ensure effective information exchange among them or to provide sufficient resources for the relationship. However, a study carried by the EC Harris Consultancy revealed that, despite the above factors, the collaborative approach is often used in the industry (HM Government, 2013). This shows that companies are trying to achieve collaboration regardless of how hard its management is. This is obviously because whilst arms-length relations decrease productivity (Cox and Thompson, 1997), the collaborative approach is capable of bringing improved cost, time and quality performances (Eriksson and Westerberg, 2011). Companies are aware of these advantages.

Higher Uncertainty and Risks

Another major feature of the construction industry is the high levels of uncertainty and risk which it has. It is the essential nature of project environments in fact. It is hard to know the requirements of the entire project at the beginning so it is almost impossible to run projects as they were planned. The major source of this uncertainty is the continuity of the design even in the project delivery period. To give a dramatic example, the Scottish Parliament building was planned to be finished in two years when the construction was started in 1999 at a total cost of £40 million, but it ended with a three-year delay in 2004 with a total cost of £431 million, mostly because of the 18,000 design change orders which were given in five years (Baily *et al.*, 2008). The eventual total cost was nearly eleven times the estimated cost.

This project uncertainty is one of the major barriers to reliability. For instance, constructing a basic building such as an office block is easy in two respects:

- It is easy to define which materials are necessary in which amounts, and
- It is easy to predict the time necessary to complete the task.

When it comes to complex projects where there are various risk factors affecting the project and where it is not possible to define those factors when the contract is signed, uncertainty becomes a critical factor. So risk management gains a vital importance for coping with the uncertainty. On the other hand, there are some other causes of high risks in the construction industry such as one-off projects, fixed-price contracts, site working and highly fragmented structure (Department of Business, 2013).

As can be seen, nearly all of the major features of the industry are risk sources. As a result, these uncertainties and risks cause a great deal of waste and reduce productivity in the construction industry (HM Government, 2013). For mitigation, holding stock, which is common in many other industries, is not possible in the construction industry, so the management of this uncertainty by various other mitigation strategies is crucial (Holmen, 2003).

Dependence on the Client

Generally in most industries, procurement procedures are defined by the companies themselves and they can select any supplier they want (Ivar Strand *et al.*, 2011). In the construction industry, however, the situation is a little bit different for the main contractor since the client has some intervention.

The client is not only the ultimate customer in the construction industry, it is also the sponsor of the projects because it is the one who provides the funding of the project. It also has a power arising from contracts, and uses it often as an intervention in the supplier selection of the main contractor (Masi *et al*., 2013). It is also generally a larger company compared with contractors and suppliers (Briscoe and Dainty, 2005). This situation increases its power. Because of that power, it has great influence on the final asset both in terms of its specifications and parameters such as the duration and completion of the project and also it limits the contractor and imposes some constraints, such as forcing the main contractor to buy from particular suppliers or to work with particular subcontractors (Akintoye *et al*., 2000). Worse than that, amendments to these specifications and parameters continue after the construction starts and until the ultimate delivery of the whole project. This structure causes high amounts of waste and rework. Rework alone represents approximately 12% of the total costs of industrial projects (Yeo and Ning, 2002). It is not possible to say that the only reason for the rework is project changes, obviously low-quality materials and works can also cause rework, but it can be said that it is one of the major causes of waste.

Price-Based Decisions

Traditional methods such as open tenders, negotiation and competitive bidding dominated the industry in the 2000s, being implemented in 80% of all projects (Saad *et al*., 2002). Even though these methods cause a variety of problems due to their adversarial rather than collaborative nature (Dubois and Gadde, 2000; Eriksson and Westerberg, 2011), they are still being commonly used (Cutting-Decelle *et al*., 2007). According to a study in which interviews were conducted with managers in the construction industry, many senior managers complained about the intense use of competitive tendering in the construction industry and they thought that purely price-based decisions prevent possible improvements (Akintoye *et al*., 2000). These managers were right in their concerns.

A survey conducted on 300 UK construction companies confirmed their complaints by showing increasing competition and insufficient contractor practices as the two major problems facing construction procurement (Reynolds, 2012). Increasing competition is a direct result of the competitive tendering approach. As a result of these methods, price-based decisions are leading the industry, and clients generally choose the contractor with the lowest initial cost (Zhou and Lowe, 2003; Briscoe and Dainty, 2005).

Although the issue under discussion is about the project procurement between the client and the main contractor, project procurement price directly affects the procurement process of the contractor with its suppliers. This situation forces the contractor to go towards price-only decisions too in order to compensate the low price of the project. Therefore, suppliers and subcontractors feel a very competitive pressure to offer price reductions. However, these price reductions are not achieved by proper cost-reductions, they are done by price-cutting which results in problems such as lower quality, delivery problems and waste (Department of Business, 2013).

There is another serious problem with purely price-based decisions. Sometimes subcontractors and suppliers offer extremely low prices on purpose in order to get the job and these prices might be even lower than the break-even point, which clearly means a loss for that supplier or contractor. This is called ‘suicide bidding’. According to a survey of 525 construction industry professionals, 82% believed that that kind of bidding exists and causes problems for the industry (CIOB, 2010). A sample of 525 is a good sample size for a particular industry and the 82% result clearly shows that industry professionals see it as a serious problem within the industry. Therefore, extremely low price offers should be taken into consideration very carefully by main contractors.

One-off Projects

Construction can be defined as a make-to-order industry (Vrijhoef and Koskela, 2000). The projects ordered by clients are one-off with very few exceptions (Cox and Thompson, 1997; Cutting-Decelle *et al*., 2007). There is no repetition for a construction supply chain, it has to configure itself again and again for each project because each project is different in type, size and requirements (Cox and Ireland, 2002; Briscoe and Dainty, 2005). This one-off nature makes especially benefitting from collaboration and other strategic approaches hardly possible (HM Government, 2013). It also causes instability and fosters fragmentation in the industry (Vrijhoef and Koskela, 2000).

Other Features

Along with the major features discussed above, the construction industry has other features which affect its supply chain. One of them is the **volumes of the work**. The construction industry deals with many big projects, so procurement in the construction industry deals with extremely high volumes of purchases (Department of Business, 2013). These volumes give procurement a more critical role because even a small effect becomes dramatic with the leverage power of high volumes. In addition, these high volumes and values have another important effect in terms of the time consumed in projects. Approval processes with these high-volume purchases necessitate long preparations and consume more time, and as a result they play a role in producing delays in project delivery (Akintoye *et al*., 2000).

The government's involvement is another feature of the construction industry. It is not limited to its legislative role; the government itself is also a major client for this industry. The UK government, for instance, owns nearly 40% of the projects in terms of value throughout the UK (CIOB, 2010). Therefore, the UK government follows the industry closely and has so far published four reports completely dedicated to the construction industry (Department of Business, 2013):

- The Latham report in 1994,
- The Egan report in 1998,
- The Wolstenholme report in 2008, and
- Construction 2025 report in 2013.

All of these reports have drawn attention to the problems of their times and have made recommendations. These regular publications clearly show the importance of the industry from the UK government's perspective.

2.3.2 Factors Affecting Supply Chain Practices

The previously mentioned features have influences for effective practices within the construction industry but they are not the only sources of effects. In addition to those, there are other factors which affect the supply chain and hence the procurement in the construction industry.

Integration is one of the major factors that has an influence on effective supply chain practices. Indeed, companies have recently understood that integration with a broad supply chain management approach is beneficial for the construction industry in just the same way as in the manufacturing industry (Saad *et al*., 2002). It gained importance after the 2000s. It requires shifting from arm's-length into long-term and closer relations. This integration and relationship can provide various benefits. According to a survey of the UK's top 100 construction companies (ranking is due to the Chartered Institute of Building), the major reasons why construction companies are willing to develop relationships with their suppliers are shown in Table 2.4.

Table 2.4 Reasons for Supplier Relationships (Akintoye et al., 2000)

REASON	VALUE
Better quality service	4.63
Cost benefits	4.55
Simplifying the construction process	4.23
Simplifying the ordering process	3.48

Value scale 1: least, 5: most

Table 2.4 is a summary of what leader companies are thinking. According to the table, integration provides quality and cost benefits while also simplifying the processes. That is exactly what the construction industry needs; it is suffering particularly from over-budgeted and low-quality project deliveries.

To ensure integration; collaboration, transparency and alignment of aims are the main enablers (Saad *et al.*, 2002). For instance **collaboration** between the Office Max company and its supplier Avery Dennison produced a 60% lead time reduction (University of Tennessee, 2013). Since time improvement is a very urgent requirement in the construction industry, the importance of collaboration is obvious. **Transparency** enables better communication and information-sharing which is crucial because the lack of especially on-time information causes many problems and hinders effective deliveries for the suppliers, therefore the information problem represents a considerable barrier to effective practices (Li *et al.*, 1999; Cutting-Decelle *et al.*, 2007). In order to solve that problem, both contractors and suppliers should share information under trust and understand the expectations of each other. This is only possible with transparency. **Alignment**, especially in design and construction, is vital for effective practices because it is not always the case that a good design is constructible, and design-based problems are one of the major problems in the industry (Dainty *et al.*, 2001). However when design and construction are in alignment, this provides more certainty and opportunity for early and accurately planning. That planning provides more time-period opportunities which increases the performance of the supply chain and hence procurement in the construction industry (Department of Business, 2013).

On the other hand, **financial factors** also have major impacts on effective practices in the industry. For instance, late payments by the main contractor is an existing problem affecting the performance of suppliers and subcontractors (Dainty *et al*., 2001). Main contractors should provide regular payments to ensure proper cash flow along the supply chain. In addition to regular payments, realistic prices also increase efficiency in the procurement process (Department of Business, 2013) because realistic prices especially for the project reduce the price pressure on the main contractor which makes higher quality procurement from its suppliers possible.

Moreover, **early engagement of suppliers**, especially the key ones, as early as possible is another major factor influencing effective practices. It provides better results in the construction because it enables the involvement of the supply chain in the project earlier, which facilitates the solutions to the conflict-based problems faced by the industry (HM Government, 2013). By doing this, suppliers can also contribute to the projects with their experience.

Highly skilled managers are also important for the construction industry and they facilitate effective practices (Department of Business, 2013). According to Monczka *et al*. (2005), having a senior procurement manager who is in direct contact with the CEO of the company facilitates achieving the procurement strategy. The absence of such managers causes several problems in procurement practices. For instance, most companies put more emphasis on the upstream of their supply chains, namely project purchasing and the client (Akintoye *et al*., 2000), which is due to the lack of skilled managers responsible for the procurement of materials and subcontracts. In a supply chain concept, it is not possible to omit one side and gain optimal value.

Finally, **environmental sustainability** is an emerging issue throughout the world. The UK government has a commitment to reduce carbon emissions by 80% in 2050 compared with 1990 figures (CIOB, 2010). This target affects all industries and the construction industry definitely has to play a major role in achieving this target since it is seen as one of the major industries with a dramatic negative impact on the environment (Eriksson and Westerberg, 2011). If a project harms the environment, it means it is also harming future markets (Primo and Filho, 2012). There is therefore a growing emphasis on environmental sustainability in the construction industry, and this is reflected in procurement as well because sustainability starts in procurement. A construction company can only be as sustainable as its suppliers (Belfitt *et al*., 2011). Although there are some issues such as design which can have effects on sustainability, their effects are limited; major enablers are the materials and the manner of construction. Therefore, since most of the project is done through suppliers and subcontractors, it is not possible to provide environmental sustainability without an environmentally sustainable procurement process.

2.4 Procurement in the Construction Industry

Procurement in the construction industry follows a similar process to general procurement but the industry's unique features and various other external factors heavily affect the procedures and choices within the steps.

In the construction industry, procurement plays a very critical role for a variety of reasons (Yeo and Ning, 2002), such as:

- Procured materials form the basis of the assets in construction projects,
- Material costs represent a very high proportion of the total costs,
- With its fragmented structure, project delivery success is highly dependent on large number of suppliers and subcontractors, and hence the success of procurement,
- There is no opportunity to compensate procurement problems by stock holding.

For all these reasons, its role in the delivery of projects is substantial. Main contractors deliver most parts of the projects through their subcontractors and suppliers. For instance, according to the major main subcontractors in the Swedish construction industry, about 75% of all project costs are spent on procurement (Dubois and Gadde, 2000). It is therefore possible to say the successful delivery of construction projects is extremely dependent on efficient and effective procurement practices in the construction industry. With the awareness of this critical importance, procurement in the construction industry has become a strategic issue (Scotti, 2007). It is not seen as a basic contractual process as it was in the past.

In the light of this importance, this section analyses the specifications of the procurement practices in the construction industry and develops the conceptual framework of procurement in the construction industry.

2.4.1 Procurement Strategy

Like other industries, appropriate strategy selection which aligns with the business strategy is a major contributor to success in the construction industry (Primo and Filho, 2012). It can be analysed under the same three procurement strategy decisions previously discussed (Gadde and Håkansson, 1994):

1) Make or Buy,
2) Supply Base Structure,
3) Nature of the Relationship.

Make or Buy

The make-or-buy decision for the construction industry is the decision about the level of suppliers and subcontractors with which a main contractor works. As mentioned in the section which discussed the features of the industry, this level can reach up to 90%, which means that companies are leaving the delivery of the projects almost completely to suppliers and subcontractors. Therefore, in the construction industry, the tendency for this decision is clearly to buy.

Supply Base Structure

For effective practices in an environment with a high number of suppliers, companies need to reduce their supply base in order to deal with fewer suppliers and develop close relationships with the remaining ones (Kannan and Tan, 2006). This is the main trend in procurement as mentioned in previous sections. However, in the construction industry, due to the fragmented structure, it is not possible to reduce the supply base very much for a main contractor because there are many different areas (mechanical, civil, electrical engineering and different types of critical materials) in the industry. Even though a main contractor shifts to a single-sourcing strategy in each area, the total number of suppliers and subcontractors would still be high. Moreover, in some cases, some clients have specific preferences for the number of suppliers and subcontractors that a main contractor can have (Primo and Filho, 2012). In that kind of situation, the client becomes the main decision-maker for the supply base strategy, and the main contractor loses control over supply-base structure decisions.

For these reasons, the supply base strategy in the construction industry inevitably results in a vast portfolio of strategic suppliers and subcontractors.

Nature of the Relationship

The nature of the relationship is a very critical issue in the construction industry because since suppliers and subcontractors deliver nearly 80% of the projects as stated above, the relationship between the main contractor and them is of vital importance. Different from many other industries, the focus of the relationship strategy should not be limited to the actual project delivery process in the construction industry because the construction industry has high levels of uncertainty and design problems which can be reduced by focusing the initial process. The initial process has a critical success enabler role in this industry. Top-level delivered projects with poor initial processes are more likely to fail than those poorly delivered but with good initial processes (Primo and Filho, 2012). As can be seen, if a project starts with weak initiation, it is hard to strengthen it even with strong subsequent efforts.

The nature of the relationship for the construction industry is therefore not only linked to the closeness of the relationship, but also when the relationship starts. Clearly, the construction industry requires the early engagement of suppliers and subcontractors for projects as a strategy. Engaging especially strategic suppliers and subcontractors as early as possible is crucial (Scotti, 2007). By doing so, construction companies can benefit from their suppliers' experience in the development of the project. Moreover, suppliers can transfer their practical knowledge to designers and contribute to design and thus avoid much potential rework and inconsistencies. In an industry in which most of the projects cannot be delivered on time and to budget, London Heathrow Airport's £4.2 billion new terminal project was delivered on time and to budget by using early engagement strategy with all suppliers and all subcontractors (Baily *et al*., 2008). This example shows that in fact it is possible with the right strategy and the right approaches.

However, despite the critical importance and some remarkable examples, the construction industry generally lacks a cooperation feature (Holmen and Pedersen, 2007), and transactional rather than cooperative relationships are leading the construction industry and these avoid early engagement (Eriksson and Laan, 2007). This is mostly because of the fragmented structure of the industry which hinders supply-base reduction and the development of closer relationships with suppliers and subcontractors.

It is not appropriate to treat all suppliers and subcontractors under same level of relationship. In the construction industry, approximately 50% of the procurement activities are done with four or five subcontractors and suppliers (Department of Business, 2013). This means that by only focusing on four or five suppliers and subcontractors, companies can improve the procurement process to the same level as focusing on maybe forty to fifty suppliers and subcontractors. It is obvious that managing four or five of them is much easier than managing forty to fifty, so a clear segmentation for the nature of the relationship decision is important in the industry.

2.4.2 Identification of the Needs

In the construction industry, it is important to identify the needs, especially the strategic items, and procure them early to avoid possible delays in the project. According to a study carried out by the Construction Industry Institute, procuring strategic items earlier on a construction project provides about 5% cost savings and 15% time savings (Scotti, 2007). So, early identification can facilitate delivering projects on time and in budget. However, due to the uncertainty in the projects, it is not possible to define exact needs in advance. Worse than that, the uncertain nature of the industry puts main contractors into positions in which there is not enough time to identify the needs clearly. As a result, wrong procurement becomes an issue in the industry.

2.4.3 Supplier Pre-evaluation

Supplier pre-evaluation is extremely important in the construction industry because it already has a nature of a highly fragmented structure and companies can avoid the negative effects of this structure to some extent by developing pools with reduced numbers of suppliers. Fewer suppliers and subcontractors should be preferable in this industry. For instance, according to a case study aimed at establishing a supply network for a leading Norwegian construction company, the company developed a supplier library by evaluating both existing and new suppliers (Holmen, 2003). The company's aim was to reduce the number of suppliers working on the projects. It used criteria which was defined by a cross-functional team to represent every aspect of the construction projects. As a result, the improvements in cost, quality and time clearly showed the importance of the pre-evaluation of suppliers and then co-operating with the key selected suppliers.

2.4.4 Supplier Selection

Supplier selection is a vital decision in the procurement process of the construction industry because selected suppliers and subcontractors deliver approximately 80% of the projects (Eriksson and Westerberg, 2011). As in many other industries, however, price-based decisions are leading the construction industry. Competitive bidding and negotiation are two major techniques for this. Especially competitive bidding is very popular within the industry. Even though it has many negative effects on effective procurement practices in the construction industry, it is being widely used (Dubois and Gadde, 2000).

First, it leads companies into arm's-length relationships. This is not preferable for the nature of the relationship with especially critical suppliers and subcontractors. Although competitive bidding might be cost-effective for initial costs, when the subcontractor or supplier comes to the construction site, more costs occur than were included in the initial tendering process. This mostly happens because of inadequate information-sharing between the contractor and supplier or subcontractor which is a direct result of arm's-length relationships.

Second, there are some hidden costs caused by competitive bidding. Dubois and Gadde (2000) carried out interviews with eleven Swedish construction firms and found that suppliers or subcontractors could only win one tender out of ten and that this process cost them about 5% of their total turnover. Turnover ratio is high because in construction industry, in order to make a quotation to a tender, a subcontractor or supplier has to make some calculations, spend time and money, and think about the project, all of which are costly. The interviews were in the Swedish market where competition levels might be lower than in bigger markets such as the UK or the US. So when it comes to a bigger market, the UK for instance, winning one tender out of ten might not be possible, it might go up to one out of twenty or more. Therefore, it becomes more and more costly for suppliers and subcontractors in the UK. One thing is certain: suppliers and subcontractors reflect all of the costs of unsuccessful tenders in the price which they quote when they win a tender in order to compensate those costs. This harms the main contractor and hence the whole supply chain.

On the other hand, this method also negatively affects suppliers and subcontractors in addition to the main contractor. A study of the supply chains of five main contracts (between the client and the main contractor) and six sub-contracts (between the main contractors and their suppliers and subcontractors) revealed that the competitive bidding method does not make a positive contribution to suppliers and subcontractors, so they prefer negotiation methods which allow some criteria other than cost to be discussed and driven forward (Department of Business, 2013). This preferred negotiation approach is used to some extent; however, when main contractors use negotiation, they check their selection of suppliers with competitive bidding from other suppliers (Hartmann and Caerteling, 2010). By doing this, they aim to know whether the supplier is offering a favourable price even if not the cheapest. If they find a considerable difference in the price offered by other suppliers, they tend to shift to the supplier with a better price offer.

Competitive bidding remains inadequate, especially in complex procurement processes. In that kind of situation, decision tables can facilitate effective processes for supplier selection. When using them, it is extremely important to put in different criteria which are suitable for the construction industry and different weights in terms of their importance. Also, in the construction industry, selection of the criteria should not be done only by the buyer which is the main contractor, it should be done jointly by the main contractor and the client (Eriksson and Westerberg, 2011) because, as discussed in the section on the features of the industry, the client has a considerable effect in the procurement process, therefore, it would be better to integrate the client into the process from the beginning in order to avoid unexpected future interventions.

Decision Criteria

What might be the criteria suitable for the construction industry? As already discussed, the major aim of the industry is to deliver projects on time and within budget while also ensuring high quality (Zhou and Lowe, 2003). It is therefore obvious that **cost**, **quality** and **time**-related criteria should be highly weighted in the decision table.

In terms of time-related criteria, delivery is the most important issue. Deliveries on time and in the right amount are necessary in the industry, which recalls the Just-in-Time (JIT) approach to management. That approach is being used extensively in the automotive industry which aims for reliable deliveries exactly when they are needed (Weber and Ellram, 1993). Although the JIT approach was developed for the automotive industry, its philosophy fits the construction industry as well (Eriksson, 2010). One of the major problems in the construction industry is failure to deliver projects on time. Problems in the delivery of the procured goods and services are an important reason for that lateness and it is not a case of holding stock for most of the goods (Micheli, 2008) which can overcome this problem to some extent. Therefore, the reliability of the supplier in terms of **JIT deliveries** is one of the leading criteria in the construction industry. Yeo and Ning (2002) suggested JIT deliveries as one of the lessons learned from manufacturing industries to be implemented in construction projects.

In addition to the JIT requirement of the deliveries, there is one more important criterion about them, which is the flexibility which allows better reactions to instant changes which are a common occurrence in the construction industry due to its uncertain nature and design problems. However, according to Hartmann and Caerteling (2010), the ability to cope with unpredictable issues is not regarded as a major criterion in supplier selection. That is interesting, since uncertainty is one of the important features of the industry and many problems are caused by the absence of proper planning. In the light of the unique features of the industry, **flexibility** should be another criterion in supplier selection. For flexibility, **reduced lead times** is an important enabler because it is hardly possible to deliver instant needs in small time-periods if the lead times are not short enough.

On the other hand, in the construction industry, the numbers of critical supplies and hence suppliers and subcontractors are very high, reaching nearly 50% of the total expenditure (Micheli, 2008). Effectively procuring these strategic items and services from these suppliers requires high-level buyer/supplier relationships, as stated before. To ensure this, **long-term relationship ability** becomes an important criterion in supplier selection in this industry. Moreover, for retaining those relationships for years, the **financial risk** of a supplier or subcontractor also becomes important because main contractors do not want to invest in and consume resources for suppliers and subcontractors which can stop providing services or goods at any time due to financial problems which they face.

In addition to the criteria discussed above, **environmental sustainability** is also an important concern in the industry. The increasing pressure in the industry over environmental issues, especially from the government, was discussed in previous sections. As sustainability starts with procurement, it is now an important criterion for supplier and subcontractor selection.

Along with these criteria, there is some discussion on one other criterion, which is the trust of the main contractor due to its past experience with a supplier or subcontractor. In their analyses of 448 contractor/subcontractor relationships, Kamann *et al*. (2006) could not find any positive future contribution from knowing each other before. The sample size was high enough to cover different relationship situations and they could not find any positive outcomes from having a past association. However, interestingly Hartmann and Caerteling (2010) analysed the interplay between trust and price in subcontractor selection with 222 questionnaires issued to medium and senior managers (*see* Table 2.5) and found that it was a consideration when other criteria are similar.

Table 2.5 Trust-Price Relation (derived from Hartmann and Caerteling, 2010)

	Selection A		**Selection B**	
Contractor	**Known**	**Unknown**	**Known**	**Unknown**
Price	**Low**	**Low**	**High**	**Low**
Quality	High		High	
Cooperation	High		High	
Utility	High		High	
Selection Probability	**95%**	**5%**	**25%**	**75%**

As can be seen from Table 2.5, when other factors are the same, knowing a supplier before makes a huge difference. In 'Selection A', trust increases the probability of selection to 95%. However, when the price changes and an unknown supplier offers a low price whilst the known supplier offers a high price, trust loses its power in selection and the unknown supplier gains a probability of being selected by 75% in 'Selection B'. To sum up, **trust** is a factor which is taken into account in subcontractor procurement, although it has no contribution for effective practices according to Kamann *et al*. (2006). It is not as much weighted as price but is nevertheless used as a supplier selection criterion.

Finally, **safety** is also an important criterion in supplier selection. Unlike other criteria, it is essential and without it having any weight, buyers are looking at a specific level of safety when selecting suppliers and subcontractors because safety issues have the potential to cause fatal problems in construction sites.

In the light of the criteria discussed above, a sample supplier and subcontractor selection table is shown in Table 2.6.

Table 2.6 Supplier and Subcontractor Selection in the Construction Industry (made by the author)

CRITERIA	Weight (A-E)
Quality	A
Cost	A
JIT Deliveries	A
Flexibility	B
Lead Times	B
Long-Term Relationship Ability	C
Financial Risks	C
Environmental Sustainability	D
Trust	E
Safety	Essential

(A: most important – E: least important)

Table 2.6 is shown as a sample. These are the common criteria in the construction industry although the importance of each criterion changes from selection to selection. For instance, when the strategic importance of the selection decreases, the importance of long-term relationship ability decreases as well.

Method Selection

Both competitive bidding and more complex decision tables have now been discussed. They are not one-size-fits-all methods so companies need to know which one to use in which situation. For instance, technical sub-contracts and technical goods' suppliers have the biggest share in total procurement activities in the industry therefore they are extremely important (Holmen, 2003). For that kind of selection, decision tables with complex selection criteria which require more resource allocation and more emphasis might be beneficial for main contractors. However, for a minor subcontracting job such as fencing, it is not effective to go through a detailed and resource-consuming procurement process because its effects on the project are very small. To achieve this separation under a structured approach, Masi *et al*. (2013) developed a matrix for supplier selection techniques in the Engineering, Procurement and Construction (EPC) industry which evaluates four different situations in terms of two factors; difficulty in the management of the process and its impact on the project (*see* Table 2.7). This is helpful for properly classifying the portfolio and implementing suitable supplier selection procedures.

Table 2.7 Supplier Selection Technique Requirements for the Construction Industry (Masi et al., 2013)

Management Difficulty	**Impact on the Project**	**Items**	**Requirements of the supplier selection technique**
High	High	Critical Items	Complex criteria, high accuracy, total cost not initial, understandable by the client
Low	High	Bulk Material	High simplicity, first criteria-based then price-based
High	Low	Bottlenecks, small quantities	Flexibility, high simplicity
Low	Low	Non-critical items	Minimum administrative costs, qualitative criteria

To sum up, in the construction industry there is a common tendency for price-based decisions in supplier selection. Although it is clear that price-based decisions represent a barrier in some procurement procedures, they are nevertheless being commonly implemented. When it is the case of a senior management strategy, they have an awareness of the importance of complex decisions, they do not see price as the only criterion, but when it comes to implementation, contrary to that awareness, purely price-based decisions are leading the industry (Dainty *et al*., 2001).

2.4.5 Supplier Management

As discussed in the procurement section, measuring the performance of the supplier and of procurement is an important part of supplier management. It was also discussed in the same section that using unbiased quantitative criteria is more suitable for obtaining an objective measurement. So, in the construction industry, since the major aim is to deliver projects on time and within budget while also ensuring high quality (Zhou and Lowe, 2003), and since they are all quantitative issues, it is appropriate to use cost-, quality- and time-based performance criteria.

Another important part of supplier management is the implementation of the nature of the relationship between the main contractor and its suppliers and subcontractors which was decided in the procurement strategy.

One important form of the nature of the relationship in the construction industry is integration, but in this particular industry, due to the large number of suppliers and subcontractors causing high levels of fragmentation, it is not easy to provide integration. There are some requirements for implementing it. According to a case study with more than 100 interviews in nine different construction supply chains carried by Briscoe and Dainty (2005), the key factors providing successful integration in construction industry are:

- Direct communication with all players,
- High levels of information flow,
- Early involvement in the projects,
- Alignment in the supply chain management,
- High quality standards,
- Developing commitment to the project,
- Developing long-term relationships.

These are all necessary in order to develop and maintain high levels of relationship in the construction industry. A key point here about supplier management in the construction industry is that main contractors should ensure close relationships not only *with* their suppliers and subcontractors, but also among their suppliers and subcontractors (Dubois and Gadde, 2000; Holmen and Pedersen, 2007).

This is critically important because delivering a project is absolutely a team effort; every player should contribute to it with a shared understanding of the goals. Coordination should be provided among all the actors. The client has an important encouraging role for this; it can use its power in the construction supply chain to ensure suitable conditions. For instance, Crossrail Ltd includes a clause for five-year framework agreements with its contractors, and forces them to organize annual meetings with their suppliers (Carris *et al*., 2011). In addition to bringing all the players together, this also helps the contractors to understand new products in the marketplace and maintain their awareness of innovations.

On the other hand, for effective management, main contractors can meet regularly with suppliers and subcontractors, especially the key ones, during the projects. In a case study in Norway, a leading construction company had three meetings with its key suppliers (Holmen, 2003):

1) At the beginning to set mutual goals,
2) In the middle to discuss good and bad experiences so far,
3) At the end to discuss the experiences from the project and to learn from them for future projects.

This approach increased the level of communication, enabled a shared goal among all the players and led to a successful project delivery. It also prepared suppliers and the main contractor for future projects.

However in such a highly fragmented industry, the number of the suppliers and subcontractors and their changing nature from project to project is a major barrier to effective practices, as has already been observed. To address this problem, main contractors can form a pool of suppliers and subcontractors. They can try to keep the numbers low in each category and also try to use the same suppliers and subcontractors in different projects. Holmen and Pedersen (2010) provided a sample pool from a main contractor with this aim (*see* Table 2.8). They were the preferred supplier and subcontractors for the categories shown. By doing this, the main contractor becomes able to develop and retain close relationships with those suppliers and subcontractors. It also avoids the negative effects of one-off projects based on the nature of the construction industry. The tendency of the main contractors to use the same suppliers and subcontractors in different projects also allows long-term relationships (Dainty *et al*., 2001).

Table 2.8 A Supplier Pool (Holmen and Pedersen, 2007).

Category	Number of Suppliers
Consulting engineer (construction)	5
Architect	6
Consulting engineers (electrical, fire, plumbing)	3
Subcontractor for plumbing services	4
Subcontractor for electrical services	5
Subcontractor for ventilation services	5
Bricklayer	3
Painter	5
Frame supplier	2
Machine contractor	4
Steel contractor	3
Roofing supplier	4
Tinsmith	2
Kitchen/bath	3

The fragmented structure is not the only problem working against integrated and close relationships; the industry is facing various other problems as well. In the UK, there is a distrust problem in the construction industry between the client and the main contractor which contaminates the relationships between the main contractor and its suppliers and subcontractors (Briscoe and Dainty, 2005). It starts in the upside of the supply chain. If the client does not develop close relationships with its main contractor, the main contractor likewise does not develop close relationship with its suppliers and subcontractors (Primo and Filho, 2012). Because of the awareness of that problem, the industry introduced a strategic approach called partnering. There is a growing interest in that approach but it mainly focuses on the relationship between the client and the main contractor and omits the downside of the supply chain (Akintoye *et al*., 2000; Dainty *et al*., 2001; Bygballe *et al*., 2010). It is not possible to benefit from partnering unless the suppliers and subcontractors are also involved.

In addition, the transactional nature of the industry is also a problem (Dubois and Gadde, 2000). For main contractors, cost is the major driver in their decisions which leads to arm's-length relationships with suppliers and subcontractors.

Muya *et al*. (1999) surveyed 35 main contractors (all in the top 100) and 30 suppliers working with these contractors in order to identify the problems hindering effective performance. They found that the main contractors frequently changed their suppliers, did not share information with them and did not engage them early in the projects. In addition, there was an interesting point raised in their survey. In the results of the survey, consistency was low between main contractors' and suppliers' responses (*see* Table 2.9). This table clearly shows that suppliers and main contractors might interpret the same issues quite differently. Since this current dissertation collects data from a main contractor only, this finding shows that this might be an important limitation of the study.

Table 2.9 Comparison of Main Contractors' and Suppliers' Responses (derived from Muya *et al*., 1999)

	Main Contractors (%)	**Suppliers (%)**	**Difference (%)**
Suppliers get involved in the development of the project	91	43	48
Suppliers get paid on time	62	20	42
There is trust in sharing project information	88	63	25
Main contractors change their suppliers frequently	20	43	23
Contractors buy at the lowest price	25	46	21
Communication is open and based on mutual respect	85	66	19

In the light of the existing literature on procurement, the construction industry and procurement in the construction industry, a conceptual framework of construction procurement and success drivers is shown in Tables 2.10 and 2.11.

Table 2.10 Conceptual Framework of Construction Procurement (made by the author)

	FRAGMENTED STRUCTURE	CLIENT DEPENDENCY	ONE-OFF PROJECTS	PRICE-BASED NATURE	UNCERTAINTY	SUSTAINABILITY PRESSURE
PROCUREMENT STRATEGY	- Increased supply base is a problem since it implies managerial complexity. - Companies are aware of the importance of the reduction of suppliers. - There is a lack of senior managers.	- Client damages main contractors' procurement strategy. - Supply base decision is affected by the client.	- Procurement strategy changes from project to project.	- Tendency is for arm's-length relationships.		- Sustainable procurement solutions are becoming popular.
IDENTIFICATION OF THE NEEDS		- Client affects identification of the needs by intervening the decisions.	- Recurring process project by project. - Standardisation is low in the construction industry.	- There is a tendency for cheap materials and services.	- Hard to know exact needs at the start of a project. - Procurement of wrong needs exists. - Time pressure exists.	
SUPPLIER PRE-EVALUATION	- Time-consuming process.			- Suppliers are eliminated for their high approximate prices regardless of their success in other criteria.		- Suppliers who are not capable of sustainable solutions are eliminated.
SUPPLIER SELECTION	- Relationship ability criterion is important. - Safety is extremely important for the construction industry	- Biased by client's preferences. - Some suppliers are being selected directly by the client without the involvement of the main contractor.	- Supplier selection is a recurring process project by project.	- Competitive bidding is the main method. - Suicide bidding exists. - Price criterion overweighs.	- Flexibility, reduced lead times and JIT delivery criteria are important.	- Sustainability criterion is important.
SUPPLIER MANAGEMENT	- Hard to develop long-term relationships with high numbers of suppliers. - Hard to monitor increased numbers of suppliers. - Senior management support is necessary for long-term relationships.	- Increased supplier power. - Additional suppliers without a management strategy. - Poor management with client's suppliers. - Dependency on client's suppliers	- Hard to maintain long-term relationships - Hard to align all players in the supply chain to a shared goal.	- Transactional relations are common with cost priority in the industry, therefore monitoring mainly focuses on cost.		

Table 2.11 Success Drivers for Procurement Process (made by the author)

SUCCESS DRIVERS	**FRAGMENTED STRUCTURE**	**CLIENT DEPENDENCY**	**ONE-OFF PROJECTS**	**PRICE-BASED NATURE**	**UNCERTAINTY**
COLLABORATION	✓	✓	✓	✓	✓
EFFECTIVE PORTFOLIO MANAGEMENT	✓		✓	✓	
EARLY ENGAGEMENT	✓	✓	✓	✓	✓
STANDARDİSATION		✓	✓		✓
REDUCED SUPPLY BASE	✓		✓	✓	✓
DESIGN-CONSTRUCTION ALIGNMENT					✓
COMPLEX DECISION CRITERIA		✓		✓	
INFORMATION SHARING	✓	✓	✓		✓

CHAPTER 3: RESEARCH DESIGN

This chapter explains the research methodology that was followed for this dissertation. It justifies the selection of the philosophy, strategy, data collection and analyses and outlines the limitations of this research. It also forms the basis of the following Results and Analyses and Discussion chapters.

3.1 Introduction

The objectives of this thesis were:

1. From the literature, to develop a conceptual framework of the procurement practices in the construction industry and to reveal the success drivers increasing the performance of these practices,

2. To refine and validate the framework by empirical testing with one case study in the Costain company,

3. To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function.

The second chapter of the thesis (the literature review) identified the conceptual framework of the procurement practices in construction industry and helped to achieve the first objective. Primarily, text books, academic journals, government reports and conference proceedings were used as sources. ‘Procurement’,’ purchasing’, ‘supplier selection’, ‘buyer-supplier relationship’, ‘supply chain’, ‘construction’, ‘engineering’, and ‘EPC’ were used as research terms in the search engines of journals. In addition to the results of those strings, the reference lists of relevant sources were also used to find other relevant sources.

Literature review chapter was developed under three sub-chapters. The first sub-chapter identified procurement from a general perspective apart from any particular industry. After that, the second sub-chapter focused on procurement in the construction industry and clarified its unique features which affect the procurement practices within the industry. Finally, the third sub-chapter identified the existing literature and also combined first two sub-chapters in order to make assumptions for procurement in the construction industry. As a result, a conceptual framework for procurement in the construction industry was developed.

A valuable aspect of this empirical research relates to the second and third objectives; validating and refining the framework which was developed after the literature review chapter and formulating recommendations for the Costain company.

This third chapter provides the details of the research methodology which was adopted for this study in order to address the second and third objectives. According to Collis and Hussey (2014), methodology covers every aspect of a research process from its theoretical base to the analyses of empirical data. Therefore, this chapter explains and justifies the research philosophy, strategy, data collection, data analysis and limitations of this dissertation. It takes this dissertation one step further. It gives the opportunity to compare the theory revealed from the literature with the practice encountered in Costain.

This chapter is basically structured in the light of the research onion (*see* Figure 3.1) developed by Saunders *et al*. (2012). The ultimate structure of this chapter is shown in Figure 3.2.

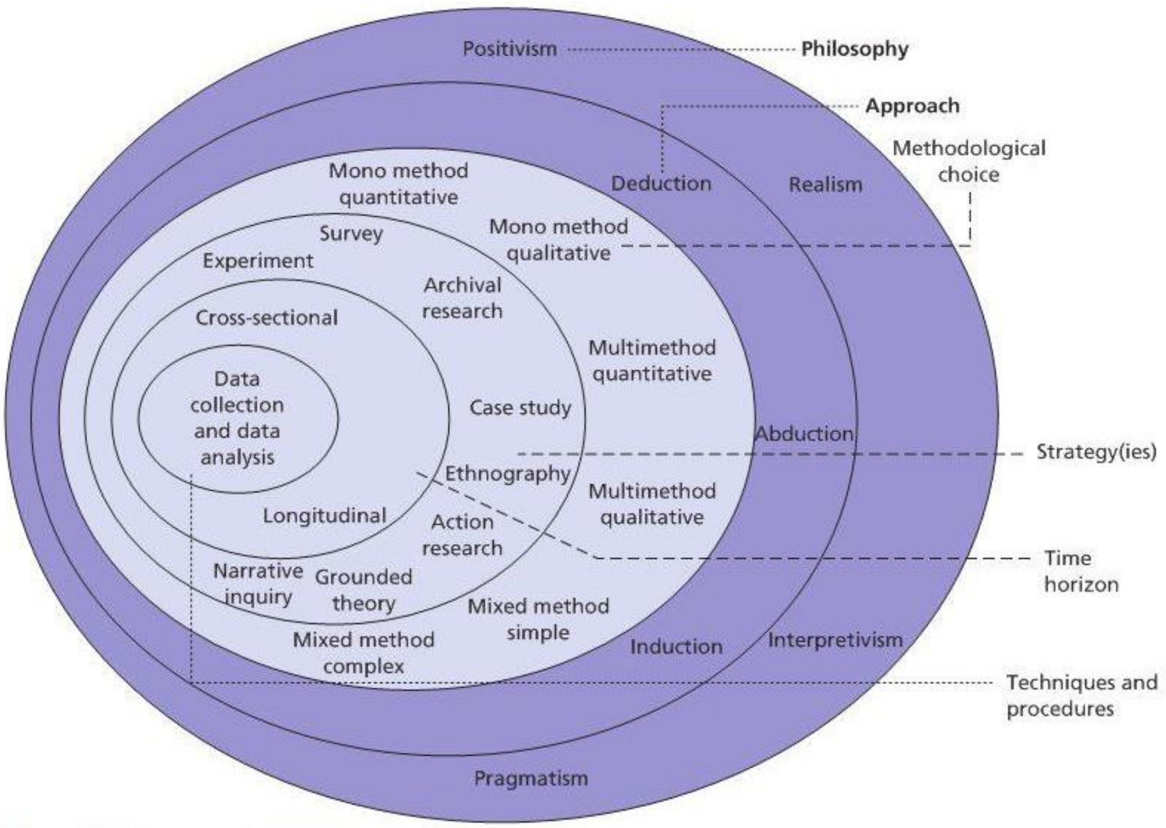

Figure 3.1 Research Onion (Saunders et al., 2012)

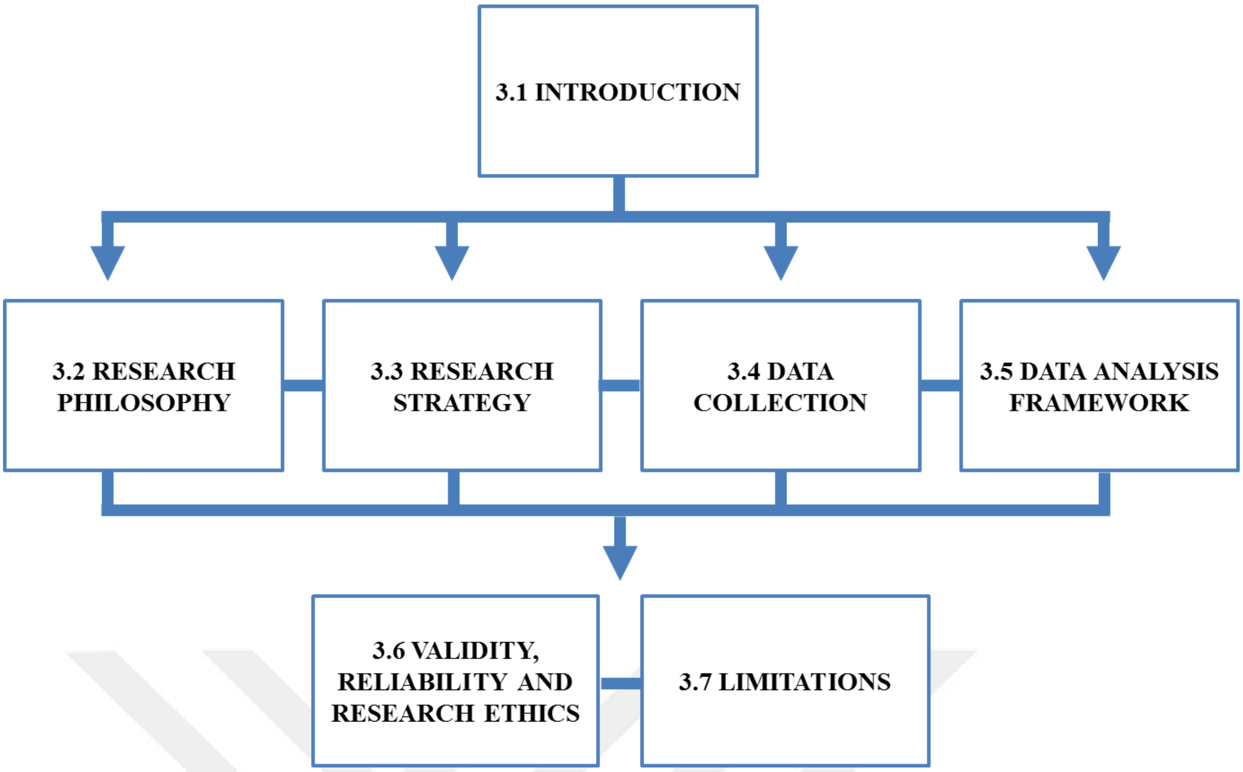

Figure 3.2 Structure of the Methodology Chapter

3.2 Research Philosophy

A research philosophy can be regarded as how a particular researcher sees the world (Saunders *et al*., 2012). Since the truth can have many possibilities (Easterby-Smith *et al*., 2012), there are various different research philosophies adopted by researchers. For instance, according to Easton (1995), realism, positivism, conventionalism and constructivism are the main philosophies. Saunders *et al*. (2012) suggested many more possible philosophies, such as subjectivism, pragmatism and interpretivism.

Whilst some of philosophies are mostly overlapping, some stay on completely different sides. It is not possible to say that one philosophy is better than another, rather that each philosophy fits with a different type of objective (Saunders *et al*., 2012). However, it is better for a researcher to know his own position as well as other philosophies because awareness of possible philosophical assumptions increases the capability of the researcher and thus adds value to the research (Easterby-Smith *et al*., 2012).

According to Collis and Hussey (2014), positivism and interpretivism are the two opposite poles of research philosophy, so a discussion between them might help to find where the current researcher's approach lies.

According to the positivist philosophy, the measurement of the existing social world should not be interfered by a researcher's intuition; reality is something rigid and does not change over time (Easterby-Smith *et al*., 2012). The evaporation point of liquids is a good example of a positivist perspective; it is completely independent from any social interference. That philosophy requires large sample numbers in order to reach statistical inferences, which is an important necessity for that philosophy (Easton, 1995). Positivists prefer to focus on data which are objectively collectable and can lead the researcher to make law-like generalisations (Saunders *et al.*, 2012). That philosophy can be criticised from the social scientists' perspective because, according to them, it is not possible to observe issues without taking their social environment into consideration (Collis and Hussey, 2014).

Interpretivism stands on the other side. According to Blaikie (2007), the world itself is full of human interpretations. It is a case of measuring different points of views and different comments on the same issue made by different people, or even by the same person for the same issue at different times. According to interpretivists, interpretations of the same issues are all different because of the changes in the context of when the observation is made and people interpret their observations in the light of the meanings they assign to them (Saunders *et al*., 2012).

This current research study does not position itself either at the positivist or at the interpretivist extreme. A realist position more fits with the intentions of this dissertation. According to Easterby-Smith *et al*. (2012), in the realist philosophy, reality exists somewhere but it is not possible to reach it directly. They claimed that it is only possible to reach its interpreted forms. Rather than being exploratory or descriptive, realism has more explanatory aims (Easton, 1995) which focus on causes and effects. According to the realist viewpoint, in order to understand what is happening in the social world, researchers should first understand the social issues which affect the main issue which they are trying to observe *(Saunders et al*., 2012). One of the important differences between positivism and realism is that in positivism findings should be based on empirical data which are law-like and observable without any social intervention, whereas in realism, it is not law-like or strict (Easton, 1995).

This thesis is about procurement in the construction industry which is a management issue and there is no one right way of doing it. It is partly an objective study, but there are some social interpretations in it. Therefore, realism might better fit the position of this study. A comparison of the three discussed research philosophies is summarised in Table 3.1.

Table 3.1 Comparison of Research Philosophies (adopted from Saunders et al., 2012)

POSITIVISM	REALISM	INTERPRETIVISM
Causal Relationships	Reality independent from mind	There are always social interpretations in the observations
Reality is objectively observable	Observable but aware of the fact that the world is constantly changing	People interpret everything in the light of the meaning they give to it
Replicable and generalizable findings	Partly objective but there are some social interpretations	Subjective
Independent from social interventions	Both qualitative and quantitative	Results change constantly from observation to observation
Researcher is independent from the research	Researcher is not completely part of the research but is biased and affects it	Researcher is part of the research

Another important consideration is the research approach. According to Easterby-Smith *et al*. (2012), there are three main reasons which makes it important:

1. It helps you to make a better research design,
2. It helps you to find which research strategies fit and which do not to your work,
3. It helps you to understand the constraints you might face.

According to Saunders *et al*. (2012), there are three common possible approaches for researchers; deductive, inductive or abductive approach. In the inductive approach, the researcher starts by collecting data, then develops a theory by analysing the data and tests that theory, whereas in the deductive approach, it is *vice versa*; the researcher starts by developing a theory, then collects the data and tests that theory (Blaikie, 2007). The other approach, abduction, does not follow either the theory-to-data order or the data-to-theory order, instead it uses iterations and moves in both directions (Saunders *et al*., 2012) so it might be seen as the combination of the other two methods rather than another separate method.

In this current study, since the conceptual framework of procurement was developed in Chapter 2 through a literature review and then validated and refined through empirical testing using a single case study, a deductive approach was followed.

3.3 Research Strategy

As with the research philosophy, there are various possible research strategies, such as experiment, survey, case study and ethnography (Saunders *et al*., 2012). Although each strategy aims at different goals, has its own way of data collection and has specific pros and cons, this does not necessarily mean that they are mutually exclusive (Yin, 2003). They are overlapping, so different strategies might be suitable for the same research. The important issue to keep in mind is that the chosen strategy for a particular study cannot be independent from the philosophy adopted for that research (Easterby-Smith *et al*., 2012).

In this dissertation, case study was adopted as the research strategy. In order to understand why it is suitable for this study, the first thing should be to understand what a case study is. A commonly acknowledged definition of case study is that:

"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident." (Yin, 2003, p.13)

As can be inferred from Yin's definition, case study is suitable for investigating current complex events, organisations and incidents. It also gives the opportunity to explore the focused phenomenon deeply (Easterby-Smith *et al*., 2012). Most case studies use qualitative data since this allows researchers to evaluate complex and contemporary phenomena. Case studies are sometimes confused with grounded theories but there is an obvious difference between them: in case study, researchers develop a preliminary theory before starting data collection whereas grounded theory deliberately avoids it (Yin, 2003).

How does case study fit the aim of this study? According to Yin (2003), one of the most important determinants for selecting a research strategy is the nature of the questions being asked. In this respect, Yin stated that 'how and why' questions are more likely to canalise the researcher into case studies, histories and experiments. In historic studies, data cannot be created using methods such as interviews and surveys, and in experiments the researcher deals with closed systems without any intervention (Easton, 1995). Neither of these is suitable for this current study which aims to develop a framework for construction procurement because the former deals with past events and the latter necessitates observations of a closed system. They were therefore both rejected. Saunders *et al*. (2012) also suggested that case studies are very capable of finding answers for 'why and how' questions. Since this study is mainly concerned with 'How procurement occurs in construction industry', case study is entirely suitable for this research study as a research strategy.

In addition, according to Dubois and Araujo (2007), studies which cover complex managerial issues usually correlate with qualitative and case-based strategies dealing with small sample sizes. Since this study aims to develop a conceptual framework for a complex managerial process – construction procurement –, it fits with the aim of case studies from this aspect too.

Case studies have been criticised for some weak features. According to Yin (2003), two important downsides of case studies are:

1) There is no specific systematic procedures,
2) It is not possible to provide a scientific generalisation with a single case study.

However, according to Easton (1995), although case studies are not suitable for scientific generalisations which means generalising to the actual population from which the sample was taken, a case study can enable a generalisation to be made to the managerial world which it covers in depth. This means that when the case is carefully selected, it allows the opportunity to generalise the findings to the area which is deeply investigated through the case. This is called analytical generalising (Dubois and Araujo, 2007). Therefore, a deep investigation of Costain allowed this study to reach analytical generalisations. The pre-interviews and interviews were conducted with people from two different sectors in the construction industry even within a single company, which enhanced the value of research.

Another issue about a research study is the time horizon. As defined by Saunders *et al*. (2012), whilst a cross-sectional time horizon is not interested in the change in time and focuses on a specific time, a longitudinal perspective explores the change through time. This research study explored the case company within a limited time period and the interviews were conducted in the same week, therefore this dissertation can be regarded as cross-sectional in terms of its time horizon.

After selecting the suitable research strategy, the next step is the design of the research, which includes the collection and analysis of the appropriate data.

3.4 Data Collection

A good case study requires sufficient preparation for the data collection. It is also important to identify clearly how a researcher will carry out that collection.

In this study, since Costain is a large company operating in six different sectors, considering all of these sectors in the case study would be enormously time-consuming and could not be finished in the limited time available for a Master's dissertation. Therefore, the focus of the data collection was on two sectors of the company, the water sector and the oil, gas and nuclear sector. Primary data were gathered through interviews.

Interviews have the major benefit of giving the researcher an opportunity to focus directly on the issue being analysed (Yin, 2003). Their aim, especially for qualitative data gathering, is to understand how the interviewee interprets the issue being asked, so it is to be expected that the answers are not objective; furthermore, it actually allows an understanding of the subjective view of the interviewee (Easterby-Smith *et al*., 2012).

One of the most frequently used topologies for classifying interviews suggests three different categories (Saunders *et al*., 2012):

- structured interviews,
- semi-structured interviews, and
- unstructured interviews.

Whilst structured interviews are more suitable for quantitative data collection and impose boundaries on the answers, unstructured interviews are suitable for exploring general issues. In this study, semi-structured interviews were used as the primary source because whilst structured interviews allows you to focus on a very specific issue, semi-structured interviews also both allow you to have a structure with pointer questions and let the interviewee identify more relevant points deeply. To ensure this, open-ended questions were used because they both let the researcher follow his own structure and let interviewees expand on subjects and raise other important issues which were not raised in the interviewer's questions (Yin, 2003). They also give the interviewee the opportunity to deepen the issues and clarify more points that might have been overlooked or omitted by the interviewer when preparing the questions. For this study, open-ended questions facilitated an understanding of the each aspect provided in the conceptual framework of construction procurement at the end of the literature review as well as an understanding of the problems which Costain is facing.

Before the actual interviews, a form of pilot study was conducted. This was necessary because pilot studies give the researcher a valuable opportunity to identify any errors and unclear parts in the interview questions (Collis and Hussey, 2014). For this study, piloting was done through a discussion with the supervisor. He had previous research experience in the topic so he was able to help to improve the questions and also to help to ensure simplification.

The actual interviews were conducted with two managers and one executive employee. These three interviewees were selected by the convenience sampling method. In that method, samples are selected because of the available access to them (Biggam, 2015). In this case study, contact was established with a senior manager from the company and interviewees were selected under his guidance and in the light of the needs of the study. In addition, two initial interviews were conducted with two of the actual interviewees at the beginning of the study. The aim of these initial interviews was to identify the construction procurement process of Costain and the problems which the company faces in this area. Interviewing managers and an executive from different sectors allowed the study to cover all aspects of the procurement process, from strategy through to implementation.

When conducting interviews, it might not be the case of asking all of the questions to all of the interviewees since their roles and responsibilities differ. In this study, for instance, one of the interviewees was an executive employee (a buyer) who was more interested in the implementation of the processes and two of them were managers who were more interested in the strategy, so the interview questions could have been broken down according to their roles. However, in order to understand the low-level employees' awareness and ideas about the strategy and the high-level managers' awareness and ideas about the implementation, all of the questions were asked to all three of the interviewees. This provided the opportunity for a far deeper analysis which is the actual aim of the case study. By interviewing different employees from different sectors with different roles, a comprehensive understanding of construction procurement in Costain was obtained.

An important opportunity to increase the value of a case study is using the triangulation approach (Yin, 2003). This also increases the validity and reliability of the study because it gives an opportunity to test frameworks with two different sources of data. In this study, in order to provide triangulation, company documents were used as an additional secondary data source. They are used in conjunction with the interview data in the discussion chapter in order to provide a better testing opportunity for the framework developed in the literature review chapter. Those three sources (literature, interviews and company documents) provided triangulation.

3.5 Framework for Data Analyses

After the collection of the data, it is necessary to describe what has been collected. An important part of this research is to analyse the case study data, compare and contrast it with the different interviews, and also relate it to the literature review.

To do this, it is first necessary to know how you can analyse the data. There are various methods for analysing data, regardless of whether it is qualitative or quantitative. Some of those different methods can both be suitable for the same data. Here, the important thing is that the method chosen by the researcher for analysis should align with the philosophy adopted by the researcher (Easterby-Smith *et al*., 2012).

An easy way to carry out qualitative data analyses is first to break down the interview data into easily identified themed subsets and then compare and contrast the responses to each themed group of questions. Incorporating themes in the questions before the interviews can make that process easier (Biggam, 2015); this is called template analysis. It is one of the methods in which the researcher looks for the data which fit the predetermined templates, however at the same time it allows new templates to emerge (Easterby-Smith *et al*., 2012). That method was adopted in this research.

In this study, in order to structure the interviews in alignment with the objectives, themes were used to group the questions. These themes represent the main areas and issues expressed in the literature review: procurement strategy, the procurement process, success drivers and common problems within the entire process. After the interviews, the responses were transcribed for detailed analysis. The raw data were first categorised and structured under the same themes as the interview questionnaire. The themes were also divided into codes in order to make the results more clear. This code table was then used for further and detailed analysis which will be described in the discussion chapter.

3.6 Validity, Reliability and Research Ethics

Two important aspects of a research study are the validity and the reliability which it has. For reliability, basically, if another researcher repeats the research with the same case study, he/she should find similar results (Yin, 2003). In addition to the consistency in the findings, it is also about the transparency which the research has (Saunders *et al*., 2012). In order to provide transparency in this research, the interviews were audio-recorded and verbatim transcripts of the interviews (*see* Appendices D-G) as well as the questionnaire (*see* Appendix C) were shown in the Appendices. Also, the interviewees were selected from different sectors of Costain in order to increase the reliability of this research study.

On the other hand, according to Saunders *et al*. (2012), the validity of research is its ability to measure what the researcher intended to measure. This is affected by the chosen research strategy and methods. Yin (2009) examined three types of validity:

- Construct validity,
- External validity,
- Internal validity.

Construct validity can be provided by using different sources. This study used company documents as a secondary data source in addition to the primary data gathered by interviews in order to ensure construct validity. External validity is about the generalisability of the research. In this study, as mentioned in the previous sections, although it is not possible to provide statistical generalisation, this case study on Costain can provide analytical generalisation. Finally, internal validity is about causal relationships. In this study, templates and pattern matching were used in order to focus causal relationships.

On the other hand, the limited time period for the study and the limitation to one company resulted in three interviews and two initial interviews. Although they were enough to cover the issue in depth from different perspectives, using more interviewees could have increased the validity of the research.

To address the issue of research ethics, ethical approval was obtained in advance (*see* Appendix A). In addition, before starting the interviews, a 'Participant Information Pamphlet' was given to the interviewees and then a consent form was signed by all of them (*see* Appendix B).

3.7 Limitations of the Research

One of the important limitations of this study is that, to focus on procurement in the construction industry from a main contractor's perspective, this study gathered data from the main contractor and omitted another important part, suppliers. As mentioned in the literature review (*see* section 2.4.5 and Table 2.9), even for the same issue, sometimes a main contractor's and suppliers' ideas might differ. Therefore, this study could have been more valid and generalizable if it could have conducted interviews with some of the suppliers and subcontractors.

This study might also be criticised for using a single-case study rather than addressing multiple cases. However, according to Easton (1995), in case studies the important issue is not the number of samples or studies. This does not necessarily mean that multiple cases are more reliable and generalizable. Yin (2003) defined five main rationales for selecting single case studies, one of which is its representativeness. In this current study, the case company Costain operates in six different sectors of the construction industry, dealing with many different sizes and types of project and facing many different issues in the industry. It can therefore be seen as a representative company of the industry. However, the downside of selecting a single-case study lies in precisely the same issue, the unique qualifications of the chosen case might limit the generalisability of the findings. To prevent this situation in this research study, the findings were analysed by questioning whether they were due to a unique or general qualification of Costain and addressing a particular sector or general issue.

CHAPTER 4: RESULTS AND ANALYSIS

This chapter presents the results of the primary data (interviews and pre-interviews) and secondary data (company documents) with preliminary analyses. It shows the results by using themes in a structured way which will form the basis of the discussion chapter.

4.1 Introduction

This chapter presents the data collected from the interviews and pre-interviews and also supports those data with company documents. The interviews were conducted in the water and the oil, gas and nuclear sectors of Costain. One of the interviewees was in the water sector at the time of the initial interview, but at the actual interview time, she had been transferred to the oil, gas and nuclear sector. This gave the researcher the opportunity to examine the issues in two different sectors from the same person's perspective. The interviewees' sectors, roles and the purpose of interviewing them are shown in Table 4.1.

Table 4.1 Interviewee Information

	Sector	Role of the Interviewee	Purpose
1	Water	Head of Supply Chain	To understand the procurement process and the strategy of the company and the problems it is facing in depth, particularly in the water sector and also in general as a group.
2	Water (preliminary interview) Oil, Gas and Nuclear (actual interview)	Supply Chain Manager (Water sector) Head of Supply Chain (Oil, Gas and Nuclear Sector)	To understand the procurement process and the strategy of the company and the problems it is facing in depth, particularly in the water sector, the oil, gas and nuclear sector and also in general as a group.
3	Water	Buyer	To understand the procurement process of the company and the problems it is facing in depth, particularly in the oil, gas and nuclear sector.

The interview questions (*see* Appendix C) were developed under a thematic structure in alignment with the conceptual framework which was developed at the end of literature review chapter. After that, all of the interviews were transcribed verbatim (*see* Appendices D-G). The gathered information was then categorised in consistency with the themes which were used for grouping the questions. In order to organise the information better, some codes were used under each theme (*see* Table 4.2). That thematic structure will also form the basis of the discussion chapter.

Table 4.2 Results and Analysis Framework (made by the author)

THEMES	CODES	THEMES	CODES
PROCUREMENT STRATEGY	Number of Suppliers	**SUPPLIER MANAGEMENT**	Monitoring
	Nature of the Relationship		Long-term Relationships
	General Strategy		Client's Intervention
IDENTIFICATION OF THE NEEDS	Client's Intervention	**SUCCESS DRIVERS**	Effective Portfolio Management
	Wrong Procurement		Early Engagement
	Design's Effect		Design-Construction Alignment
SUPPLIER PRE-EVALUATION	Criteria		Information Sharing
	Method		Standardisation
SUPPLIER SELECTION	Priced Based Decisions		
	Client's Intervention		

In order to show clearly how this chapter contributes to the objectives, it will be useful to revisit them first. The objectives of this study were:

1. From the literature, to develop a conceptual framework of the procurement practices in the construction industry and to reveal the success drivers increasing the performance of these practices,
2. To refine and validate the framework through empirical testing with one case study in the Costain Company,
3. To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function.

The first objective has already been achieved with the literature review. The empirical part of this study targeted the second and third objectives. The results of the interviews contribute to this study from three important aspects:

1. They show how the procurement process is carried out in Costain and in the construction industry,
2. They show the major problems which Costain is facing in these processes, and
3. They show the success drivers for effective procurement practices.

The first aspect is related to the second objective of this study. The second objective requires the testing of the findings of the literature review (the unique features of the procurement process in the construction industry) with a case study of the Costain company. It is about the entire procurement process, and therefore the results of the interviews for themes 2-5 which are about the procurement process and the first theme ‘procurement strategy’, which directly affects the procurement process, address the second objective of the study.

The second and third aspects are related to the third objective of this study. The third objective first necessitates identifying the problems which Costain is facing. Some problems were mentioned by the interviewees under themes 1-5. This objective also necessitates providing recommendations to Costain, which is the unique role of theme 6, ‘success drivers’. The second and third objectives will be achieved after a further discussion in the following chapter.

The structure of the chapter is shown in Figure 4.1.

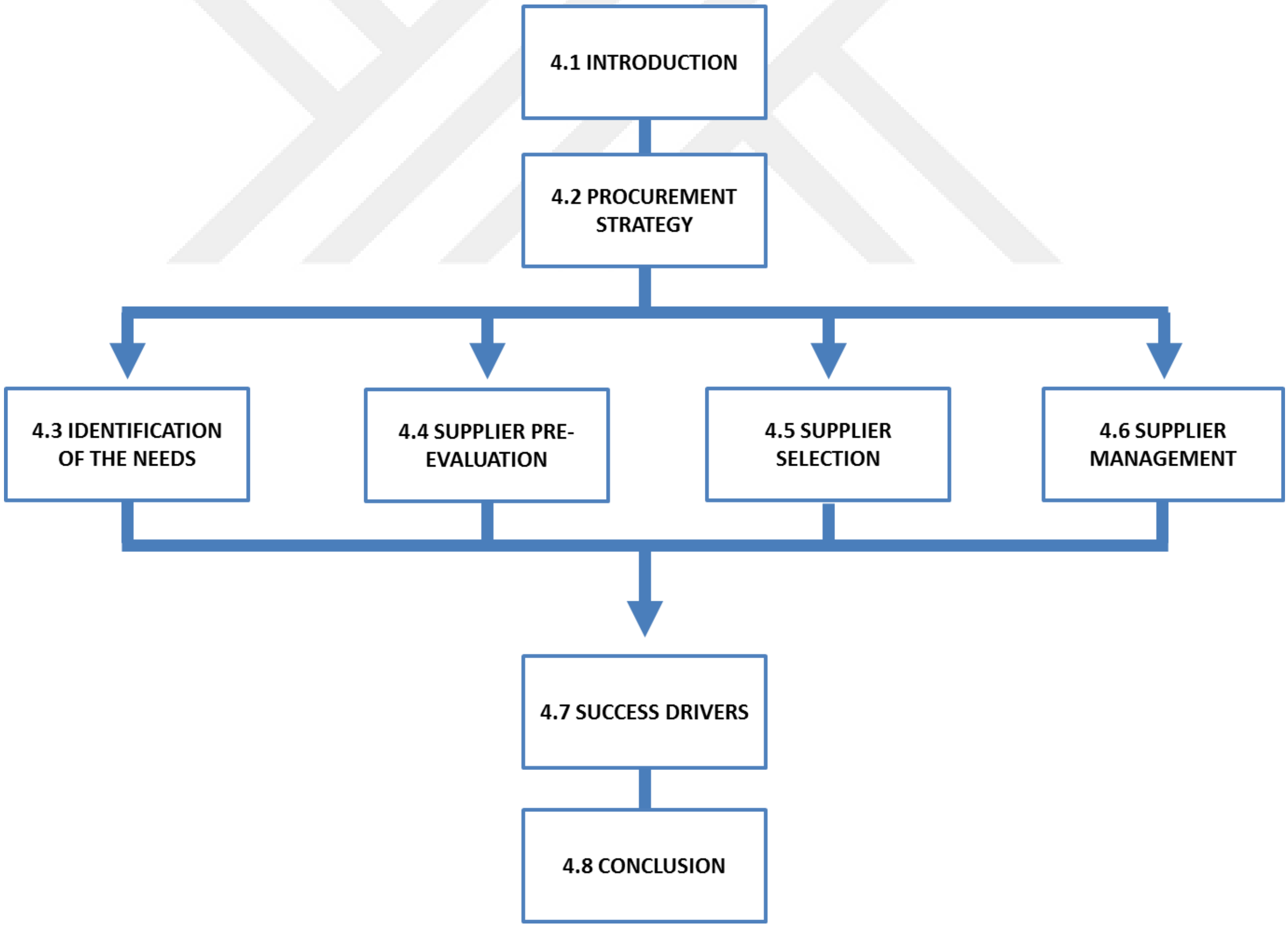

Figure 4.1 Structure of the Results and Analysis Chapter

4.2 Procurement Strategy

The first theme of the conceptual framework developed after literature review was procurement strategy. It also formed the first theme of the questionnaire. The objective for this theme was to discover the key approaches taken by Costain and by main contractors in general in order to achieve their procurement strategy. This theme also contains the problems which Costain faces with regard to its procurement strategy. In order to investigate the theme deeply, the questions which are shown in Table 4.3 were put to the interviews.

Table 4.3 Interview Questions for Procurement Strategy

Do you think the construction industry has a fragmented structure? If yes, how do you manage a vast portfolio of suppliers as a result of that structure?
Do you have a particular supply base strategy? (reduction in the number of suppliers for instance)
Do you try to develop different types of relationships with different suppliers? (close with strategic ones, arm's-length with routine ones)
Does your procurement strategy differ from project to project?
How does the client affect your decisions asked about above?
What are the problems with your procurement strategy? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)

The results of the first theme, 'procurement strategy', are presented under three codes; number of suppliers, nature of the relationship and general strategy. The first two codes reflect the main decisions which should be taken under procurement strategy and the third code reflects the issues about procurement strategy which are not relevant to the first two codes.

All three interviewees mentioned the importance of having a reduced supply base and this was confirmed by the company documents. The first interviewee also stated that Costain does not have a particular supply base strategy as a group, however the second interviewee said that there is a group-wide strategy covering supply-base reduction. The first interviewee added that, especially in water sector, far from a reduced supply base, even how many suppliers Costain has is unclear. Also, the second interviewee stated that supply-base strategy is not optimal in Costain. She also referred to having too many suppliers as a serious problem for the entire industry and the third interviewee confirmed this comment by stating that it is better to have small number of suppliers.

For the nature of the relationship, all three interviewees said that Costain has very close relationships, especially with its strategic suppliers. This was also confirmed by the company documents; it is one of the objectives of Costain's strategy. However, the first and third interviewees had some concerns about the relationship strategy. Whereas the first interviewee thought that strategy is not integrated with supply chain management in the company, the third interviewee thought that it required some improvements.

For general strategy, all three interviewees thought that there is a problem of consistency across Costain. The first interviewee identified more problems than the other two interviewees, such as the lack of key objectives and vision, the disconnection between procurement and supply chain, the underestimation of procurement and the lack of senior managers. He summed up the underestimation problem by saying:

> "*We are seen as a necessary evil rather than a vital contributor to a successful business*".

This comment clearly shows how procurement is seen by other managers. The reason why he mentioned so many problems is probably that he was working in the water sector and that sector is facing more problems than other sectors of Costain. The company documents for the water sector confirmed what he said by addressing the need for a better supply chain in that sector in alignment with the policy in the wider Costain group. In addition, the second interviewee mentioned the importance of sustainability as a procurement strategy, which shows the increasing tendency for doing things more sustainably. This was confirmed by the company documents. The documents referred to sustainability as a "burning desire", which clearly expresses its importance.

To summarise, it is clear that having a reduced supply base strategy is preferable in the industry. With a reduced supply base, it is also necessary to establish close relationships, especially with suppliers with which more money is spent. In order to provide these, a consistent and clearly documented procurement strategy in alignment with the broader supply chain strategy is needed. Imposing sustainability on this strategy is also necessary. It is more than a simple selection criterion now, it is part of the procurement and hence the business strategy.

The findings from the pre-interviews, interviews and company documents for the 'procurement strategy' theme are shown in Table 4.4.

Table 4.4 Interview Results for Procurement Strategy

Number of suppliers	Interviewee 1	Costain does not have particular supply base strategy group-wide. Especially for the water sector, it is unknown how many suppliers Costain has.
	Interviewee 2	Costain has a group strategy; let's not have too many, let's keep it just right and let's have a good relationship with them. Working with small number of strategic suppliers is better but they are still working on it, it is not optimal now in Costain. If you have 5000 suppliers in your pool, it is not good, you can't manage them in the way you want.
	Interviewee 3	Repeat business with a small number of suppliers is better.
	Documents	One of the objectives of the company is to have long-term relationships with a reduced number of suppliers.
Nature of the relationship	Interviewee 1	They are very good at supply chain relationship management but not in supply chain management. They have strategic relationship with the suppliers with whom they spend a lot of money on high-risk activities.
	Interviewee 2	Very close relationships with strategic suppliers.
	Interviewee 3	They want to make improvements on how they manage the suppliers.
	Pre-interview 1	They have strategic relationships with the main suppliers.
	Pre-interview 2	Close relationships with strategic suppliers.
General strategy	Interviewee 1	Costain does not have a documented procurement strategy. Therefore it is not consistent, changing day-by-day, project-by-project. There is a lack of vision and key objectives. Procurement and supply chain is disconnected. The importance of procurement is underestimated. There are not enough senior managers dedicated to procurement.
	Interviewee 2	Across the group, they have a very good standard sustainability policy. However it is the client that can take this policy further or *vice versa*. Since they are not manufacturing anything, sustainability depends on their suppliers and subcontractors.
	Interviewee 3	Strategy in the oil, gas and nuclear sector is good but needs a little bit tweaking.
	Pre-interview 2	Procurement is done project-by-project, there is no consolidation in the water sector.
	Documents	There is a burning desire for doing things more sustainably. The water sector aims to have a supply chain which is fully aligned with the principles of the wider Costain group.

4.3 Identification of the Needs

The second theme of the conceptual framework and also the interview questionnaire was the identification of the needs. The objective for this theme was to identify which factors affect this process and what are the results of these effects. This theme also contained the problems which Costain is facing in identifying the needs. In order to investigate the theme in depth, the questions which are shown in Table 4.5 were put to the interviews.

Table 4.5 Interview Questions for Identification of the Needs

Who is responsible for identification of the needs? How it is done?
In the identification, is there a tendency for cheap materials and services?
Do you think projects carry lots of uncertainties? If yes, how does it affect this step?
Do you face procurement of the wrong items? If yes, what are the main reasons for that?
Is there a standardisation problem for the needs? If yes, what are its effects?
Is there a time pressure problem for identification of the needs? If yes, what is the result?
Do you consider sustainability when identifying the needs?
What are the problems in the identification of the needs? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)

The findings of the second theme, ‘identification of the needs’, are presented under three codes; client’s intervention, wrong procurement and design’s effect. The client’s intervention and design’s effect codes represent the major causes of the problems in this step. The wrong procurement code reflects the major problem which Costain and the industry are facing.

On client’s intervention, all of the interviewees strongly agreed that there is interference by the client for the identification of what is needed in projects. This was also confirmed by the company documents. The first and second interviewees commented that the intervention is more in the water sector, where the client defines most of the materials to be procured. Another aspect of this intervention is that the client might change its mind during the project progress and this results in the identification of new needs. The first interviewee expressed this problem by making a comparison between the construction and automotive industries:

> *“You don’t build a car by thinking I’m going to build a hatchback and then end up building a five-door instead. In construction you start with a three-bedroom detached and end up with a five-bedroom detached”.*

On wrong procurement, the first and second interviewees thought that it is a serious problem in the construction industry which occurs frequently. They thought that it stems from inadequate design. The first interviewee thought that weak specifications and bespoke orders in the industry are also causing this. It is probably again inadequate design which is causing weak specification therefore it can be said that the root cause of wrong procurement is clearly a design problem.

Apart from being inadequate at the beginning, design has another effect on the identification of the needs. It also evolves during the project phase, which causes instantly emerging new needs. The first interviewee thought that those needs put considerable time pressure on the process.

To summarise, identification of the needs is exposed to client's intervention and the effects of design. The client is a key player in the identification, especially in the water sector where the client takes the main role in it. From the main contractor's perspective, in addition to this problem, uncertainty of the design at the beginning of the project negatively affects the identification process. As a result, procurement of the wrong items occurs in the industry very frequently.

The findings from the pre-interviews, interviews and company documents for 'identification of the needs' theme are shown in Table 4.6.

Table 4.6 Interview Results for Identification of the Needs

Client's intervention	Interviewee 1	Client changes the scope during the project which causes uncertainties and time pressure. Especially in the water sector, the client defines most of the materials which will be used in projects.
	Interviewee 2	Sometimes the client defines the bill of materials. Its intervention is only for materials, not subcontracts.
	Pre-interview 1	What is needed changes due to changes in the client's mind; they may specify which product they want.
	Pre-interview 2	In the water sector, many materials are in agreements with the client.
	Documents	The client is part of the decision for what is needed.
Wrong procurement	Interviewee 1	Mostly because of inadequate and weak specifications. Other reasons are changes in the design and not involving the suppliers. Projects are generally bespoke in the industry, this also causes wrong procurements.
	Interviewee 2	This is a serious problem, especially in the water sector. Commonly stemming from inadequate design problem.
	Pre-interview 2	This is a serious issue in the water sector mostly because of inadequate design.
Design's effect	Interviewee 1	Design evolves during the project so new needs emerge instantly. It also causes time pressure for the identification of the specifications.
	Pre-interview 1	Design evolves throughout the life-cycle of the project. Especially in big projects, design and construction occur simultaneously.
	Pre-interview 2	What needs to be procured is unidentifiable at the beginning of the project.

4.4 Supplier Pre-Evaluation

The third theme of the conceptual framework and also the interview questionnaire was supplier pre-evaluation. The objective for this theme was to discover how new suppliers are selected and confirmed to enter the existing supplier pool. This theme also contains the problems which Costain faces in supplier pre-evaluation. In order to investigate the theme in depth, the questions which are shown in Table 4.7 were put to the interviews.

Table 4.7 Interview Questions for Supplier Pre-Evaluation

If you agree that the construction industry is highly fragmented, what is its effect on supplier pre-evaluation? (There are several subcontracting areas and material groups in this industry.)
What criteria do you use for supplier pre-evaluation and in what level of detail?
When the price is considerably high, do you directly eliminate that supplier or prefer to see whether its other qualifications can outweigh the cost problem in supplier selection?
Do you have any sustainability-based pre-evaluation criteria?
What are the problems in supplier pre-evaluation? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)

The findings for the third theme, ‘supplier pre-evaluation’, are presented under two codes; criteria and method. The method code reflects the ways in which Costain implements supplier pre-evaluation and the criteria code reflects which qualifications they are giving importance to in the pre-evaluation.

On criteria, all three interviewees were aware of the importance of complex criteria, which was also supported by the company documents. There was strong agreement on the health and safety criterion; all the interviewees and the company documents saw it as the top criterion. Moreover, the second interviewee defined safety as more than a criterion; according to her, it is essential and it cannot be assessed according to its level as other criteria can. It is like black or white, a supplier has or does not have safety; there is no grey. The agreement also existed for quality as the second important criterion and for lead times as if not third then important. In addition, the first and second interviewees also gave cultural fit and financial structure as other important criteria. The first interviewee said that the cash flow of large projects can kill suppliers which are not financially strong and stable. They also mentioned sustainability. The first interviewee especially emphasised that even it is not the case now, sustainability will become a very strong criterion in the near future, and will on its own be enough to eliminate suppliers. Although it is clear that there is an awareness of the use of complex criteria, this is not the case for every project. The second interviewee addressed an important point that which criteria are to be used and at what level of importance differs from sector to sector, even from client to client in the same sector.

On method, the first and second interviewees stated that Costain uses two different processes, one is choosing from global networks such as ‘Achilles’, the other is sending questionnaires to the suppliers to test their criteria. According to the documents, questionnaires are assessed by relevant departments. However, the second interviewee said that it is a simple check of ‘yes’ or ‘no’; they were not using weighted criteria now but were planning to use them in the future.

To summarise, there is an awareness within the industry of the importance of complex criteria. Although it changes from project to project, safety and quality are unarguably seen as the top criteria, followed by cultural fit, lead times, financial standard and sustainability. Among these, sustainability is gaining importance and will probably be in the top three in the near future. For adding new suppliers to the pool, Costain uses both some supplier databases and questionnaires, but mostly the latter. The company is testing the criteria discussed above with those questionnaires.

The findings from the pre-interviews, interviews and company documents for the ‘supplier pre-evaluation’ theme are shown in Table 4.8.

Table 4.8 Interview Results for Supplier Pre-Evaluation

Criteria	Interviewee 1	They look at health and safety, quality, sustainability, capability, capacity, cultural fit, innovativeness and financial size. Safety is always the first criterion, quality is key, then cultural fit. Financial size is important because cash flow of big projects can kill suppliers with small turnovers. Sustainability is especially important because it can reduce the waste and increase the profits; however it is not a very strong criterion now but in the near future, maybe in a year, it will be an enough reason to eliminate suppliers. Not enough attention is paid to the time aspect.
	Interviewee 2	It depends from sector to sector and client to client. In the water sector, price is more important than quality. Even if the identified need is correct, the selected supplier might not be correct so selecting the right supplier is of critical importance which can be achieved with complex criteria. Top criteria are quality and performance, financial standard, cultural fit, sustainability, health and safety. Health and safety is a must, more than a criterion. It is number one, quality is number two. Sustainability is massive for everybody and gaining importance. Lead times are also vital.
	Interviewee 3	Health and safety is a critical issue. Lead times are also important. For some particular materials, you have to do single sourcing since there is only one supplier for those materials.
	Documents	Health and safety, quality and innovation are important criteria.
Method	Interviewee 1	They use Achilles to find suppliers, which is a Europe-wide supplier database.
	Interviewee 2	When they don’t have somebody to do a particular job of a project, they look for new suppliers and start pre-qualification. They use a questionnaire for pre-qualification. They also identify suppliers from Achilles or Linkup. They want to use scoring criteria in the future. They are now getting approval from different departments, there is no scoring
	Pre-interview 2	In the water sector, pre-qualification is poor. It’s a simple check over some qualifications. Weighted criteria would be useful, however some criteria such as safety should be ‘yes’ or ‘no’.
	Documents	Questionnaires are being used for pre-evaluation. They are assessed by relevant departments.

4.5 Supplier Selection

The fourth theme of the conceptual framework and also the interview questionnaire was 'supplier selection'. The objective for this theme was to understand how suppliers are selected for projects from the supplier pool and how the client plays a role in this. This theme also contains the problems which Costain is facing in supplier selection. In order to investigate the theme in depth, the questions which are shown in Table 4.9 were put to the interviews.

Table 4.9 Interview Questions for Supplier Selection

If you agree that the construction industry is highly fragmented, what is the effect of the fragmented structure on the supplier selection step? (because there are several subcontracting and material areas.)
What is the effect of the client's intervention on the company's supplier selection? (has its own suppliers or affects the selection process etc.)
Do you select suppliers for each project or select suppliers from a pool and try to use them in every project?
What are the five most important criteria in supplier selection? (depends on the project but what are the common ones?) Can you weight them (especially price and sustainability if they are in the top five)
What are the problems in supplier selection? (unique to the water sector, unique to Costain, general for the construction industry) (Can you provide examples?)

The findings for the fourth theme, 'supplier selection', are presented under two codes; price-based decisions and client's intervention. The price-based decisions code reflects how the price obsession is leading the industry. The client's intervention code reflects the client's direct role in supplier selection.

There was very strong agreement among the interviewees that the industry is obsessed with price-based decisions. The company documents indirectly confirm that obsession. Shifting from competitive tendering to performance-based selection is identified as a target in a company documents which means that competitive tendering and hence price is currently the existing main selection method. Whereas the second interviewee explained this tendency as "*picking the cheapest, quickest and dirtiest*", the first interviewee gave "*Three quotes and buy the cheapest*" as the method that most people use. Whilst this is a general problem in the industry and the first and second interviewees said that it is at a serious level in the water sector, the second and third interviewees thought that it is not happening in the oil, gas and nuclear sector. This is probably because of the nature of the industry. In such a dangerous industry, there is no tolerance for problems arising from low cost and hence low quality procurement.

Another reason which makes the industry so price-based is the QSs. It was commented by both the first and second interviewees that in the construction industry, QSs who are commercial people and not qualified for procurement are doing most of the procurement by only focusing on cost. They stated that this is especially a problem for Costain in the water sector.

On the other hand, all three interviews said that suicide bidding exists in the industry. Companies are quoting prices which they cannot afford just to get tenders. In addition, the first interviewee also referred to the very opposite of suicide bidding. According to him, some suppliers are quoting extremely high prices just because they do not want to get the job but they also do not want to say no. In both cases, getting those suppliers results in large costs for the main contractor.

According to all three interviewees, the client's intervention problem exists in supplier selection as well as in identification of the needs. The company documents confirm this by showing that every supplier selection needs to be reviewed by the client. Actually, client's intervention occurs in two different ways. The first way is canalising the main contractor into particular supplier(s). The first interviewee stated that the client's specification for some materials might lead to particular suppliers. The second way is directly imposing the client's own suppliers. The second interviewee commented that some clients have their own suppliers for key spend areas and that main contractors have to use them when working with those clients.

To summarise, it is clear that there is a great tendency in the industry for selecting suppliers by competitive tendering hence price. Costain is aware of this problem. In the oil, gas and nuclear sector, for instance, it is selecting strategic suppliers on their performance. The company is targeting to enhance this approach to other sectors and suppliers. There is also a serious problem with suicide bidding. Companies therefore should be careful when assessing low bids. On the other hand, as with other steps, clients can intervene in supplier selection too. They are not leaving the decision over suppliers to the main contractors in many cases.

The findings from the pre-interviews, interviews and company documents for the 'supplier selection' theme are shown in Table 4.10.

Table 4.10 Interview Results for Supplier Selection

<table>
<tr><td rowspan="6">Price-based decisions</td><td>Interviewee 1</td><td>In construction, there is an obsession with price. This is mostly because QSs do the procurement and their focus is on the cost.
If something is too cheap or too expensive, there is something wrong with it.
Along with suicide bidding, the opposite also exists. Some suppliers quote 50% more than the actual price because they are too polite to say directly that they don’t want the work.</td></tr>
<tr><td>Interviewee 2</td><td>General construction is about price, and especially in the water sector, there is a great pressure for pushing down the price. Suppliers offering high prices would directly be eliminated in the water sector.
When QSs do the procurement, they don’t care about the whole life cost and other issues, they focus on the initial price only. They are not qualified for procurement.
Suicide bidding exists in the industry. They put out low prices which they cannot provide just in order to take Costain. As a result, suppliers might go out of business and that costs us a large amount of money.
Strategic suppliers are not subject to competitive tendering hence price-based decisions; work is allocated to them based on their performance.</td></tr>
<tr><td>Interviewee 3</td><td>In the oil, gas and nuclear sector, it is not always the price, it is not the main driving factor.
They face suicide bidding. It does not necessarily be on purpose but it happens.</td></tr>
<tr><td>Pre-interview 1</td><td>Tendency is buying on price.</td></tr>
<tr><td>Pre-interview 2</td><td>The industry is price-led because procurement is done by commercial people who are interested in cost only.</td></tr>
<tr><td>Documents</td><td>Rather than price-based selections with competitive tendering, the company aims to allocate future work to suppliers on their performance.</td></tr>
<tr><td rowspan="6">Client’s intervention</td><td>Interviewee 1</td><td>Especially in the water sector, the client’s specification for materials might take you to particular suppliers which are not in your pool.
If you can manage your supply chain very well and get great results and quantify it and show this to the client, it will let you work with your own suppliers and will solve the client’s intervention problem.</td></tr>
<tr><td>Interviewee 2</td><td>Some clients have their own agreements with tier-2s in key spend areas.</td></tr>
<tr><td>Interviewee 3</td><td>The client is in all the way right through to the end</td></tr>
<tr><td>Pre-interview 1</td><td>Clients are not after value, they are only interested in the cost.
They may specify which supplier they want.</td></tr>
<tr><td>Pre-interview 2</td><td>The client has agreements with some suppliers and the main contractor can’t even see the terms and conditions of those agreements. It has no visibility and no say in what happens.</td></tr>
<tr><td>Documents</td><td>All selected suppliers are reviewed with the client before use.</td></tr>
</table>

4.6 Supplier Management

The fifth theme of the conceptual framework and also the interview questionnaire was 'supplier management'. The objective for this theme was to identify how suppliers are managed and how the relationships are maintained with them. This theme also contains the problems which Costain is facing in supplier management. In order to investigate the theme in depth, the questions which are shown in Table 4.11 were put to the interviews.

Table 4.11 Interview Questions for Supplier Management

Do you have close and strategic relationships or simple relationships with most of your suppliers? How do you segregate the nature of the relationship?
How can you influence the behaviours of your suppliers?
When your client selects some of the suppliers, how do you manage relationships with those selected ones?
Do you engage with your suppliers before project initiation? Why?
Do you measure the performances project-by-project? Why?
Do you measure the performances of all suppliers? Why?
What level of information-sharing exists between you and your suppliers? (low, medium or high) Why?
What are the problems in supplier management? (unique to the water sector, unique to Costain, general for the construction industry) (Can you provide examples?)

The findings for fifth theme, 'supplier management', are presented under three codes; monitoring, long-term relationships and client's intervention. The monitoring code reflects the main instrument for supplier management. The long-term relationship code reflects the main target of supplier management and the client's intervention code reflects the client's direct role in supplier management.

The first and second interviewees stated that Costain monitors its suppliers – especially the strategic ones – mainly on time, cost, quality and health and safety. The company documents show the same criteria for monitoring. The documents also show that there is also a kind of monitoring for preferred and verified suppliers although this is not done by supply chain managers, it is done by QSs. This is probably the reason why the interviewees mentioned monitoring for only strategic suppliers. They did not see what QSs are doing as monitoring.

The important issue in monitoring is being objective. Both the first and the second interviewees emphasised this importance. Objectivity provides a healthy comparison opportunity.

On the other hand, the first interviewee had some concerns about how Costain does the monitoring. He thought that it might be measuring the wrong things in an inconsistent way. He also thought that there is no visibility in monitoring across the entire company so a poorly-performing supplier in one sector might be working in another. The second interviewee suggested a centralised database for averting that kind of problem. The company documents addressed a very critical issue about monitoring: as was observed in the findings for previous themes, the company targets the allocation of work to suppliers based on their performance, which means that monitoring will play an extremely critical role in the future.

In supplier management, there is a tendency for long-term relationships. The second interviewee said that even though a supplier is not performing well, they tried to solve the problem and improve the performance of that supplier. Dismissing that supplier was the last solution. The company documents confirmed this issue. They showed that Costain establishes an improvement plan when there is a problem with one supplier. Both the first and the second interviewee saw education as the key to establishing and maintaining relationships with suppliers. Costain has a supply chain academy for this. In addition, according to the second interviewee, uncertainty, high numbers of suppliers and QSs' approach to procurement are the barriers to long-term relationships.

On client's intervention, the second interviewee thought that having to use a client's suppliers increases the supplier dominance because it is hard to manage them as they have not passed through the pre-qualification and selection process of Costain. For those suppliers, supply chain managers are responsible for establishing relationships.

To summarise, in the construction industry, monitoring is done against time, quality, cost and health and safety. It is extremely important to measure them objectively. Costain is planning to use the results of monitoring to allocate work to suppliers, and that is why monitoring will probably gain more critical importance. Establishing long-term relationships with suppliers is also important for the industry. Education is the key enabler for that. As with the other steps, client's intervention is causing problems in the management of suppliers as well.

The findings from the pre-interviews, interviews and company documents for the 'supplier management' theme are shown in Table 4.12.

Table 4.12 Interview Results for Supplier Management

Monitoring	Interviewee 1	Costain doesn't have enough information about its suppliers' performance. There are scraps of information but not a coherent picture. Consistent approach, evaluation and analysis is necessary for the monitoring. They are monitoring the suppliers with strategic importance on time, quality, safety and some other criteria. They are trying to keep it as objective as possible in order to be able to make healthy comparisons. They might be measuring the wrong things. A poorly-performing supplier in one sector might be working on another project in another sector because they don't have a complete end-to-end visibility of monitoring results.
	Interviewee 2	They are monitoring people, time, health and safety, quality and cost. They are using multiple choice questions in order to provide objectivity for comparison. With a centralised database, they want to monitor through the whole relationship period.
	Pre-interview 1	They are monitoring but he was not sure about whether they are doing the right things with the information they get.
	Pre-interview 2	They are monitoring the strategic and preferred suppliers.
	Documents	Costain is trying to measure the performances of suppliers against set expectations. Strategic suppliers are managed by supply chain managers, preferred and verified suppliers are managed by QSs. Performances are reviewed by supply chain manager, QSs, supplier, project manager and customer representative. They monitor mainly against time, cost, quality and health and safety.
Long-term relationships	Interviewee 1	Education is a facilitator for long-term relationships. They use the supplier chain academy for education.
	Interviewee 2	Education is the key for this. They use their supply chain academy. Work peaks and troughs, therefore it is hard to maintain long-term relationships. Uncertainty and the high number of suppliers are also barriers to long-term relationships. If a supplier is not performing well, they try to solve the problem and improve the performance of the supplier in order to keep it in the pool. They don't stop working with a supplier just because it had a redo.
	Pre-interview 2	QSs make it difficult to build long-term relationships because they easily shift from one supplier to another one on cost.
	Documents	After monitoring, even if there is a problem, Costain establishes an improvement plan and tries to keep working with the supplier.
Client's intervention	Interviewee 2	They try to get clients' suppliers to the level that their supply chain would accept. Supply chain managers are responsible for that.
	Pre-interview 2	The client's role increases the power of the supplier over the main contractor which results in supplier dominance.

4.7 Success Drivers

The sixth and final theme of the conceptual framework and also the interview questionnaire was 'success drivers'. The objective for this theme was to find the key success enablers in the procurement in the construction industry. Unlike the other themes, this theme solely addressed the third objective of the study which was 'To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function'. In order to investigate the theme in depth, the questions which are shown in Table 4.13 were put to the interviews.

Table 4.13 Interview Questions for Success Drivers in Construction Procurement

Can you put in order these success drivers? (the ones from the literature review.)
Do you think any of them has little effect?
Are there any other important success drivers?

The findings for sixth theme, 'success drivers', are presented under five codes; effective portfolio management, early engagement, design and construction alignment, information sharing and standardisation. Each of these codes reflects one success driver for procurement in the construction industry.

On effective portfolio management, the first and second interviewees thought that Costain is not performing well mostly because QSs are handling the procurement and they have different goals from those of procurement officers. The second interviewee suggested that a centralised database could provide better management opportunities. The third interviewee indirectly addressed the same issue by raising the importance of historic data. The company documents also showed that creating a central supply chain database is one of the targets of the company. Both the first and the second interviewees also mentioned that time pressure and last-minute issues are two major barriers to effective portfolio management. According to them, real-time management, which can be defined as minute-by-minute management, is necessary rather than week-to-week management which is currently being done.

On early engagement, the first and second interviewees thought that Costain is not at the level they desired and the company documents confirmed their view. According to the documents, early engagement is part of the company's 'upskilling the supply chain' strategy which means they are not good at this currently. All three interviewees thought that early engagement of the suppliers could solve many problems, such as the lack of visibility, high risks and quality issues, by bringing the expertise of the suppliers into the projects before initiation.

On the alignment of design and construction, all three interviewees agreed that lack of it is one of the root causes of the problems which the industry is facing and it is also the case in Costain. According to the company documents, it is one of the objectives of the company. The first and second interviewees thought that it could be solved by having the design in-house. This is because whilst it is a serious problem in the water sector of Costain where the design is done by external consultants, the oil, gas and nuclear sector is performing well in this alignment where the design is done in-house.

On information sharing, all three interviewees thought that it is not at the desired level within the industry. It can be improved. According to the company documents, Costain is working to create an environment which encourages information sharing. However, the second and third interviewees thought that it is at a good level in the oil, gas and nuclear sector.

On standardisation, the interviewees from the water sector thought that it is an important success enabler and reduces waste and time, however the interviewees from the oil, gas and nuclear sector stated that it is not a target in their sector. This is probably because that sector requires bespoke deliveries because of its unique nature. On the other hand, although he saw it as vital for success, interviewee 1 also mentioned the dangerous side of standardisation. According to him, in some cases the tendency for standardisation turns into a resistance to change. In order to do things in the same way as they have done before, people sometimes close themselves to new solutions. Therefore, separation between innovation and using standardisation is important.

To summarise, in such a fragmented industry, effective portfolio management is extremely important in order to deliver projects successfully. To provide this, procurement should be left to procurement officers, not QSs, and management should be done on a minute-by-minute basis rather than week-to-week. In addition, early engagement of suppliers provides a great opportunity for overcoming many problems of the industry. Suppliers' expertise can reduce the uncertainty and risks in projects which are a root cause of many other problems. Also, alignment of design and construction by having both in-house is necessary. Increasing the level of information-sharing can also facilitate effective project deliveries. Finally, although it might change from sector to sector, providing standardisation makes deliveries easier and faster.

The findings from the pre-interviews, interviews and company documents for the 'success drivers' theme are shown in Table 4.14.

Table 4.14 (1) Interview Results for Success Drivers in Construction Procurement

Effective portfolio management	Interviewee 1	Good portfolio management increases the procurement performance a lot. There is a management problem in Costain, procurement is not always done by the procurement officers. There are always time pressures, and also a lot of last-minute issues emerge during the projects. Rather than week-to-week and month-to-month management, minute-by-minute (real-time management) is necessary. Costain has a pretty stable supplier pool which is a positive contributor for effective portfolio management.
	Interviewee 2	Procurement is done by QSs which prevents effective portfolio management. QSs don't do procurement in the same way as procurement officers do. They have different drivers, goals and targets. There is always time pressure on everything. Costain's behaviour is *ad hoc* and reactive, and faces a lot of last-minute issues. A centralised database can provide better management opportunities.
	Interviewee 3	Historic data is very useful for good management.
	Pre-interview 1	Virtual engineering is necessary. Companies should engage suppliers, remove uncertainty from the process, and plan everything in advance. By doing so, they can reduce time and costs. Looking for stuff for tomorrow or today, not next week or the week after happens in the industry frequently and causes problems.
	Documents	Costain is targeting to create a central supply chain database to store all relevant management information (performances, reports, meetings).
Early involvement	Interviewee 1	Costain does not involve the supply chain early enough, it is not good at setting out plans with suppliers. There are regular supplier meetings but it is not enough. It would be great to have a lot more early supply chain involvement. It enables the adjustments in the projects to prevent costly problems. It also provides visibility of demand which is extremely important for reducing the risks.
	Interviewee 2	If they put more effort in before the project starts, she is aware that they can make better decisions. They try to use early involvement with strategic suppliers. Early involvement solves the problems about health and safety, quality and similar issues and facilitates more effective delivery of projects.
	Interviewee 3	It is vital to bring suppliers' expertise and knowledge at the beginning of the projects.
	Pre-interview 1	Suppliers also want this, it provides mutual benefits.
	Pre-interview 2	It provides the opportunity to take suppliers' experiences. Suppliers bring their expertise to the table.
	Documents	Engaging suppliers early is an objective for the company. It is part of their 'upskilling the supply chain' strategy. Costain has regular contact with its strategic suppliers.

Table 4.14 (2) Interview Results for Success Drivers in Construction Procurement (Continued)

Design and construction alignment	Interviewee 1	A lot of problems arise because of incomplete design.
	Interviewee 2	It is very beneficial to have design in-house so design and construction can be in alignment. The water sector suffers from lack of alignment. In the oil, gas and nuclear sector, design is in-house and they are not facing this problem. It is difficult to build long-term relationships when it is not provided. In that case, uncertainties hence wrong procurement increase.
	Interviewee 3	When they are not in alignment, it causes a lot of changes during the project period.
	Pre-interview 1	One of the biggest barriers to this alignment is that a lot of design is done by external consultants. It is hard to align external designers to a shared goal with the constructors. Even for the external designer, it is sometimes main contractors', sometimes clients' decision to choose which designer to work with. This increases the complexity of the problem.
	Pre-interview 2	It is a massive problem in the water sector. In the oil, gas and nuclear sector, it is not a problem since there is a design team in-house Suppliers can help in the solution of this problem by making decisions about the buildability of the design before construction starts.
	Documents	Alignment of design and construction is one of the objectives of the company.
Information sharing	Interviewee 1	It could be improved. For instance, having a supply chain newsletter, sending it to all suppliers, letting them know Costain's strategic plan, their expectations from suppliers and these kinds of thing would be great. Communicating with suppliers, letting them know the reasons why they are eliminated is important, it opens a space for better future relationships.
	Interviewee 2	Good in the oil, gas and nuclear sector but poor in the water sector due to the structure of procurement there. Costain holds quarterly meetings with strategic suppliers. Buyers are also involved in these meetings.
	Interviewee 3	Good in the oil, gas and nuclear sector right from beginning to end.
	Pre-interview 2	People do not communicate in the construction industry.
	Documents	Costain is working to create an environment which encourages information sharing in order to find problems and then collaborate for solutions.
Standardisation	Interviewee 1	With standardisation, you can provide information such as 'how much it is, how long it takes to deliver, where it is coming from, when it will be ready' accurately which will improve the performance of procurement and hence the industry. Now everything is bespoke in the industry which increases the likelihood of getting things wrong.
	Interviewee 2	In the water sector, there is a great push for standardisation but it is different in the oil, gas and nuclear sector. When the value and technical specifications increase, standardisation decreases.
	Pre- Interview 2	For the clients working with many contractors, standardisation is a vital issue.

4.8 Conclusion

This chapter has presented and briefly described the data collected from both the pre-interviews and the interviews. It has also supported those results by company documents. All the results were categorised and shown under a thematic structure which was in alignment with the literature review findings. This structure will be used in the next chapter, which is 'Discussion and Recommendations', in order to achieve the second and third objectives of this study. In that chapter, the findings from this chapter will be discussed along with the findings from the literature review.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

This chapter combines the results of the empirical data from the third chapter with the findings from the literature review. In addition, this chapter also provides some recommendations to the Costain company for the purpose of improving its procurement process.

5.1 Introduction

This chapter compares and contrasts the primary data findings in the results chapter with the literature review in order to provide comments and recommendations based on the research. By doing so, this chapter collates three separate sources of information (interviews, company documents and literature) with the author's interpretations.

The chapter was developed in alignment with the thematic structure of the results chapter and same codes are used (*see* Table 4.2 – Results and Analysis Framework). This chapter achieves the second and the third objectives of the study which are shown below:

2. To refine and validate the framework through empirical testing with one case study in the Costain company,
3. To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function

The second objective was about the entire procurement process and it will be achieved by discussion of themes 2-5 which are about the procurement process and the first theme, 'procurement strategy', which directly affects the entire procurement process. The third objective was about providing recommendations to Costain company and it will be achieved by discussion of theme 6, 'success drivers', with regard to Costain's problems.

The structure of the chapter is similar to that of the results chapter since this chapter follows the same thematic structure. Chapter structure is shown in Figure 5.1.

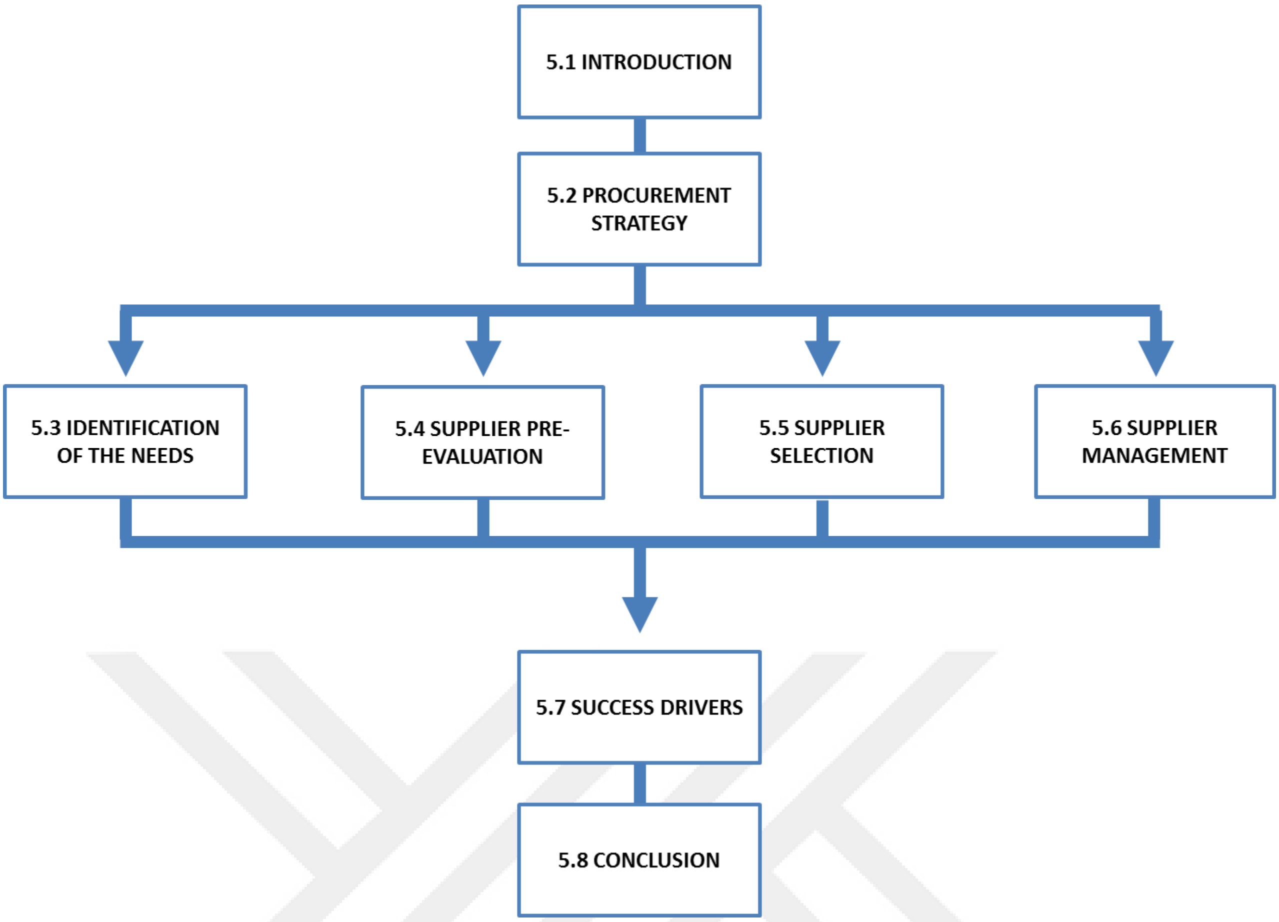

Figure 5.1 Structure of the Discussion and Recommendations Chapter

5.2 *Procurement Strategy*

The objective for this theme was to discover key approaches taken by Costain and other main contractors in general in order to achieve their procurement strategy. Since procurement strategy affects the entire procurement process and the decisions within procurement steps, this theme helped to discover the general approach taken by companies and by Costain for procurement. In this respect, it addresses the second objective of the study. This theme also includes the problems which Costain is facing with regard to its procurement strategy in order to contribute to the third objective of the study.

The discussion of this first theme, ‘procurement strategy’, is presented in alignment with the results chapter under three codes; number of suppliers, nature of the relationship and general strategy.

For number of suppliers, the literature (*see* 2.2.3) showed that there is a trend for reduction in the number of suppliers which carry high supply risks and have high profit impacts for the buyer company (Holmen and Pedersen, 2007; Cousins *et al.*, 2008). The aim of this trend is to develop better relationships with the reduced number of suppliers (Gadde and Håkansson, 1994; Cox, 2001; Cousins *et al*., 2008). Supporting the literature, awareness of the same trend was mentioned by all of the interviewees and company documents for the same target. Costain is aware that with a reduced number of strategic suppliers it is possible to allocate enough time and other resources to them. However, the first interviewee also mentioned that this strategy is not consistent or robust group-wide whereas the second interviewee said there is a group-wide strategy covering supply base reduction. This contradiction shows that there is a strategy written somewhere but its implementations in different sectors are not consistent. With reference to this contradictive view, the literature (*see* 2.4.1) also showed that some clients have specific preferences for the number of suppliers and subcontractors that a main contractor can have (Primo and Filho, 2012). This was strongly stated by the first and second interviewees to be the case in the water sector. This might be the reason why the interviewees from the water sector thought that there is no robust supply-base reduction strategy because it is not possible to implement such a strategy while the client is deciding the suppliers. The client's intervention stands as a major barrier to this strategy.

As for the number of suppliers, in the light of discussion above it can be concluded that supply base reduction is a necessity for companies, especially for areas with high importance. Although the awareness strongly exists, there are still some issues with the implementation of that strategy. Client worsens number of suppliers problem by imposing its own suppliers. Costain should develop a group-wide, robust supply base strategy and provide consistency in the implementation of that strategy across all sectors. In order to be able to do that, Costain should prevent client's intervention in supplier selection.

For nature of the relationship, the literature (*see* 2.2.7) showed that closer relationships provide better performances (Carr and Smeltzer, 1999; Chen *et al*., 2004) but price based decisions are standing as a barrier against that and close relationships are not in the desired level (Holmen and Pedersen, 2007) (*see* 2.4.1). It (*see* 2.2.3) also addressed the importance of segregating suppliers and developing close relationships with strategic ones (Bensaou, 1999; Cox, 2001), because in construction procurement, 50% of the procurement activities are done with four or five subcontractors and suppliers (Department of Business, 2013). This critical segregation was also mentioned by all the interviewees. The company documents showed that Costain is segregating its suppliers into three categories (*see* Figure 5.2).

Figure 5.2 Costain's Supplier Classification

This uses a similar logic to Kraljic's (1988) portfolio purchasing model (*see* Figure 2.4). In this triangle, the verified suppliers section corresponds to the routine section, the preferred suppliers section corresponds to the leverage section, and the strategic suppliers sections corresponds to the bottleneck and strategic sections of Kraljic's matrix. Costain has different natures of relationship with each group.

Although it seems that Costain has a clear nature of relationships strategy, the first interviewee stated his concerns about the gap between this strategy and the general supply chain management strategy. This is a serious problem. A strategy is useless when it is not in alignment with other strategies of the company. This criticality was clearly addressed by the literature (*see* 2.2.3) in Gloucestershire County Council's (2002) procurement strategy. According to that report, a procurement strategy has to support the broader business strategy. By doing so, it contributes to success in the construction industry (Primo and Filho, 2012) (*see* 2.4.1).

As for the nature of the relationship, in the light of the discussion above it can be concluded that segregation of the suppliers in order to provide different natures of relationship is a necessity. Costain has developed an appropriate strategy for this. That strategy needs to be in alignment with other company strategies.

For general strategy, two topics were addressed: lack of senior managers and sustainability. Lack of senior managers is a serious problem in the industry. The literature (*see* 2.3.2) clearly showed the importance of senior managers; they facilitate effective practices (Department of Business, 2013). Monczka *et al*. (2005) addressed the importance of having a senior procurement manager who is in direct contact with the CEO of the company. Despite this critical importance, the primary data showed that Costain is not giving enough importance to its procurement function. The first interviewee stated that rather than be contributors to a company's success, procurement people are seen as a 'necessary evil'. This metaphor shows how procurement is seen by companies. As a result, companies are not allocating enough senior managers to the procurement function. In fact, the literature (*see* 2.4) showed that procurement has come to be seen as a strategic function in the construction industry (Scotti, 2007), however the primary data showed that this is not the case, at least not in Costain. When it is considered that Costain is a large main contractor operating in six different sectors of the construction industry, which shows that it can be seen as a representative company for the industry, the underestimation of procurement and the lack of senior managers in this company probably exists in the rest of the industry as well.

On the other hand, the literature showed that sustainability is a significant trend in the industry. According to the Chartered Institute of Building, the UK government has a commitment to reducing carbon emissions by 80% in 2050 compared with 1990 figures (CIOB, 2010) (*see* 2.3.2). The government also published regular reports and addressed the sustainability issue strongly in its latest report 'Construction 2025' in 2013 (Department of Business, 2013) (*see* 2.3.1). How sustainability is gaining importance within the industry was also mentioned by the second interviewee and confirmed by the company documents. Costain used the expression 'burning desire' in order to emphasise its importance for the company. To ensure sustainability, procurement is key for the construction industry because a construction company can only be as sustainable as its suppliers (Belfitt *et al*., 2011) (*see* 2.3.2). Costain is aware of procurement's role too. The second interviewee referred to this awareness by pointing out the fact that since they are not manufacturing anything, sustainability can be provided by their decisions on suppliers.

As for the general strategy, in the light of the discussion above it can be concluded that companies are not giving enough strategic importance to procurement functions. This underestimation results in a lack of senior managers which stands as a major barrier to the effective delivery of the projects. Costain should group-wide allocate more senior managers responsible for procurement. On the other hand, sustainability is an important concern now. Since the major way of providing sustainability in the construction industry is procurement, sustainability should be seen as part of the procurement strategy rather than as a single criterion. Given the UK government's determination, sustainability will probably increase in importance in the near future.

To sum up the theme; after comparing and contrasting the primary data and the literature findings, a refined form of the conceptual framework for procurement strategy is shown in Table 5.1.

Table 5.1 Conceptual Framework for Procurement Strategy

LITERATURE REVIEW	EMPIRICAL DATA		CONCLUSION
• Increased supply base is a problem since it implies managerial complexity. • Companies are aware of the importance of reducing the number of suppliers.	• Increased supply base is a fact. • Practitioners are aware of the importance of reducing the number of suppliers. • There is a tendency to implement this strategy especially in strategic supply areas.	M	• Empirical data support the literature. • Although an increased supply base is a fact in construction industry, main contractors are trying to reduce the number of strategic suppliers hence the supply base.
• There is a lack of senior managers in the construction industry.	• Practitioners think that there is a lack of senior procurement managers.	C	• Empirical data agree with the literature. • Construction industry suffers from lack of senior procurement managers, which shows that not enough importance is attached to procurement.
• Client damages main contractors' procurement strategy.	• According to the practitioners, clients' suppliers are a barrier to the implementation of main contractors' procurement strategy.	C	• Empirical data align with the literature. • Clients' own suppliers are a barrier to the implementation of the procurement strategy.
• Supply base decision is affected by the client.	• Client is affecting the supply base decision, and for practitioners, that problem is greater in the water sector.	M	• Empirical data agree with the literature. • Client affects the supply base decision by imposing its own suppliers. This causes an increase in the supply base of the main contractors. This effect is greater in the water sector.
• Tendency is for arm's-length relationships.	• Practitioners think that arm's-length relationships exist in the industry but the tendency is for close relationships.	D	• Empirical data contrast with the literature. • In the industry, there is a tendency for close relationships with strategic suppliers but in some conditions (such as when the decisions are price-based), arm's-length relationships are inevitable.
• Sustainable procurement solutions are becoming popular.	• Practitioners see sustainability as becoming a part of the procurement strategy.	C	• Empirical data approve the literature. • Sustainability is gaining importance very quickly and it will soon form a major part of the procurement strategy.
• Procurement strategy changes from project to project.	• According to practitioners, weak procurement strategies exist in the industry. Since they lack consistency, they change in each project.	M	• Empirical data support the literature. • Weak procurement strategies exist in the industry. A robust procurement strategy in alignment with other company strategies is of vital importance, also there shouldn't be any gap between procurement strategy and other strategies of the main contractor in order to increase its robustness.

C: Confirmed, M: Modified, D: Denied

5.3 Identification of the Needs

The objective for this theme was to find which factors affect the identification of the needs and also what the results are of these effects. Since identification of the needs is the initiation of the procurement process, this theme helped to discover the issues which the industry and Costain are facing at the beginning of procurement. In this respect, it addresses the second objective of the study. This theme also includes the problems which Costain is facing with regard to its identification of the needs in order to contribute to the third objective of the study.

The discussion of this second theme, 'identification of the needs', is presented in alignment with the results chapter under three codes; client's intervention, wrong procurement and design's effect.

On client's intervention, the literature (*see* 2.3.1) pointed that clients have some power arising from contracts and they use it against main contractors (Masi *et al.*, 2013). This was supported by the primary data; all the interviewees thought that client's intervention is an issue within the construction industry. The company documents showed the same; the client has a confirmatory role in the selection of materials. The interviewees pointed to another important aspect of client's intervention as well. According to them, the client might change its mind during the project's progress which results in a necessity for the identification of new needs. The first interviewee provided a dramatic example of such a situation:

> "*You don't build a car by thinking I'm going to build a hatchback and then end up building a five-door instead. In construction you start with a three-bedroom detached and end up with a five-bedroom detached"*

The possibility of a client changing the requirements creates a barrier to effective procurement practices in the industry. The first and second interviewees especially mentioned that this is happening more in the water sector.

As for client's intervention, in the light of the discussion above it can be concluded that clients are stealing the role from the main contractors in the identification of the needs. This is a serious issue for a main contractor because it loses control of the process when the client decides what is needed. To address this problem, especially in the water sector, Costain should improve the frameworks which it has with clients in a way that reduces a client's unexpected interventions. It should also provide visibility for the required needs before the initiation of the projects, including the client's preferences.

By doing the latter, the company could prevent if not intervention by the client, at least the negative effects of that intervention.

For wrong procurement, the literature (*see* 2.2.4) suggested that it is very hard to provide clear specifications for complex needs (Arlbjørn and Freytag, 2012). As a result of unclear specifications, wrong procurements are likely to happen frequently (Rushton *et al*., 2014). The first and second interviewees also confirmed this issue; according to them wrong procurements are happening in the construction industry very frequently. They thought that in addition to unclear specifications, inadequate design, the bespoke nature of the industry and time pressures with last-minute emerging needs on procurement are also reasons for wrong procurement. The second interviewee especially commented on time pressure problems for the water sector.

In the light of the discussion above it can be concluded that wrong procurement is a serious problem for the industry. It can also be seen that there are various reasons for wrong procurement such as unclear specifications and time pressures. In order to overcome wrong procurement problems, the industry needs to have qualified procurement officers who can provide more clear specifications in the identification of the needs. These qualified procurement officers can also provide proper planning in advance in order to reduce the last-minute emerging needs and hence time pressure on identification of the needs.

Design has similar effects to client's intervention. First, because of being inadequate at the beginning, it makes what needs to be procured unidentifiable and as a result it causes wrong procurements. Second, since it evolves during the project phase, it brings out new needs instantly. Especially its evolution throughout the life-cycle of a project was strongly mentioned by the first interviewee.

As for design's effect, in the light of the discussion above it can be concluded that design stands as a major barrier to properly identifying what needs to be procured. A further discussion about design will be presented in the success drivers section (*see* Section 5.7).

To sum up the theme; after comparing and contrasting the primary data and the literature findings, a refined form of the conceptual framework for identification of the needs is shown in Table 5.2.

Table 5.2 Conceptual Framework for Identification of the Needs

LITERATURE REVIEW	EMPIRICAL DATA		CONCLUSION
• Standardisation is low in the construction industry. • Identification of the needs is a recurring process project by project	• Standardisation is extremely low in the industry because of its bespoke nature. • Identification of needs recurs in each project.	C	• Empirical data confirm the literature. • Because of the bespoke nature of the industry, standardisation is very hard hence extremely low, and identification of the needs recurs in each project with bespoke new needs.
• There is a tendency for cheap materials and services when identifying the needs.	• There is no concern about price in the identification of the needs step.	D	• Empirical data contrast with the literature. • Price issue comes to the table in supplier selection, not in identification of the needs.
• Client affects identification of the needs by intervening in the decisions.	• Client sometimes selects what needs to be procured. • Client can also change its mind during the project which produces new needs.	M	• Empirical data support the literature. • In some cases, client is selecting what needs to be procured. Worse, it sometimes occurs that a client changes its mind during the project which produces instant needs.
• Hard to know exact needs at the start of a project.	• At the beginning of a project, it is hard to define what is needed. • Inadequate design is a main reason for this.	M	• Empirical data agree with the literature. • Inadequate design makes it hard to define early what is needed in the project and this causes problems.
• Procurement of wrong needs occurs in the industry.	• Procurement of wrong needs occurs frequently in the industry.	C	• Empirical data align with the literature. • Procurement of wrong needs occurs frequently in the industry which is a serious problem.
• Time pressure exists in the identification of the needs.	• Time pressures exist in the industry with lots of instantly emerging last-minute needs.	M	• Empirical data support the literature. • Time pressures due to last-minute issues are one of the barriers to effective practices.

C: Confirmed, M: Modified, D: Denied

5.4 Supplier Pre-Evaluation

The objective for this theme was to discover how new suppliers are selected and then evaluated to enter the existing supplier pool of companies. Since supplier pre-evaluation is a critical step in which companies select their future suppliers, this theme helped to discover how this critical step is handled in the industry and in Costain. From this aspect, it addresses the second objective of the study. This theme also includes the problems which Costain is facing with regard to its supplier pre-evaluation in order to contribute to the third objective of the study.

The discussion of this third theme, 'supplier pre-evaluation', is presented in alignment with the results chapter under two codes; method and criteria. In fact, the literature defines selection against criteria as a supplier selection issue, not supplier pre-evaluation. However, according to Costain, selection of new suppliers for the supplier pool is a supplier pre-evaluation process; for Costain, the supplier selection process is different from that, it is the selection of suppliers from their supplier pool for particular projects (*see* Section 5.5 for supplier selection). Therefore, the criteria code was discussed in the supplier pre-evaluation section.

For method, the literature (*see* 2.2.5) showed that companies can use specialist journals, web pages such as the Thomas Register and yellow pages, and they can also check whether a supplier has certification from reliable organisations such as the International Standards Organization (Benton, 2010). The first and second interviews confirmed this by stating that using a global network called 'Achilles' is one of the ways that Costain finds suppliers for its supplier pool. According to them, Costain also uses questionnaires as a supplier pre-evaluation method.

There is a great consensus in the literature about the importance of supplier pre-evaluation. The literature (*see* 2.2.6) clearly showed that this process is seen as one of the most important processes for procurement managers (De Boer *et al.*, 2001; Micheli *et al.*, 2008). The literature (*see* 2.2.6) also showed that strategic procurements necessitate multi-objective approaches which involve various criteria (Weber and Ellram, 1993). Similarly, all the interviewees mentioned the importance of using complex criteria for supplier pre-evaluation. This was also supported by the company documents. However, the second interviewee also stated that Costain is not very good at using complex criteria. Although it exists in the process, it is a simple 'yes' or 'no' check process.

As for the method, in the light of the discussion above it can be concluded that there are various ways for main contractors to reach suppliers in the market. They can benefit from global networks as well as using their own methods such as questionnaires. In the questionnaires or similar methods, it is important to use multi-objective approaches to the criteria. Although that kind of approaches consume more time and resources, when the complexity in these criteria is increased, the likelihood of selecting better suppliers also increases. Although Costain is using complex criteria, it is not using them on a weighted basis. It should shift from simple yes/no checks to detailed weighted evaluation processes. Especially for suppliers with high importance, it should implement a more detailed pre-evaluation process.

For criteria, according to the interviewees, safety was unarguably the most important criterion. The second interviewee even defined it as essential, independent from having a level. The literature (*see* 2.2.6) defined having that kind of essential criterion as a non-compensatory model (De Boer *et al*., 2001). In this model, even though a supplier performs extremely well for other criteria, if it does not fit the requirements for one or more specific criteria – which is safety in the construction industry – it is directly eliminated.

For other criteria, the order of importance varies from industry to industry. Even in the construction industry, it varies from project to project, client to client. The literature (*see* 2.2.6) suggested quality, delivery and cost as the top criteria according to more than 100 papers from different industries (Weber *et al*., 1991; Ho *et al*., 2010). From the interviewees' perspective, the agreement also exists for quality as the second most important criterion and lead times if not third then important. According to them, quality is one of the most important difference-makers among suppliers. The lead times criterion can be seen as part of the delivery criteria; it directly affects delivery performance. In addition to the lead times, the literature (*see* 2.4.4) also stated the importance of on-time deliveries (Eriksson, 2010).

The literature (*see* 2.3.2) also addressed the importance of financial structure and pointed out cash flow problems (Dainty *et al*., 2001). The first and second interviewees confirmed financial structure as an important criterion. Especially the big projects of the industry require strong financial structures for suppliers working on those projects. They also expressed cultural fit as another important criterion. Moreover, as mentioned in the procurement strategy discussion (*see* section 5.2), sustainability is gaining importance and is a candidate for being one of the most important criteria in the near future. This was also confirmed by all of the interviewees as an important criterion.

As for the criteria, in the light of the discussion above it can be concluded that although it differs from project to project, safety is essential in all projects. Quality and delivery performance are extremely important criteria, followed by cultural fit. Cultural fit is important because it forms the basis of close relationships which is a target for most companies. In addition, sustainability is expected be another top criterion soon. Costain is aware of these top criteria. Costain is also taking sustainability as a serious necessity. It is more than a selection criterion for the company, it is part of the procurement strategy, as stated before.

To sum up the theme; after comparing and contrasting the primary data and the literature findings, a refined form of the conceptual framework for supplier pre-evaluation is shown in Table 5.3.

Table 5.3 Conceptual Framework for Supplier Pre-evaluation

LITERATURE REVIEW	EMPIRICAL DATA		CONCLUSION
• Supplier pre-evaluation is a time-consuming process.	• Practitioners stated that multi-objective time-consuming approaches are being widely used for supplier pre-evaluation.	M	• Empirical data support the literature. • Multi-objective approaches involving various complex criteria are common for supplier pre-evaluation. When the complexity increases, success in selecting better suppliers also increases, but it consumes more time.
• Suppliers are eliminated for their high approximate prices regardless of their success in other criteria.	• Price is not considered as a top criterion in this step.	D	• Empirical data disagree with the literature. • Price is actually being considered in the next step 'supplier selection'. In contrast, quality is a top criterion here.
• Relationship ability criterion is important for supplier pre-evaluation.	• Cultural fit is an important criterion for supplier pre-evaluation, according to practitioners.	C	• Empirical data align with the literature. • Cultural fit with suppliers is necessary in order to be able to form close relationships with them.
• Flexibility, reduced lead times and JIT are important criteria.	• Practitioners think that delivery performance is one of the top criteria in supplier pre-evaluation.	C	• Empirical data confirm the literature. • Delivery performance, which includes lead times, JIT deliveries and flexibility, is one of the most important criterion in supplier pre-evaluation. Deliveries are crucial for on-time delivery of projects.
• Suppliers who are not capable of sustainable solutions are eliminated.	• Sustainability is an important criterion although it is currently not that strong to eliminate a supplier.	D	• Empirical data contrast with the literature. • Sustainability is not that strong yet, however it is gaining importance very quickly and it seems that it will be a reason for eliminating suppliers in the near future.
• Safety is extremely important for the construction industry.	• According to the practitioners, safety is essential in the industry.	C	• Empirical data agree with the literature. • Safety is essential in the industry independent from having a level. It is either there or not.

C: Confirmed, M: Modified, D: Denied

5.5 Supplier Selection

The objective for this theme was to understand how suppliers are selected for projects from the existing supplier pool. The effects of client's intervention and price-based decisions on this were also discussed in order to understand the process in depth. Since this selection is the final step before a supplier starts working on a project, a mistake made here cannot be compensated. It is therefore a crucial step for the success of projects. In this respect, it addresses the second objective of the study. This theme also includes the problems which Costain is facing with regard to its supplier selection in order to contribute to the third objective of the study.

The discussion of the fourth theme, 'supplier selection', is presented in alignment with the results chapter under two codes; price-based decisions and client's intervention.

According to the literature (*see* 2.4.4), price-based decisions are leading the construction industry (Dubois and Gadde, 2000; Dainty *et al*., 2001). Competitive tendering is being widely used for that kind of decision. The literature (*see* 2.2.6) showed that it usually lets the procurer have the real market price, sometimes even lower (Dimitri *et al*., 2006) because it allows more suppliers to take part in the competition. The primary data confirmed this nature of the industry; all the interviewees strongly mentioned the price obsession. They explained that it is worse in the water sector. The company documents also confirmed this problem in an indirect way by targeting the shift from competitive tendering to performance-based selection. However, the second and third interviewees said that in the oil, gas and nuclear sector, price is not the main driver. They are allocating work to strategic suppliers on their performance.

Interestingly, the literature (*see* 2.3.1) showed that many senior managers complain about price-based decisions made using the competitive tendering method (Akintoye *et al*., 2000). Micheli *et al*. (2008) also stated that the fact that price-based decisions are not suitable for finding value is widely accepted in the industry (*see* 2.2.6). This is interesting because despite the fact that price-based decisions are seen as incapable of providing value, they are still being widely used in the industry. This is a problem for Costain especially in the water sector. A major reason for this problem is Quantity Surveyors (QS). It was mentioned by the water sector-based interviewees that QSs who are commercial people are doing procurement in the water sector. According to the interviewees, QSs only focus on the price.

Another problem with price-based decisions is suicide bidding which is extremely low prices quoted by companies just to get a tender which they cannot afford. According to the literature (*see* 2.3.1), this problem exists in the industry. A survey revealed that among 525 construction industry professionals, 82% believed that suicide bidding exists (CIOB, 2010). If a supplier with that kind of bid is selected by the main contractor, it results in problems such as lower quality, delivery problems and waste (Department of Business, 2013). All the interviewees confirmed the existence of suicide bidding. They said that companies are quoting low prices just to get a tender, to get work from Costain which in fact they cannot deliver at that price. The third interviewee also said that some suppliers are not doing this on purpose, they really think that they can afford what they quote, but the result is the same. Whether on purpose or not, unhealthy bidding can lead to the failure of a supplier, which directly affects the main contractor as well. The second interviewee pointed to the necessity of preventing this from happening. Main contractors need to be very careful when they are assessing the bids.

As for price-based decisions, in the light of the discussion above it can be concluded that competitive tendering and hence price-based selections are leading the industry. This is a problem for the entire industry because low prices usually lead to low quality, low quality causes rework and maintenance, and as a result the total cost becomes higher with low initial-price selection. In addition to the total cost, low quality also causes customer dissatisfaction. Costain is facing a price-based decisions problem as well, especially in its water sector. QSs are doing the procurement there by only considering price. Costain should use procurement officers who are qualified for procurement rather than QSs. In the oil, gas and nuclear sector, this is not such an issue. This could be related to the nature of the industry. In such a dangerous industry, price-based decisions which might lead to low-quality materials might cause health and safety problems. Therefore, price is of secondary importance, and performance-based work allocation which leads to value is being used. This should be implemented by all sectors of Costain.

On the other hand, suicide bidding exists in the industry. It represents a great risk because when a supplier is selected who did suicide bidding, that supplier will not be able to deliver the work as it was supposed to. This causes delays in the project. Therefore, if Costain chooses to use competitive bidding, it should be very careful when assessing very low bids from suppliers. It could demand a justification for very low bids in order to understand whether the supplier is really capable of delivering the work at that price or it is suicide bidding.

For client's intervention, the literature (*see* 2.3.1) showed that clients are sometimes forcing main contractors to procure from some specific suppliers (Akintoye *et al.*, 2000). All the interviewees confirmed this intervention. Clients sometimes impose their own suppliers directly or even if not their suppliers, they can canalise their main contractors to particular suppliers. Either way, clients have a role in supplier selection. The company documents also showed that every supplier selection needs to be reviewed by the client. This is more an issue in the water sector, where they have client's agreements in the frameworks. The second interviewee said that except for three major subcontracting areas, the client is selecting all of the suppliers.

In the light of the discussion above it can be concluded that clients have direct effects on supplier selection. This is a serious problem because it forces main contractors to work with suppliers which are not coming from their own supplier pool, hence they have no relationship. Costain is facing this problem especially in its water sector because of the framework agreements with its clients. Clients are imposing their own suppliers. Since it is not effective to work with client's suppliers, Costain should convince its clients that it needs to use its own suppliers. To achieve that, Costain should be able to quantify the value it is offering with its own suppliers, and the client should see it in a tangible way in order to understand it. In this way, Costain can reduce the intervention of the clients and take control of supplier selection which can increase the effectiveness of procurement.

To sum up the theme, after comparing and contrasting the primary data and the literature findings, a refined form of the conceptual framework for supplier selection is shown in Table 5.4.

Table 5.4 Conceptual Framework for Supplier Selection

LITERATURE REVIEW	EMPIRICAL DATA		CONCLUSION
• Supplier selection is biased by client's preferences.	• Client has direct interventions in the selection.	C	• Empirical data confirm the literature. • In supplier selection, main contractors are not the only deciders, clients also have interventions in the selection. Client can canalise main contractors to particular suppliers.
• Some suppliers are selected directly by the client without the involvement of the main contractor.	• According to practitioners, client's selection of suppliers exists in the industry. • If a main contractor can quantify the value it can offer with its own suppliers, this might satisfy the client and prevent its intervention.	M	• Empirical data support the literature. • In the construction industry, clients sometimes select the suppliers by themselves and force main contractors to work with those suppliers. This creates a serious problem for the main contractor as it is being forced to use suppliers it has not selected and has no previous relationship with.
• Supplier selection is a recurring process project by project.	• Practitioners said that suppliers are selected from supplier pools for each project separately	C	• Empirical data align with the literature. • Supplier selection needs to be done separately for each project because projects are bespoke and require different qualifications and assets.
• Competitive bidding is the main selection method for suppliers.	• Competitive bidding is leading the industry as a supplier selection method.	C	• Empirical data agree with the literature. • Competitive bidding is the major method for supplier selection in the construction industry.
• Suicide bidding is a problem in the construction industry.	• According to the practitioners, suicide bidding exists in the construction industry.	C	• Empirical data approve the literature. • Suicide bidding is common in the industry, which necessitates very careful assessment of extremely low bids. They shouldn't be accepted unless the supplier can justify how it can offer such a low price.
• Price criterion overweighs in supplier selection.	• There is an obsession with price in the construction industry. • QSs doing the procurement worsens this obsession. • In oil, gas and nuclear sector, price is not a driver for selection. Performance-based work allocation is being successfully used.	M	• Empirical data support the literature. • Price is a very important concern in supplier selection. When QSs do the procurement, the situation worsens. It causes quality and rework problems. Performance-based work allocation is necessary for better results as its success was proven in oil, gas and nuclear sector

C: Confirmed, M: Modified, D: Denied

5.6 Supplier Management

The objective for this theme was to understand how suppliers are managed and how relationships are maintained with them. The effects of client's intervention was also discussed. From this aspect, it addresses the second objective of the study. This theme also includes the problems which Costain is facing with regard to its supplier management in order to contribute to the third objective of the study.

The discussion of the fifth theme, 'supplier management', is presented in alignment with the results chapter under three codes; monitoring, long-term relationships and client's intervention.

For monitoring, the literature (*see* 2.2.7) showed the importance of having objectivity in it. The first and second interviewees expressed the same necessity for objectivity. It provides a healthy comparison opportunity. In order to monitor objectively, delivery, quality and cost are suitable quantitative criteria (Monczka *et al*., 2005). The literature (*see* 2.4.5) also showed that the major aim of the construction industry is delivering projects on time, within budget and with high quality (Zhou and Lowe, 2003). As can be seen, the aims of the construction industry match up with suitable objective criteria. Confirming that, all the interviewees stated time, cost and quality as the criteria which Costain is monitoring. They also added health and safety as an important criterion to be monitored. The same four criteria were also seen in the company documents.

On the other hand, the first interviewee mentioned his concerns about how monitoring is done in Costain. He was not sure about the visibility of monitoring so that a poorly performing supplier in one sector might be working in another sector of Costain. There might be an inconsistency among the sectors. The second interviewee suggested using a centralised database to provide consistency. The documents showed that even though the methods are different, they are monitoring strategic, verified and preferred suppliers. Interestingly however, the interviewees said that they are only monitoring strategic suppliers. This opinion difference is probably due to the fact that whilst strategic suppliers are monitored by supply chain managers, preferred and verified suppliers are monitored by QSs. The interviewees did not see what QSs are doing as proper monitoring.

In the light of the discussion above it can be concluded that monitoring is mainly done against cost, delivery, quality and safety criteria in the construction industry. Being objective in monitoring is very important in order to be able to use the results for comparison. The results of monitoring are being used in the oil, gas and nuclear sector for new work allocation to suppliers which is called performance-based work allocation. The tendency is to increase that kind of work allocation so it will probably be more common in the near future. This will increase the critical importance of monitoring. However, it seems that Costain has some problems with the robustness and consistency of its monitoring process. It should use a centralised database as suggested by the second interviewee. By doing so, every sector can benefit from the monitoring results of the other sectors.

For long-term relationships, the literature (*see* 2.2.7) addressed the importance of having long-term relationships especially with key suppliers (Carr and Smeltzer, 1999; Cox, 2001; Chen *et al*., 2004). It improves the performances of both sides. The literature (*see* 2.4.5) also showed that there is a tendency for this particularly in the construction industry (Dainty *et al*., 2001). The interviewees said that it is a target for Costain as well; Costain aims to have long-term relationships with its key suppliers. The third interviewee mentioned the importance of having repeat business with the same suppliers which can facilitate long-term relationships with those suppliers. The second interviewee said that even though a supplier underperforms, they try to solve the problem and keep working with the same supplier. The company documents confirmed this tendency. It can be seen from the documents that Costain is establishing an improvement plan for underperforming suppliers.

The key enabler for long-term relationships is education. Costain has a supply chain academy and it was mentioned as a critical enabler for long-term relationships by the first and second interviewees. Costain is also organizing regular business-to-business meetings. The third interviewee said that, in addition to managers, buyers are also getting involved in these meetings. This is extremely important. By involving the executive employees as well as the managers, Costain gets the opportunity to cover practical issues in addition to the strategic ones.

The literature (*see* 2.2.7) showed that senior manager support is also necessary for establishing long-term relationships (Ellram, 1995). Lack of senior managers was mentioned by the first interviewee as a general barrier to long-term relationships.

In the light of the discussion above it can be concluded that it is necessary to develop long-term relationship with key suppliers to increase effectiveness. Costain is aware of its importance. One of the key enablers of long-term relationships is education. Costain is using its supply chain academy for that very effectively. However it faces the lack of senior managers which is another enabler for long-term relationships. It should have more senior managers dedicated to procurement.

For client's intervention, the literature (*see* 2.3.1) showed that clients are sometimes selecting suppliers on behalf of main contractors (Akintoye *et al.*, 2000). This has already been discussed in the previous sections as a problem for supplier selection but it also has some implications for supplier management too. Client's intervention puts main contractors in a position that they need to manage suppliers with whom they have no previous relationships. The second interviewee referred to this problem and mentioned that this situation increases the power of suppliers against main contractor. It was seen in the literature (*see* 2.2.3) that this kind of supplier dominance generates a dramatic risk in the procurement process (Micheli, 2008) since the supplier takes control over the main contractor. It should be *vice versa*; the main contractor needs power in order to provide effective management practices.

In the light of the discussion above it can be concluded that client's intervention is a problem in terms of management as well. It is causing supplier dominance which is an undesirable situation for the main contractor since it causes loss of control. In order to prevent this, Costain should find a way to quantify the value it can provide to clients with its own suppliers; in this way a client can withdraw itself from imposing suppliers and let the main contractor deliver the project in its own way.

To sum up the theme, after comparing and contrasting the primary data and the literature findings, a refined form of the conceptual framework for supplier management is shown in Table 5.5.

Table 5.5 Conceptual Framework for Supplier Management

LITERATURE REVIEW	EMPIRICAL DATA		CONCLUSION
• Hard to align all players in the supply chain to a shared goal and maintain long-term relationships.	• Practitioners think that not aligning all players to a shared goal is a problem in the industry. • Education can facilitate the alignment of all players.	M	• Empirical data support the literature. • Since there are many players in the construction industry (designers, on site engineers, many suppliers), it is hard to align all these players to a shared goal. Education can solve this problem.
• Hard to monitor increased number of suppliers.	• According to practitioners, it is not necessary to monitor all suppliers; strategic and important ones are enough.	M	• Empirical data agree with the literature. • It is not necessary to monitor all suppliers, monitoring strategic and important ones is enough because they are the ones main contractors plan to work with again in future projects.
• Dependency on client's suppliers. • Additional suppliers without a management strategy. • Increased supplier power. • Poor management with client's suppliers.	• For practitioners, client's suppliers cause supplier dominance and this situation prevents long-term relationships	C	• Empirical data confirm the literature. • Client's suppliers cause a management problem for main contractors since they have no previous relationship with them. The necessity for using them also increases their power against the main contractor. This results in supplier dominance for client's suppliers and it is hard to establish long-term relationships under these conditions.
• Hard to develop close and long-term relationships with high number of suppliers and maintain that relationship with them.	• Increased supplier base with many suppliers is a fact in the construction industry however according to practitioners, it is necessary to develop close and long-term relationships with only key suppliers, not all.	M	• Empirical data align with the literature. • Apart from clients' suppliers, the industry itself has a fragmented structure with high numbers of suppliers in most projects. Therefore it is hard to manage high numbers of suppliers and establish long-term relationships. However, it is not necessary to treat all of the suppliers in the same manner. Close and long-term relationships should be established with strategic suppliers only.
• Senior management support that is necessary for long-term relationships.	• Practitioners think that senior managers facilitate long-term relationships.	C	• Empirical data approve the literature. • One of the barriers to long-term relationships is the lack of senior managers.
• Transactional relations are common with cost priority in the industry therefore monitoring mainly focuses on cost.	• According to practitioners, cost, delivery, quality and safety are the top criteria to monitor.	D	• Empirical data contrast with the literature. • Monitoring is not limited to cost; delivery, quality and time are also important criteria to be monitored.

C: Confirmed, M: Modified, D: Denied

5.7 Success Drivers

The objective for this theme was to find the key success enablers in the procurement of the construction industry. Unlike the other themes, this theme solely addressed the third objective of the study which was ‘To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function’. The discussion of this sixth theme, ‘success drivers’, is presented under five codes; effective portfolio management, early engagement, design and construction alignment, information sharing and standardisation, which are all success drivers.

The literature (*see* 2.3) showed that a project supply chain consists of several supply chains with multiple layers of subcontractors and suppliers (Kumaraswamy *et al*., 2000). The literature (*see* 2.3.1) also showed that in an average large project which is about £20 million, there are generally more than 50 tier-1 suppliers (Department of Business, 2013). In addition, there are also suppliers’ suppliers, designers, building and maintaining teams and several other players in the construction supply chain (HM Government, 2013). This complex and fragmented structure obviously brings some management issues with it. Therefore, effective portfolio management is critical in the construction industry. The interviewees also addressed the importance of this issue. However, the first and second interviewees said that Costain is not performing well mostly because QSs are handling the procurement and they have different goals to the procurement officers. The second interviewee thought that this could be improved with a centralised database. It was seen from the company documents that Costain is planning to create such a database.

Another barrier to effective portfolio management is last-minute emerging issues. This was raised by the first and second interviewees as a serious problem for effective management. According to them, the industry requires real-time management which can be defined as minute-by-minute rather than week-to-week management. By implementing a more detailed management approach and planning everything minute-by-minute, last-minute emerging issues can be reduced.

As for the effective portfolio management, in the light of the discussion above it can be concluded that it is extremely important in order deliver projects successfully in such a fragmented industry. Working with approximately 100 players in a project necessitates high management skills. If a main contractor can work with the same set of suppliers in different projects (if not all, as much as possible), management becomes easier. Therefore, Costain should keep its supplier pool as stable as possible. In addition, QSs represent a barrier to effective management. Procurement should be left to procurement officers, not QSs, and management should be done on a minute-by-minute basis rather than week-to-week. Moreover, clients should also be seen as part of the portfolio. Repeat work with repeat clients can facilitate effective portfolio management as well.

For early engagement, the literature showed a clear awareness of how important it is. It provides solutions before conflicts cause costly problems (HM Government, 2013) (*see* 2.3.2). The literature (*see* 2.4.1) also showed that top-level delivered projects with poor initial processes are more likely to fail than poorly delivered projects with good initial processes (Primo and Filho, 2012). Engaging suppliers as early as possible is crucial (Scotti, 2007). A recent good example of this is London's Heathrow Airport. Its £4.2 billion new terminal project was delivered on time and to budget by using early engagement strategy with all suppliers (Baily *et al*., 2008). In accordance with the literature, the primary data showed the importance of early engagement and this was also confirmed by the company documents. All the interviewees agreed that early engagement can solve many problems such as lack of visibility, high risks and quality issues by bringing the expertise of the suppliers into the projects before initiation. However, despite that awareness, the first and second interviewees thought that Costain is not at the level they desired. Especially in the water sector, there is a lack of early engagement. The second interviewee said that in the oil, gas and nuclear sector, they are trying to engage suppliers early when they have enough time.

As for early engagement, in the light of the discussion above it can be concluded that it is a critical problem-solver for projects, especially the large ones. It provides suppliers' expertise into the project before initiation and prevents several problems. Costain is implementing it to some extent in the oil, gas and nuclear sector but not in the water sector. It should be extended group-wide under a strict strategy.

For design and construction alignment, the literature (*see* 2.3.2) showed that it is vital to align design with construction because it is not always the case that a good design is constructible and design-based problems are frequent in the industry (Dainty *et al*., 2001). To give a dramatic example, the Scottish Parliament building was planned to be finished in two years with a total £40 million cost, but it took five years with a £431 million total cost mostly because of the 18,000 design changes introduced throughout the project (Baily *et al*., 2008) (*see* 2.3.1). The total cost was nearly eleven times greater than the estimated cost, mostly because of design-based changes. The primary data confirmed this problem. All the interviewees mentioned this as one of the root causes of the problems which the industry is facing. It is a serious problem for Costain as well. The company documents agreed with the importance of the problem; it was one of the objectives of the company stated in the documents. The first and second interviewees recommended having design in-house as a solution for this problem. This was actually proved within the company. Costain is facing many problems due to the lack of design and construction alignment in its water sector where design is done by external consultants, whereas it is not a problem in the oil, gas and nuclear sector which has an in-house design team. It makes the difference between two sectors in terms of design and construction alignment.

In terms of the alignment of design and construction, in the light of the discussion above it can be concluded that there is a lack of this alignment in the industry, they are not done with any consistency. Costain is facing this problem in its water sector however in its oil, gas and nuclear sector, it is not such a problem because there is design in-house in that sector. Therefore, Costain should have design teams in-house in its other sectors as well. Those design teams should work together with both the construction people of the company and suppliers.

For information sharing, the literature (*see* 2.3.2) clearly showed that it is generally inadequate in the construction industry (Li *et al*., 1999; Cutting-Decelle *et al*., 2007). However, the literature (*see* 2.4.5) also showed that high levels of information flow are necessary for providing integration (Briscoe and Dainty, 2005). In accordance with the literature, the interviewees mentioned the importance of information sharing and pointed out that it should be improved within the industry. The second interviewee thought that it is at a better level in the oil, gas and nuclear sector. This could be because procurement is done by procurement professionals in that sector and with awareness; they are trying to keep information flow at high levels. Whereas in the water sector, procurement is done by QSs and they do not care about information sharing or any other issue rather than cost.

As for information sharing, in the light of the discussion above it can be concluded that it is not at the desired level in the construction industry but it is one of the success enablers. It facilitates effective project deliveries. It is at a better level in the oil, gas and nuclear sector of Costain than in the water sector because QSs in the water sector do not care about information sharing. Therefore by giving procurement people the responsibility for procurement, Costain can improve information sharing in its water sector as well.

Standardisation is not an issue for the construction industry in the literature, although it was mentioned by the interviewees from the water sector as a necessity. Therefore, it can be seen a unique issue for the water sector. When the general industry is considered, projects are bespoke and require different assets each time. This makes standardisation extremely hard. However, in the water sector it is not that much bespoke. The first interviewee said that they are only dealing with clean and waste water in that sector. According to him, standardisation could be achieved for the water sector. In fact, one of the reasons for clients' intervention and selecting the suppliers was also standardisation. If a client who is working with different main contractors lets them select their own suppliers, that client probably ends up with various types of product for same functions. This would create many maintenance problems. Therefore, standardisation is necessary for the water sector. It can increase the effectiveness of the procurement function in that sector. It can also reduce wrong procurement by moving poor specification problem away.

So for standardisation, in the light of the discussion above it can be concluded that it is a success driver for water sector. It would be beneficial for every sector but the bespoke nature of the industry makes it difficult to implement to every sector. If it can be provided in the water sector, client's intervention could also be decreased. Costain is aware of this necessity and is currently working on that issue in the water sector.

To sum up the theme; after comparing and contrasting the primary data and the literature findings, a refined form of success drivers for procurement in the construction industry is shown in Table 5.6. All of the success drivers from the literature review were confirmed by the empirical data however reduced supply base, complex decision criteria and collaboration (as long-term relationships) were discussed separately under other themes so they have not been included in the revised success drivers list.

Table 5.6 Success Drivers for Procurement in the Construction Industry

LITERATURE REVIEW	EMPIRICAL DATA	CONCLUSION
• Effective portfolio management.	• Critical since there are hundreds of players in an average large project. • Stable supplier pool is necessary. • Procurement should be done by procurement officers. • Last-minute emerging issues should be prevented, a shift to real-time management is necessary	• The criticality of this driver is related to the size of the project; when it increases, criticality also increases. • In order to increase the effectiveness, there are some requirements. First, procurement should be done by procurement officers who are qualified for this job, not by QSs. In addition, real-time management should be implemented to prevent last-minute issues. Also, a stable supplier pool can facilitate the effectiveness of this success driver.
• Early engagement.	• It brings the expertise of the suppliers into the projects. • It can solve many problems before they become costly issues.	• This driver encourages suppliers to have a role which requires more than simply delivering goods or services. Their expertise is also necessary for effective project delivery. By doing this early in a project, many problems can be solved before they damage the project.
• Design and construction alignment.	• It reduces the uncertainty of projects. • Having design in-house can provide that alignment.	• Uncertainty is one of the root causes of many other problems in the construction industry. Design-construction alignment is very effective for reducing that uncertainty. It also reduces instantly-emerging needs due to design changes by keeping the design consistent. • A major enabler for that alignment is having design in-house working with construction in coordination.
• Information sharing.	• Plays a part in the integration of players.	• Information sharing is necessary for the integration of every player in the construction industry, such as suppliers, main contractor and client.
• Standardisation (only for the water sector).	• It reduces uncertainty and wrong procurement. • It decreases client’s intervention.	• Standardisation is a success driver unique to the water sector because the bespoke nature of the industry does not allow standardisation in other sectors whereas in the water sector, it is all about clean and waste water. • It can reduce the uncertainty especially in the identification of the needs, hence it can prevent time pressure and wrong procurement. Also, when the needs are standard, the client’s-own-suppliers problem can be solved naturally.

5.8 Conclusion

This chapter has compared and contrasted the results chapter with findings from the literature review. The same thematic structure as the results chapter was followed. With this chapter, the second and third objectives of the dissertation have been achieved. The next chapter, the Conclusion, will provide an overall conclusion to the dissertation and explain the results of the objectives.

CHAPTER 6: CONCLUSION

This chapter provides an overall conclusion by reviewing the objectives of this study. It also presents suggestions for further research.

6.1 Introduction

The overall aim of this research study was to fill the gap in the literature on construction procurement from the main contractor's perspective and to improve Costain's procurement function. In order to achieve this aim, the objectives of this dissertation were;

1. From the literature, to develop a conceptual framework of the procurement practices in the construction industry and to reveal the success drivers increasing the performance of these practices,
2. To refine and validate the framework through empirical testing with one case study in the Costain company,
3. To formulate a set of recommendations for the Costain company with the purpose of improving the performance of the procurement function.

This chapter first reviews the research objectives repeated above and explains how they have been achieved, and then discusses the value of this research study and makes some recommendations for further research. The structure of the chapter is shown in Figure 6.1.

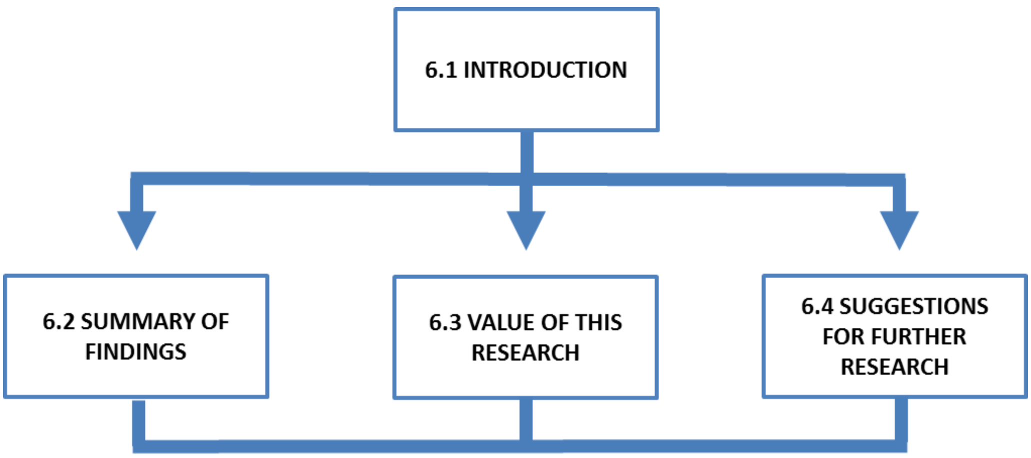

Figure 6.1 Structure of the Conclusion Chapter

6.2 Summary of Findings

Research Objective 1: This objective has been achieved in the literature review chapter. By reviewing the existing literature, a conceptual framework for procurement in the construction industry and a success drivers table were developed by combining the procurement literature with the unique features of the construction industry. It was seen that although procurement in the construction industry follows similar steps to other industries, the unique features of the industry affect the entire process dramatically. The conceptual framework and the success drivers table were shown in Tables 10 and 11.

Research Objective 2: This objective has been achieved in the discussion and recommendations chapter. By comparing and contrasting the primary data findings of the results chapter with the conceptual framework developed from the literature review chapter, that conceptual framework was validated and refined. In the procurement practices of the industry, the client's effect in nearly all steps and design based issues have been identified as prominent findings. Although the empirical data has confirmed and detailed most of the findings from the literature review, it has provided some surprising results as well. For instance, despite the strong agreement in the literature and the empirical data about the price obsession of the industry, the empirical data also showed that there is a great awareness of the negative results of the price obsession in the industry and this awareness has caused a shift from the cost criterion in some sectors to performance-based work allocation. It will probably increase in importance in the near future within the industry. All of the tested results were shown in the form of a table after each theme in the discussion and recommendations chapter.

Research Objective 3: This objective has been achieved in the discussion and recommendations chapter as well. By addressing the problems which the Costain company faces during its procurement practices and also identifying the success drivers, some recommendations have been provided for it. The root of several problems for Costain, especially in its water sector, is the quantity surveyors (QS). They are commercial people mainly focusing on price and omitting other factors. Therefore it has been strongly recommended that Costain should leave procurement practices to procurement officers rather than QSs. This and each of the other recommendations were presented under the relevant theme in the discussion and recommendations chapter.

Research Aim: The research aim has been achieved by answering the aforementioned research objectives. With this research study, both a gap in the literature about procurement in the construction industry from a main contractor's perspective has been fulfilled and valuable recommendations with the purpose of improving Costain's procurement practices have been provided.

6.3 Value of this Research

This research study's value is twofold. First, it has filled a gap in the construction procurement literature. The review of the literature showed that although there are various studies which have focused on the construction industry's supply chain and procurement practices, there had been a lack of comprehensive research into procurement practices in the industry from a main contractor's perspective. Therefore, developing a conceptual framework of construction procurement by combining procurement and construction industry studies and then testing it with empirical data from the Costain company has provided important value for the literature on procurement in the construction industry by filling that gap.

Second, it has provided recommendations for the Costain company with the purpose of improving the performance of the procurement function. Improvements in the procurement function of a company which is dealing with large projects in several construction sectors are obviously valuable. Furthermore, in order to provide recommendations for the Costain company, this study has also identified success drivers for procurement in the construction industry. Those recommendations are applicable to other construction companies as well. This has therefore increased the value of this research study.

6.4 Suggestions for Further Research

As already stated in the discussion of the limitations of this study, empirical data gathering was done through the main contractor, the Costain company, and suppliers were omitted. However, it was found in the literature review that, sometimes, a main contractor's and its suppliers' ideas might differ, even for the same issue (*see* Table 2.9). Therefore, in order to explore procurement in the construction industry in a more comprehensive way by looking from both the main contractors' and their suppliers' perspectives, it might be helpful to conduct a more detailed study which includes suppliers in the empirical data collection. In addition, this research study has focused on only two of the six sectors in which Costain is operating. Although this has provided the opportunity to contrast two different sectors, a more comprehensive research study could be conducted by including other sectors as well.

On the other hand, in this research study, the predominant effects of the client have been identified in the procurement practices of the main contractors. It might therefore be beneficial to conduct a research study focusing on construction procurement from the client's perspective. That kind of study could identify the factors which cause the client to interfere in main contractors' procurement practices.

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APPENDICES

Appendix A – Ethical Approval Form

Dear Mr Hazir,
Warwick ID Number: 1463024

Thank you for submitting your Supervisor's Delegated Approval form to the FT Course Office for the project: Procurement in Construction Industry from the Contractor's Perspective: Case Study in Costain Construction Company.

Your reference number is REGO-2015-WMG-0099.

You now have the appropriate approval in place to begin your study.

Please ensure you insert a copy of this email into the appendices of your project.
Best Wishes
Lucy Inman
Full-Time MSc Course Office - WMG
Quick link to website: go.warwick.ac.uk/wmgftmsc
courseoffice@wmg.warwick.ac.uk
+44(0)24 7657 4206

Appendix B-1 – Consent Forms

WMG Innovative Solutions

THE UNIVERSITY OF WARWICK

PROJECT TITLE: Procurement in the Construction Industry

NAME OF RESEARCHER: Deniz Hazir

I confirm that I have read and understood the provided information sheet for the above project, and that I have had the opportunity to ask any questions that I may have.

I agree to take part in the above study and am willing to have my involvement in the interview noted and electronically recorded.

I understand that my information will be held and processed to be used anonymously for internal publication for an MSc project, to be submitted for assessment for an MSc degree. I also understand that such anonymous data may be used for future research, including that for publication.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason without being penalised or disadvantaged in any way.

Name of participant ....STEVE FOZARD........ Date ...24/7/15...Signature ....

Appendix B-2 – Consent Forms

WMG Innovative Solutions

THE UNIVERSITY OF WARWICK

PROJECT TITLE: Procurement in the Construction Industry

NAME OF RESEARCHER: Deniz Hazir

I confirm that I have read and understood the provided information sheet for the above project, and that I have had the opportunity to ask any questions that I may have.

I agree to take part in the above study and am willing to have my involvement in the interview noted and electronically recorded.

I understand that my information will be held and processed to be used anonymously for internal publication for an MSc project, to be submitted for assessment for an MSc degree. I also understand that such anonymous data may be used for future research, including that for publication.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason without being penalised or disadvantaged in any way.

Name of participant LAURA BLACKBURN Date 20/07/15 Signature

Appendix B-3 – Consent Form

THE UNIVERSITY OF WARWICK

PROJECT TITLE: Procurement in the Construction Industry

NAME OF RESEARCHER: Deniz Hazir

I confirm that I have read and understood the provided information sheet for the above project, and that I have had the opportunity to ask any questions that I may have.

I agree to take part in the above study and am willing to have my involvement in the interview noted and electronically recorded.

I understand that my information will be held and processed to be used anonymously for internal publication for an MSc project, to be submitted for assessment for an MSc degree. I also understand that such anonymous data may be used for future research, including that for publication.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason without being penalised or disadvantaged in any way.

Name of participant ....JULIE TOWNLEY.. Date ...20/7/15.... Signature ....J. Townley

Appendix C-1 – Interview Questions

SUBSETS	QUESTIONS
PROCUREMENT STRATEGY	Do you think the construction industry has a fragmented structure? If yes, how do you manage a vast portfolio of suppliers as a result of that structure?
	Do you have a particular supply base strategy? (reduction in the number of suppliers for instance)
	Do you try to develop different types of relationships with different suppliers? (close with strategic ones, arm's-length with routine ones)
	Does your procurement strategy differ from project to project?
	How does the client affect your procurement strategy?
	What are the problems with your procurement strategy? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)
IDENTIFICATION OF THE NEEDS	Who is responsible for identification of the needs? How it is done?
	In the identification, is there a tendency for cheap materials and services?
	Do you think projects carry lots of uncertainties? If yes, how does it affect this step?
	Do you face procurement of the wrong items? If yes, what are the main reasons for that?
	Is there a standardisation problem for the needs? If yes, what are its effects?
	Is there a time pressure problem for identification of the needs? If yes, what is the result?
	Do you consider sustainability when identifying the needs?
	What are the problems in the identification of the needs? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)
SUPPLIER PRE-EVALUATION	If you agree that the construction industry is highly fragmented, what is its effect on supplier pre-evaluation? (There are several subcontracting areas and material groups in this industry.)
	What criteria do you use for supplier pre-evaluation and in what level of detail?
	When the price is considerably high, do you directly eliminate that supplier or prefer to see whether its other qualifications can outweigh the cost problem in supplier selection?
	Do you have any sustainability-based pre-evaluation criteria?
	What are the problems in supplier pre-evaluation? (unique to the water sector, unique to Costain, general for construction industry) (Can you provide examples?)
SUPPLIER SELECTION	If you agree that the construction industry is highly fragmented, what is the effect of the fragmented structure on the supplier selection step? (because there are several subcontracting and material areas.)
	What is the effect of the client's intervention on the company's supplier selection? (has its own suppliers or affects the selection process etc.)
	Do you select suppliers for each project or select suppliers from a pool and try to use them in every project?
	What are the five most important criteria in supplier selection? (depends on the project but what are the common ones?) Can you weight them (especially price and sustainability if they are in the top five)
	What are the problems in supplier selection? (unique to the water sector, unique to Costain, general for the construction industry) (Can you provide examples?)

Appendix C-2 – Interview Questions

SUBSETS	QUESTIONS
SUPPLIER MANAGEMENT	Do you have close and strategic relationships or simple relationships with most of your suppliers? How do you segregate the nature of the relationship?
	How can you influence the behaviours of your suppliers?
	When your client selects some of the suppliers, how do you manage relationships with those selected ones?
	Do you engage with your suppliers before project initiation? Why?
	Do you measure the performances project-by-project? Why?
	Do you measure the performances of all suppliers? Why?
	What level of information-sharing exists between you and your suppliers? (low, medium or high) Why?
	What are the problems in supplier management? (unique to the water sector, unique to Costain, general for the construction industry) (Can you provide examples?)
SUCCESS DRIVERS	Can you put in order these success drivers? (the ones from the literature review.)
	Do you think any of them has little effect?
	Are there any other important success drivers?
GENERAL	What are the other problems that you face in the procurement process?

Appendix D – Pre-Interview 1

28 MAY 2015 - BIRMINGHAM BUSINESS PARK – PRE-INTERVIEW 1

Pre-Interviewee 1 (S) – Head of supply chain in water sector

Deniz: I tried to find some information about Costain from web and read some publications. Is it OK to say Costain is a construction company?
S: We prefer to say engineering solutions provider. Construction is simply build something someone else's designed.
D: It's a limitation?
S: It's a limitation. It is constraint. And actually Costain does not get involved in projects that 4 or 5 people can do. If more than 4 or 5 people can do it, we don't get involved. We don't fit to work on price only, if we can add value through what we do, then we have something else. Because effectively all you working for is a tiny 2 or 3 % margin and that's not really what a company's growth is looking for. So, engineering solutions provider.
D: According to me, we can separate procurement in two different phases; one is between you and your clients, the procurement of the projects. The other one is between you and your suppliers. We want to focus on the second part, the relationship between you and your suppliers.
S: Increasingly holistic so it stands with what the supplier wants, what the client needs. And it has appointed us to deliver that, then 80% of what we deliver is via the supply chain. So we don't employ labour directly to do the work; we employ the programme management, the commercial management, the legal management, safety health environment and quality management to ensure that work is done. So it's not actually the Costain employees doing the work, we manage subcontractors, materials and mechanical, electrical and civil in nature.
D: So you outsource some parts of your projects?
S: 80% of it, yes. So effectively, we manage all the people to do the work.
D: So basically, our aim for this project with Donato is; first go the literature and develop a conceptual framework for construction industry procurement, then validate it with data and interviews from your company, then formulate recommendations. We basically want to go through these three steps.
S: Fine, what we are looking for the data is, the data that we can use in a visual, graphical format that indicates whether time or whether money is actually blocked or wasted potentially. So it is; where is the value that we can unblock in a supply chain. We got to look and see, we got to focus on you get your biggest. It's the Pareto isn't it? You know, 80% of your effort gives you the biggest benefit. 80% of our spending is with 20% of our supply chain actually. Generally it's true irrespective of which industry or activity you are in.
D: 80-20 rule.
S: Yes 80-20, Pareto. Let's have a look at where we can, is the one or two really key things that we can get right and transform on what we do. Focus our efforts on the really big things, two or three things to transform what we do in our supply chain.
D: So for projects, your major clients are governmental organisations or the private industry?
S: Combination actually. The company we have just been in, Severn Trents, they are a regulated business. So they work publicly owned. Because the control of quality of the water is a really important issue. They are regulated, after the tender through the OJEU process, Official Journal of European Union, so we are appointed in a kind of transparent process. So that somebody can challenge if they don't really, so we are the combination of primarily highways England diverse business. So we got a water sector, road-highway sector, rail, oil and gas sector, nuclear which is nuclear maintenance and repair. We've got six sectors splitting to two divisions, infrastructure and natural resources. So water, new build is classified as a natural resource.
D: Is it differ when you are working with government or private industries in terms of contracts and the flexibility of the contracts?
S: No. What is consistent is the lack of data and any engineering or construction activities generally predicate on a design, evolves throughout the life cycle of the project. So you don't start on day one with a clear indication: I want to build a building that looks like that and that's it. Things evolve and those changes due to client's requirements. Clients change their mind, they want to build a 700,000 square fold, than 1,000,000 square fold. So changes in the requirement, in sizes, usage within that as well so, and the design continually evolves and everything is designed from scratch every time. So it's completely sub-optimal. Particularly in water, do one product it's called H_2O, there isn't H_3O, it doesn't exist so you deal within the product and then within the waste. So we are only dealing with two products, treatment of clean water and waste water. There are some variables within that. Quality, hard water, soft water. It's not like different brands of coffee

with different tastes. It's just water, that's all it is. So we are trying to over-complicate this particular sector. It's a bit like rail. All you do within rail is to transfer goods and people from point A to point B. That's all. That is it. And all you doing within road, is getting people and goods from point A to point B. And that is all. In this country, we are not geographically diverse really, we don't have massive mountains, vast deserts. It's pretty mundane and fluctuates between 0 and 3000 feet of sea level. Generally, it's not a harsh environment really. But mature is to make it really complex. It usually double the cost to build in the UK than is in mainland Europe. So we need to know why that is.

D: So can we say even clients don't change the requirements during the project, the complexity of the projects are also source of data frustration?

S: Yes, we can talk about our approach after that. If you tell me about your...

D: I just prepared some questions.

S: No it's good, it starts the base, isn't it? What's the...

D: Are you using a centralised procurement approach in the headquarters or do you have different units for different projects for the procurement?

S: We have a fragmented approach. We have a really good supplier relationship management tool. I think it's really good. It is industry leading. We are trying to use for what we are doing and what I've been has to do, only...

D: Is it a special tool for you, that tool?

S: It's unique to us. I can share a copy with you actually. So you understand what we talk about. We use it in, what we call it B2B meetings. So we have strategic relationships with the main suppliers. We meet in a regular basis, have discussions, talk about the issues, talk about performance and look at develop improvements, however, that supply chain, what you have is effectively, in a mature organisation is that you tend to buy on price. Maturity one, you are buying on price, this coffee is 2.25, in café over there it is 2.20. I choose this one, I like the taste of it, I'm prepared to pay for it, and this is where we are getting to a quality argument now. So centralised-decentralised; we have some functions in Maidenhead (headquarters), put some deals in place for indirect stuff like company cars, energy, photocopies, like some commodity materials, so we have some.

D: Not core ones?

S: Yes. And I'm still trying to determine whether they're mandatory, compulsory frameworks or whether a project can choose to do something different and return the flexibility. That's the journey I'm currently on. I've been on it for two weeks, this is my second week on it.

D: I've also read you separate suppliers by verified, preferred or strategic.

S: Yes we do. That's fair to say we do. We segregate them via the relationship rather than via the procurement ownership. That segregation is via relationship mechanism, not a value mechanism. Am I making sense there? It is based on the notional value the we spend more money with them within the meeting, it is not focused on commercial value, it is about how do we feel about, it's more about feelings and state of the relationship rather than a key and commercial edge, that's why I would really like to know how much money is that supplier making Costain. We're spending money with them, spending time with them, how much profit we are driving from working with them. That's then I think we will have a lightbulb model , because it could be spending time with the wrong people, rather than with the people actually making a lot of money for us. They are over here, we are not spending any time. Is that concept making any sense? Just because you spend money with something doesn't mean that delivering profit to you. Fulfilling the function but we don't know about the quality, safety, how much profit there are, every B2B is to make profit. If they are delivering a profit for us and we could know that then we could perhaps transform the way we interrupt with people. I feel then what we do is right. It might still be dealing with exactly the same people, but for at least we would know what we don't have is a great deal of data as you are going to find out. You are going to see a lot of data but it's not massively well formatted throughout the business.

D: I've also read that you are checking your top 100 suppliers' performances quarterly.

S: Yes but it's the question of, you can check and monitor, but what do you do with it? That's the big question for me. Meeting you and chatting to you is fine but if you don't benefit, and meeting in three months' time, chat again, where is the value? That's where I feel there is a disconnect, describe it as a value gap in the, there is some value to be here, there is a relationship here, but we are not talking about this bit and between. That's where the money is. The money is buried there, we are talking about how we feel, we are not getting under that, lift up, so that relationship becomes effectively. It is not a value based relationship. It is valuable because they are talking to us and we are talking to them but could argue that, while we are talking to them, one of our competitors can also. Do you understand that? While I'm talking to you, my competitor can talk to you at the same time. What I want to do is add the maximum amount of value to the timeline, in that supply chain management, we could have larger emphasis on delivering value. So I've got something I need to send you, our SC strategy.

D: So there is a gap there?

S: I think there is a disconnect, there is a gap. This is about feelings, how you feel; this is about what we think about each other, do you respect costing, am I credible, are you credible, do I respect you. So that's got value. And I'm not dismissing it. But really, the value we are all here for is this. That's it. Can I get it cheaper, quicker, safer, what can I do gives me more certainty and what can I do to actually ensure that you make more money as a supplier I was talking to, and could I ensure that I make more money by giving more time to you. That's more suppliers, make claims that we want to do X, Y and Z to save you money. Great. But I don't see where the money is. We chat, that conversation is worth 500,000 pounds, do you know what I mean, we don't quantify things in terms of how much money you as a supplier making for. I'd like to do that. I've got an idea of few things blocking that.

D: In the literature there are a lot of papers about partnering approach. What's your opinion about this approach? Are you using it, and if yes are you including the suppliers also?

S: Yes. I'll give you a couple of big background first, so you can understand who I am and what is driving me (first document: Construction 2025). There is more than these couple of document. It is quiet light. Construction 2025, July 2013, so it's nearly 2 years old but it's to 2025 so it's effective for ten years. The important thing to understand from this is, we have a group within our business, to looking at, that's the vision, people, smart, sustainable, growth. Anyway. That is important. Cost benefit 30%, get this coffee for 1.50, instead of 2.25.

D: Are these the government's expectations?

S: No it is the government's and ours. This is not written by the government and we are told what to do. We have contributed to this as a sector, as an industry. So we have come together with government.

D: So this is the aim of whole construction industry?

S: Yes. But some people working in construction don't even know that exists. So it's a bit like the best research paper in the world but lying in somebody's drawer somewhere. This is something I have on mind.

D: Also the environmental sustainability is gaining importance, in every industry in fact.

S: I'm talking with some guys from Edinburgh, they are doing an MBA, and they've got three weeks to do a road map for Costain on carbon reduction. I understand, I got a second talk today, 4 o'clock. Time is faster, doesn't it, cause you know, can we do it, yes , let's have a chat, when meet again, tomorrow, right, you got two weeks to get this report and then roadmap. So it needs to be 50% quicker, so, 50 % faster. If humans evolved to have two arms, possibly, it is not going to happen, is it, so we need to fundamentally alter what we do.

D: And this is a whole supply chain issue. You should be consistent in every aspect.

S: Well there are couple of things we can do. One is we can vertically integrate, which is a supply chain concept of, I own the steel mill, I own the robot factory, I produce the engines.

D: Ford

S: Ford did right. That's vertical. Our concept is virtual engineering, so it's virtual. So it's time to your question; do we engage the suppliers? We have a group called Costain Factory Thinking Group, and we meet every two or three months to discuss the ideas and concepts with them. What we want to know is, say we build that building, what is in that building? How many tiles, how much glass. What we want to do is, we build an asset or something, we want to use product pyramid from the automotive sector so that's the asset, that's the building; that's the sub-assembly, so could well be that counter or fridges could be sub-assembly; component that could be a coffee table; and that's parts, so this table has got a top and this base. It's got three parts that makes a component, that's sub-assembly tables and chairs, and the asset I've got a restaurant. So what we want to know is how much does it weight, how many components in total so the bill of quantities, and we want to know, this is the important part, once you get how much each of the components are, what you really know is this is the biggest one. I like the discussion at the moment in the UK about productivity and how poor we are. So haven't improved for years, France and Germany are significant, and better than UK in output per person, so what can we do to increase our output. So it's the time. How do we reduce time? If we reduce the time, we would reduce our costs.

D: So is time, for you, the key enabler to increase productivity?

S: Yes. If you buy time, you lower your costs. We can argue all day about how much a cup of coffee is. But if we change it to I buy this and go, I'm doing something else. I'm driving, I'm doing something else. We are not very good at managing projects and programs. So maybe this is the correlation between government projects for instance. How many over-budget and over-time. We can do it. If you look at the Olympics in 2012, it was built on time and budget. So we can get it right. But we don't always get it right because of poor specifications. Something else I want to share with you is another that drives me (second article: Game changing trends in supply chains). University of Tennessee. Game changing trends in Supply Chain. You can find that. That contains some really important concepts for me. All these people here are cleverer than I am. So why wouldn't I listen to them. I always refer to the construction report 2025, because if I say I believe, I want to do something quicker. The government is written the report and that's what we got to do. We've written it with the government. This isn't a report they imposed on us. This is actually written by the president of the institution of civil engineering.

D: So he knows.
S: Yes. He has approached different companies within construction. And what we need to do is a common problem which is projects never on time and budget. How do we stop that? The important point about the construction is, the global construction sector is going to grow by 70% in the next 10 years.
D: But projects never go on-time and budget
S: Yes. Never. They are not always delivered on time and budget. I don't know what the figure is. It's about 60 %. You've got unhappy clients. And then unhappy client is likely to go somewhere else.
D: From the general point of view, it's not the lose only in that project, you lose a lot more things.
S: Yes, you lose your brand, your reputation. Would you really want to lose future? So we do engage with suppliers and we do have a factory thinking group. In construction suppliers want few things, early involvement, visibility of demand, regular communication.
D: So suppliers want these?
S: Yes, and as a supplier to the client, we also want. We work with a lot of business with quite few frameworks. Certain amount of work to do in certain areas for certain period of time. The exact nature of it is unknown. What we really need is visibility what the demand is, if we have visibility, we can transfer that to our supply chain. What tends to happens, our client wants to know that we have appointed the supply chain and then three quotes and buy the cheapest. That doesn't give you value. Simply means, if you buy a cup of coffee for 50 p, are you going to like it, probably not. Am I going to like it, probably not. So what is on to buy the cheap? That's where we are. A lot of our clients are very price-led. They don't understand the value, or actually, I think it's probably most of them. So I say two things contradictory. One is our clients want the cheapest but they also wanted to be safe, high quality, less environmental impact, no impact on my customers.
D: Especially if the client is government, they only go for money.
S: Yes absolutely. However I think they would buy value if we could quantify it. Because we are incapable of quantifying it, they don't see any reason why they should buy it. So what I actually see is, we are incapable of interpreting what that value is. So they only buy on price because they know that we can't quantify the value. Every three months we have regular meetings with them but the main question is, so what is that mean to me? Where can be quicker, where can be cheaper, where do you improve your productivity? And there is a big problem in construction about quality as well. If this coffee was cheaper, I'm not having it. In construction quality control is not really delivered. If you had a car and wouldn't start, if you have a building and the air conditioning doesn't work, you get somebody to fix it. You wouldn't reject it. You've got people and it gets fixed eventually or maybe never, but just come out with a building. It was hot in the summer and freezing in the winter, it wasn't very pleasant. So the quality within construction is not really delivered. Every single project would be 100% error and fault-free. If we can do that, we don't have to spend any time going back.
D: You already mentioned but I took some notes for the procurement methods for projects such as the traditional method, design and build, framework agreements, construction management. I think you are probably using construction management because it is for large and complex projects in which design and construction occurs simultaneously.
S: Well we got design and build effectively. We tend to manage the build, the design certainly within... We have got design team in Costain but a lot of design that happens within construction -this is a real problem- it's done by external consultants. So a lot of work what we do is common. If it was the water sector, the problem is slightly different sizes with the slightly different shaped angles. Every time, every single time, it's different. What we are trying to develop is a range of standard solutions and standard products, because our clients just ask to transmit water from point A to point B. That's all it does. Within that, sometimes there are some size constraints, floor constraints, chemical processes that go on. This is a process design needs to reflect what's happening but we have an army of people altering things, timely demands. They are getting a lot of money to do it. They are getting back value every time. Because it's less and less to go for, because the design, design is consistent every single time. The time it takes and the cost is almost predetermined and set by the design consultancy. We are designing it, we are dependent on design from either a partner or a design consultant by the client. We don't always design. We do sometimes, we do sometimes design and build, in oil and gas we design it and build it. In water we don't design it and I don't know where the value is. In the overall project, how much it weights, how much time and cost for design of the asset, I don't know. If I knew, if that was planned in design time, if I knew the cost that amount way to design something was relatively low value, actually I need to get that down. I just build the same thing. I'm not going to change it. Not make it slightly smaller. I want the same thing. That's it. We have complexity within the design that's built in. A lot of time burnt, initially in changing design over time, additional cost.
D: Is your clients giving the design and build separately to different contractors or you take whole project and give design to your subcontractors?
S: Combination of both. Sometimes it's ours, sometimes it's the client's. Not an easy answer but it is the answer. There is a disconnect there between the design ability and build and constructability. If you can design something, it does not

necessarily mean it functions well. The ergonomics might not be right. You could argue that these guys (Apple) get design right. They make 9 billion dollars a quarter. That's their design. Whereas you could say these guys (Nokia) failed, Microsoft bought them because this is (Nokia phone) rubbish. Does not work as well as that (I-phone). So within construction we don't have that link between design and function. We're trying to, how to describe it? When you look at the life cycle of a project, the construction phase could be 2-3 years. It is the space we operate generally. Could be longer, could be shorter. There is a feasibility phase and there is the design. What we are gonna do, how feasible is that design. But there is a longer period which is the maintenance. So effectively you got a year of concept, a year of design, you got to run it. Sometimes on projects that take longer to build, you have to operate longer as well. So we operate in this space. In order to make margins there, tiny. There is a higher margin here, bigger return, there is probably even bigger margin here, and there is maybe small returns annually from the maintenance. But, that plus that plus that plus that means, that's your operating cost, is huge. So effectively what we want to do is to move in that space, design capability. If you rely on that, you've only got your current state, but effectively you need to look at as well as a how do you break into, you move both ways, you start design, and somehow get a contract in highways and maintenance. If we put a road, you got sub base there and a top layer there. Now if we found this is more expensive to build a road where the sub base there, top base there but potentially an additional layer there, it would increase the cost but it wouldn't require as much maintenance so if we can brought in those kind of contracts where we were responsible for longer, you could build more of the capital there, capital cost to offset a reduced operation cost.
D: Can we say this is not shifting to maintenance, rather it is shifting the profits into construction which were in the maintenance?
S: No. I see where you are coming from. What we are trying to do, we are not in the space where we design, build, maintain and operate. We are trying to get into design and build, if we can get into design and build and maintain, great, but we are not in there now. Not entirely. What we want to do ultimately is get into this space (maintenance and operation), this space (design) and leave that space (building). Because there the margin is just reduce, reduce, and reduce. Here, pretty consistent. If you come with a good idea, you can make a lot more money.
D: Yes, design is the winner in many industries now.
S: Yes, that's where the real value is. That's where we are trying to move to, in order to get to there, we need to understand this really really well. You can't move into that unless you understand this. And I would argue, we don't really fully understand.
D: So you are not doing any design now?
S: We are doing some, but minor relative to... What I would like to know is how much? So, overall as a company, we turnover... what I would really want to know is how that is split from. How much of this is design? Where is it? If I knew how much is it materials that would really help me. So what is our spend on what we are buying? Where is it? If we are spending a lot on materials, we can negotiate the price. But that is not allowed to go up. Because it is a commodity the price is well-known. We should be reasonably efficient. I'm not saying we are. I'm saying we should be. I don't know how much is internal, how much is external. I don't know but I'd like to. How much, you know generally it's like that, labour. That's generally the construction supply chain. I don't know what it looks like. Once I've got that, then I can start looking at is it mechanical, civil, electrical. I really like to know. That would be very helpful. Have another meeting, another chat when you want.

D: Especially when I start to develop my framework, it will be more clear what kind of data I need exactly.
S: And then there is a question how we've got the data you need, in the format you needed. We can provide data. We've got a lot of data but I would argue we don't have a great deal with it. I can share some data from the company I used to work with. I would love to get from where we are now to there. That was September 2013, actually going back two years in time would bring me forward massively.
D: So we talked about the clients' effect in the supply chain.
S: We do have to incorporate some client specified products within our asset, so within the asset the client may specify which product they want. Not all the time but they might do. That's particularly relevant in water. They say you have to use a pump from this supplier. We have to ensure that component fits into the asset.
D: When you think of the steps in procurement like supplier selection, evaluation, negotiation etc., do you think one or some are more important or challenging?
S: I don't fully understand Costain process, not involved in it. I don't understand it. So would be helpful to document what the current process is and then see if that's consistent across the group to see if there are any variability, what we are looking for, are we looking to consistent policy, procedure and process supply chain and procurement. So what we are looking to is to ensure that suppliers get treated in the same way. Interpretation of what that means, but if the template says this is what you do. If you choose to interpret it differently, it should be written in a way that you can understand

even though you've never seen it before. So I think supplier selection is all right. I have a concern about how we engage that supplier, what the procurement process is actually needs to be appointed. Is it just on price or we incorporate quality, carbon, innovation, safety. If we're buying suppliers on price, are we gonna be safe? Might be, might not be.
D: For some materials, only price might work but not for all.
S: But if it's the subcontract of the labour, then it is the quality of the person. So is there a link between price, quality and safety? My previous experience tells me there is, I know, if you buy cheap, the quality isn't that great, the safety isn't that great either, so why would you buy on price if it's gonna heart somebody. Because in IT you might not get an email on time but in construction or engineering, it could kill somebody or seriously danger somebody. So why would you run that risk.
D: There is a famous saying in Turkey, I'm not rich enough to buy the cheapest.
S: I liked that one, I will use that. I like those kind of sayings. We don't buy the cheapest in our lives, we don't go and buy the cheapest of everything.
D: For contracts, do you consolidate the needs and procure them or procure separately for each project?
S: It's fragmented and I'm trying to understand it. I don't understand it and I've been in touch to understand it. So we manage the relationship within procurement is inconsistent or it appears to be. I would be staggered if is consistent on the versus that, that kind of alignment rarely happens in nature. So I would be staggered if Costain defeats entire laws of physics by being completely aligned and coordinated. I think, what we really want to do is to understand the complexity of our supply chain and try to find a solution to the selection, appointment and management of those suppliers. The management of them is quite good but we need the commercial edge. We get the commercial edge by the correct appointment process. And we get to right selection by understanding what the hell is we need. We are not very good at it. We need to understand the connection between, what point you need something and what point you can say somebody to do something. So it's a question, I've got the need now, I have to appoint then, I start on Monday. Is that gonna give me the best process than saying I know what I need, I've got three months to appoint and I've got 6 months to start. Am I going to get a better result there than there. And at the moment we are there all the time, every day, we are doing this every single day. And we are wondering why we are not getting anywhere. It's something universal, a common problem.
D: Do you use a warehouse or a distribution centre or you deliver everything in JIT approach and only procure goods when necessary?
S: We have some projects, if you look at London Bridge Station in London, where we are building a platform underground using pre-cast concrete segments. We are delivering product to a railway station in London, our logistics is going to fit, arrive on time, and it's got to be required programme and delivered. We set most deliveries after 1 or 2 in the evening, and 6 o'clock in the morning, we get all deliveries in. So we have to do really good. I need this this afternoon, I need this tomorrow, and we are constantly on the phone looking for stuff for tomorrow or today, not next week or the week after. We don't monitor production on a minute by minute, hour by hour basis. We built projects in weeks, months and years. We don't build projects in seconds, minutes and hours. Time concept again, isn't it? How long will it take to do this? Oh, 2-3 years. Ok. Not 3762 hours. Wouldn't it be great to know that?
D: Great but very hard.
S: I know but if it is hard and somebody else is not doing, that's why we are looking at. We got to try to address this kind of issues.
D: Ok, I asked all of my questions.
S: The issues described are not unique to Costain by the way, it is same for all construction industry.
D: So you don't have any unique issues, problems with procurement different from other construction companies?
S: Same. I think what we need is that the data to tell us.

Appendix E – Pre-Interview 2

18 JUNE 2015 – WARWICK – PRE-INTERVIEW 2

Pre-Interviewee 2 (L) - Supply chain manager in water sector

Deniz: I want to learn Costain's procurement processes.
L: Will it help you if I send you our supply chain strategy here?
D: Yes it can help.
L: Ok. The procurement is done within two ways. The materials and plant procurement is looked after by plant and materials buyers, and the subcontract procurement is looked after by QSs.
D: So you mean, different people are responsible.
L: The procurement isn't done traditionally here. So traditionally you would expect all of the procurement is done by a procurement team and they would look after materials, plant and sub-contract. But here in Costain what they do particularly in water is, they have material and plant buyers or people they are trained to procure plant and materials and sub-contracting is done by QSs. QSs are quantity surveyors. They manage cost here. So they look after the subcontract procurement for us.
D: You mentioned the procurement in the water sector. Is it different in 6 industries you are operating?
L: Yes, very different. It's very complicated. They do it different within each sector in Costain. So rail is more traditional. They have a material, plant and subcontract buying team. All in one team. So the distinction between the quantity surveyors and buyers is that the buyers report into an accountant and the QSs report into the commercial director. So different goals.
D: Is it right to say the procurement of subcontractors is more important?
L: Subcontractors should be done by the procurement team, not by the commercial team. Because the commercial team are only interested in cost, not best value or health and safety or quality. They have different drivers from the procurement team. So building long term relationships with subcontractors that have dealt with quantity surveyors is very difficult. Because it is generally a commercial discussion.
D: And their focus in other sides?
L: Exactly. Their focus is entirely different to what we would focus on. So that was kind of a core issue here. In rail, the procurement of plant, materials and subcontracts are done by the procurement team, not the QSs. So the contract is agreed by the procurement team, all terms and conditions, quality, health and safety all agreed by procurement. And QSs are managing the day to day cost of the contract, not the procurement of a contract. That's a really important distinction.
04.16 D: Is there a major difference in the performances of those two sectors?
L: There would be a major difference in terms of performance. So here, one of the key issues that we have is retaining subcontractors. So originally we decided we want a collaborative relationship. So long term relationship, provide them clear visibility for the next five years. Agree common terms and conditions at the beginning of the process. That was not happened. So we lost trust. So we went through the whole process over a space of a year and building relationships. And then the commercial director is had a bit of rethink about the strategy. That caused major issues with the supply chain.
D: It is different because the process is different in two sectors of the same company. Why senior managers don't see this?
L: Here, even I'm responsible for the supply chain, I'm not considered as a procurement manager. The procurement buyers do not report into me. The QSs do not report into me. So we are affectively trying to give advice that nobody have to take.
D: Interesting. Is it right you are the supply chain manager for only water sector?
L: I'll leave here on Friday and I'm going to oil and gas and nuclear. And I'll have a different role. So I have a subcontract background but it isn't used on water. Because QSs do the subcontract procurement. So quite confusing.
D: And first interviewee told that you are giving suppliers and subcontractors nearly 70-80% of the whole project. Can we separate them, is it more subcontractors or suppliers in terms of value?
L: The problem we have got here is that a lot of materials and plant are in agreements with the client. So Costain does not have an agreement with that supplier, Severn Trent has an agreement with that supplier.
D: So they force you to procure from specific suppliers?
L: Yes, exactly. So they are giving us a list of maybe three suppliers of each product, pumps or screens or something like that. And then our buyers will go to these people and procure those bits of plant or equipment. The only areas where that is not the case are mechanical, civil and electrical subcontractors. And they are the ones that looked after by the QSs. So

we build a relationship with them as supply chain managers. Ultimately, the QSs make the decisions in terms of the contracts. So that's why the process is broken.

D: And you said they take the cost as the only criteria?

L: Yes. All they are interested in is just cost.

D: But in the long term, it might be more costly

L: Exactly, small minded. Of course the cost is always important but it shouldn't be the most important factor. The contract that we were to on here is very rigid. So the subcontractors can't claim additional time or additional money. They can claim additional time but not necessarily additional money. Because the contract is written, the only a substantial process change wanna talking about process, they are talking about the whole water treatment plant. So somebody delivering civils for example, if he prices for a stone road, and the client wants a tarmac road, it is very difficult to justify the additional cost. Because, they as a competing contractor should have said do you want a stone road or a tarmac road. We are very good at playing the game as well. We are commercially very aggressive. So a lot of the subcontractors get stuck for additional cost. For example, if we procure materials but don't deliver them on site, they find it very difficult to claim for the lost revenue for not being able to work on the days as a result of that delay. So it is a very difficult commercial agreement for subcontractors. So they rely on the supply chain managers to help them, trying to solve commercial issues. We have a lot of commercial issues.

D: Can we say for the other four sectors, it is the same case?

09:18 L: No, not necessarily. I'm not too sure about oil and gas and nuclear but what I do know is that we have a procurement team with material, plant and subcontract buyers. So I can only think that that's more traditional and I assume that that is a better way of working. The same for rail. They have materials, plant and subcontract within the procurement team. The other water company, they have materials, plant and subcontract within procurement team. That's unusual for water. So we are trying to support the guy that's managing the procurement at the only water framework where is more traditional to make sure that he is successful. So we can say then to the other business, look this is what we should be doing in water. This will have better results. But it is very engraind.

D: Let me check my questions. In the documents you will send, can I see a structured procurement process, like step 1 – step 2 etc.?

L: We don't have one of those. I can just print off for you. Do you want me to draw it for you?

D: Doesn't matter.

L: So you need to know what the different steps are. So the procurement process here is quite complicated. You've got the client agreements which are frameworks. So you've got client agreements with tier-2s. Tier 1 is Costain. You have our group agreements. We have our specialist civil, mechanical and electrical. So we have buyers of plant, materials and we have QSs. They do the subcontract client agreements. STW is the client. They have their own procurement team. Their procurement team go up to tender for tier-2 agreements that we have to use. They manage those frameworks, we don't even see the terms and conditions or the rates which is very unusual. We send a tender to one of these companies and they send us back a quotation. Severn Trent audits that tier-2 on a regular basis. That's the only assurance we've got that the rates give are the right rates. I've never heard of that before, ever. So they audit, we have no visibility of terms or rates. So the buyers of plant and material, they generally procure via the group agreement. So the other things like aggregates and heavy machinery, that's our staff. And the subcontractors and STW client agreements are done by the QSs. So the buyers report into the accountant. QSs report into the commercial management. So it is very disjointed.

D: Is the accountant part of the procurement team?

L: No. Accountant is just the accountant. That's why it is unusual that the buyers report into him. The buyers should really report into the procurement function. And subcontract QSs and the buyers don't communicate. Any benefits, leverage etc. is lost because the buyers create a table which goes to the accountant. That doesn't get showed to anyone else in the framework. The QSs keep their own records that goes to commercial. So what I'm trying to do is come up with a universal report which looked all of the buying that we did.

D: So the procurement team can't see the buyers' report and QSs' report. They see nothing about the process.

L: No, no control. So we have no say, no visibility of what happens. There is no planning and programming. They place orders for the equipment for next day. It's very inefficient.

D: So where is the procurement team's role in this process? What are they doing?

L: Not here.

D: So nobody here in water called procurement officer or something like that?

L: No.

17:45 D: This is for water. In rail?

L: Rail is different. Oil and gas and nuclear I believe are different as well. So they have the traditional procurement set up. Everything is centrally procured effectively.

D: First interviewee also said procurement process is not consistent within the group
L: No, right. We have a supply chain function and a procurement function in the group. But those are not joint either, not connected.
19:00 D: For rail maybe if not in water, do you keep some certain subcontractors in a pool or something like that and work with same subcontractors in different projects?
L: I'm sure they would do. I'm sure they have a list of preferred suppliers. We have key trades within Costain. So a key trade is a company that works in more than one sector. They are the business critical, we have a high value of spend with them. They become a key trade. So we have key trades throughout the group. So in every single sector, we have key trades. As supply chain managers, we are responsible for the performance and relationship with the key trades. So when they want to deliver a package of work, we should asses it and recommend key trades and other suppliers from our preferred list of supply chain that we've got. And that is what generally happens in other parts of the business. But that's not what happens here.
D: So I had a lot of questions about supplier selection but you said it is different here in water.
L: Different, yes. We have a pre-qualification process. But it is not really a process. It's all very loose here, how things are done. But essentially, if somebody wants to be approved, the QSs will send them a link. Then they submit all their documentation which goes to the relevant health and safety, quality, commercial, operational departments. They review all the different documents, accreditations, ISOs, that kind of stuff. And if we believe that they are a good company, have all the right accreditations in place, got good experience working in that area, can provide some sort of benefit to work with us, then they become a preferred supplier. And people ask them to tender for some specific works. And then after a period of time, if they are successful, than they hopefully integrated into the system. So we have a financial system called E1. It lists all of our suppliers. We also have a space on iCosNet, which is the webpage for Costain. Anyone works there can access all the preferred list of suppliers with the different categories. So technically, people should go on to the system, for a typical type of work that need to be completed and see a list of suppliers with contact names and numbers, and they should go to them first. Should be introducing new suppliers consistently and it should be an analysis of who we already have and what the capabilities are, not just open the float gates and you know prove lots of different people consistently.
D: Do you know which criteria they are using other than cost? Not in water, in other sectors.
L: The criteria is, they do health and safety check, so do they have an health and safety manager, policy, have they had any accidents or incidents they have gone to the HSE, was there any investigation, findings.
D: IS it only a check or they weight it?
L: It is just a check. It's not a weighted criteria. Yes or no. Do you have this policy, yes or no? Do you have a management system in place, yes or no? They'll ask you to provide cost information, turnover, any prosecutions, non-payment fines, anything like that, all different policies and procedures. Make sure that you've got everything in place that they assured. Dou you have an ISO 9001 or other accreditations. In oil, gas and nuclear, on top of that, depending on what we are prequalifying them for, it also goes to senior engineers , designers to specifically check the competence for that particular part of the criteria. I don't know if that happens here, if someone involved in that process. But they do that in other parts of the business.
D: So if two suppliers pass this process, there won't be any difference between them, they will be just confirmed.
L: Yes
D: Your webpage says there are two ways of selecting suppliers; accreditation scheme and questionnaires. Can you explain them?
L: Ok. So if people are in LinkUp, there is a system called Achilles. It is a verification website. And that one is weighted. So essentially, suppliers across the different industries submit all their information to Achilles. Achilles hold an essential register.
D: So it's a general database.
L: Yes. But some big clients are affiliated with it. So people like network rail will only work with suppliers if they have this particular registration. What Achilles do is go out to different companies and they audit them. So what we've said is if companies are UVDB, which is one of the sections within Achilles, or building excellences, if they have that particular accreditation in Achilles, then we can approve them on that basis. If they don't have that, then they have to fill in a prequalification questionnaire, which is the process I've just explained to you.
D: Do you use any segmentation to separate your suppliers?
L: Yes we have verified, preferred or key trades (strategic). So we've got three segregation. People just coming into the company would be verified, preferred are slightly higher, they might have delivered some projects for us and delivered them well. We had a certain range of spend with that particular supplier. Strategic or key trade would be somebody we have a collaborative long term relationship with. So our civil, mechanic and electrical should be strategic, key trades. Because we know that we have 5 years within spend. So it makes sense we do early contracts and involvement, take

benefit of their experience, and have a long term agreement with them. The preferred and verified are probably, the verified at least are one off orders. It won't be a long time.
D: But it is a separation about the suppliers. Not about the items or needs of Costain. Do you have that kind of separation also like strategic, routine etc..?
L: Civil, mechanic and electrical are strategic. Because we've got 5 years framework, over the 5 years, you will need all three of those. It would be a strategic agreement because we need them and we need to maintain that relationship. The verified guys, wouldn't be. You need a fence putting up, we are not gonna have a strategic relationship with a fence supplier. We just gonna use it when we need.
D: So, do you have these as a structured framework? Or you just decide when the work comes?
L: So when we start the framework, we know that we've got requirements like civil, mechanical and electrical. That would be highlighted as a strategic requirement. The verified wouldn't be a strategic requirement. So we just use them as in one. But that would be considered. So the verified guys, they are placed with the QSs. So they just have a list of people that they are verified. The preferred and strategic are looked after by the supply chain managers. So we have B2B meetings with them. We do 360 performance management with them. So we report on each other's performance. We spend a lot more time with them in terms of the relationship that's where the supply chain managers commit. So that's how they are treated differently. And the key trade guys don't get a lot of one on one time with the supply chain managers and had a supply chain for group. So they get more meetings, more sessions, we talk to them about what else is in the pipeline, we really try to keep those guys informed and as part of the team. We treat them entirely differently.
D: Do you have any prioritization for local suppliers and subcontractors?
L: So we do work with SMEs. We have something called the supply chain academy. So we have a preferred list of strategic, verified all that sort stuff. But obviously if we are working on the Shetland Isles for example, it wouldn't make sense to take companies from the mainland over to the island. Obviously at that point we are looking at SMEs in the local area. And if there is a business that we can work with and develop, that is part of our strategy, wider group strategy. That something we like to do. We always do that in the first instance. If we find that they are quite small, and they have got an appetite to grow, and we are gonna be there long term, then we would direct them through the supply chain academy. Academy gives businesses really basic and innovative information about how to run a business better. It is one on one presentations with a small number of SMEs. We give them tools effectively to enhance the business and make easy to work with us. So SMEs are hugely important within our group strategy. Not so much here.
D: Do you consolidate the needs for procurement or do you procure separately for each project?
L: They should but they don't. They work project to project. I'm sure in other parts of the business, because it is done by the procurement team, I'm sure they consolidate. Because they have data and able to speak to each other about different projects.
D: Do you stock materials?
L: We don't have that facilities. Because we procure either through STW framework agreement, we wouldn't procure stock from them. We don't have any ability to buy and gain or anything like that agreement is very very clever for client. It makes it very difficult for tier-1 involved. With regards to anything else we procure, that would be via group agreement, so that would be things like aggregates, now I'm sure we will have orders or agreements in place with people like who provide aggregates whereby we could have some in stock. But I don't know. Certainly not on here, we don't do that.
D: In the procurement process, do you have different approval levels for some threshold levels?
L: In terms of order value, that will be. I don't know because I don't do any of that. But of course I'm sure they will have to have sign off. For oil and nuclear and gas, I have to sign off the procurement buyers and subcontract buyers orders. That I do know happens. But here, because I'm not directly involved with that, I'm not sure. I can't imagine that there wouldn't be sign off. That would be crazy.
D: But it will go to the commercial manager.
L: Exactly.
D: You don't have dedicated employees for procurement.
L: No.
D: And you don't have senior manager level in procurement.
L: Not here. But in Costain we have procurement managers. I know it is very confusing. But for some reason, in water, we don't run a traditional procurement.
D: And in your webpage, it says you measure the performances of your suppliers quarterly.
L: Yes we do. If they are verified, the performance is done in isolation. So the QSs will go on the system, fill in a form. The supplier never sees it. Nobody else does anything with it. If they are preferred or strategic particularly, then the supply chain managers will do the performance. And other team will invite the subcontractor into the office or go to them. We'll invite their operational team, project manager, the QS, and collectively we'll discuss the supplier's performance and then

we'll discuss Costain's performance. That's very effective way of doing it. Because any niggles going on can be resolved quickly and if you don't do that, sometimes what you find is they never ever meet which is disgusting. They only do this by email or phone call but never face to face. It's crazy.

D: We talked about the problems generally but do you have some specific problems in procurement?

L: In water specifically, because the QSs do the subcontract procurement, they are going out to the market, they agree in the terms and conditions, they are setting the contract, they doing the start of the meeting with the subcontractor, and then when they actually get to side, there then managing all the cost associated with that contract, what sometimes happens is, the commercial guys play everything very close to the chest because they are trying to achieve a buying gain. When the subcontractors start the work, they find that it is not as they thought it is gonna be, it is not as agreed, so we have quite few commercial disagreements. So the subcontracts find it very difficult to get paid for the things, they believe they are working on this basis, but then actually find they are working on this basis. So it is quite different. What we are told consistently is it is a really big learning curve, so for example as a procurement person, if you set on with a subcontractor, you'd be talking about health and safety, you'd go through all the different policies, you'd talk about the works, the design, you probably meet with the designers, meet with the teams, understand who the project managers were, you take them through the work , make sure that they understand the commercials, and the bids of the contract. So they could account for that, make sure that included within their cost, because all of these things have a cost associated with them. What happens when you have the QSs doing that process, is all of that other stuff that we talk about where there is a cost associated they tell not to do. So will just give them a drawing, solely introducing to the team. They won't go through the bids of contract that were owners to them. In some cases they might purposely not discuss bits of the contracts that they are owners to the subcontractor. They will take the position that if you are not ready, that's your problem, I'll send it to you. Whereas as a procurement person you would say you need to be aware of this and you need to be aware of that. Because the problem that we've got is, we take a long term view of it so we want that company to stay in business to remain strong, to be successful, not have any health and safety incidence, make sure the quality is as it should be. And if you've got that relationship, when you start that relationship on the right basis, that generally happens. If you start our relationship and you feel like somebody has deceived you or not giving you important bids of information that have an effect on your cost, makes it very difficult for the subcontractor to deliver on the cost that they originally quoted. So that is the biggest issue that we have here, because people are approaching the procurement from different angles. It has massive effects in terms of quality, health and safety and cost.

D: And sometimes you need to change the subcontractor during the project.

L: Exactly. So what our framework director was, I understand his point of view. He is looking at all these different jobs, and he has got all these costs associated with that job. And there is a QS that could go into him and say: If you work with company A, I can save you £20,000 before we even start because their quotation is £20,000 cheaper than company B. Or, what I'm not telling in this is not on a like for like basis because the design hasn't progressed enough for it be on a like for like basis. You've got a person who isn't operationally qualified making decision on whether quotation fits the scope. And then you can't quantify the additional man hours for Costain to manage that subcontractor, because if they are cheaper, they probably got less management in place or not as many processes or procedures to safe guard their workers. So you've got an additional cost for Costain. It's not considering the fact that if the subcontractor finds that actually he has been drastically under solved exactly what in he has to do. He is gonna try and recoup his money in some way so that could have an effect on quality and then the worst case scenario is tries to deliver the work with less men. And that could mean a health and safety impact. So it's difficult, everything that we do as procurement function is unquantifiable on day 1. But the QS can quantify very clearly on day 1, savings that they can make.

D: Sorry for confusion and asking same questions. You said that here in water, STW is deciding for subcontractors. But also QS are looking for the subcontractors??

L: No, STW have got their approved people that we have to use. But the mechanical, electrical and civil, those 3 categories, we can make the decision on as Costain. They leave that decision to Tier 1s. Mechanical, electrical and civil are the main subcontractors that we use. Anything else is very minor. So we occasionally do a bit of fence work. But generally what we do, if there is anything like that, we'll get the civils' guy to do it. To incorporate in their scope. So civil, mechanical and electrical really are three main subcontracts here in water. So the supply chain managers, because civil, mechanical or electrical, at the beginning of the framework, they would know that they would be the three key areas, they would fall into a strategic arrangement because from a perspective of securing supply, value of spend, criticality, they are the major people. So the supply chain managers would go out to tender, possibly they would select different suppliers for each category and then the QSs would only be able to place orders with the suppliers that we have told them that they can use. So we would give them probably three in each category that they can go to. And what we tried to do here is allocate the work for next five years to those key suppliers in each of those competences.

D: It is happening in other sectors, not water.

L: Yes, that will always happen in all sectors. For that in particular, if there is a strategic requirement, those suppliers are managed by the supply chain managers. And in different sectors, we have much more power or authority to enforce them. In water, we had a lot of push back. So they didn't want to use the suppliers that had been given, they want to use somebody else. They want to use the person just down the road. So there was a lot of resistance and that's because here the QSs and the commercial function have got quite big presence so it's very difficult to try in, advice or provide any kind of best practice because they are kind of setting the ways in a silo mentality. And so, they will try and find all kinds of different ways to overall any decisions made by the supply chain managers.

D: STW chooses what, QSs do what?

L: QSs do the verified. If there is a bit of fencing or something like that, the QSs can choose anyone for that. They just look on the verified list for a particular trade. But for strategic, it's got to be the supply chain managers. We tell them who they can use.

D: Ok but you also said STW says you have to work with these suppliers?

L: That's the client agreement. That is just specific to here. Just for Severn Trent. The reason they did that is many years ago, when they first started in water, the client had a number of different Tier-1s. And they had no agreement with the Tier-2s. So what happened was the Tier-1s went all of their suppliers so Severn Trent ended up with lots of different process plants with lots of different variations because they used different suppliers. So if you think about that from a maintenance perspective, when they are going in and trying to change a light bulb for example, the likelihood that they would be able to do that in one was zero. Because every different tier-1 had used a different kind of light bulb and so Severn Trent ended up with something like 150 types of different lightbulbs. So to try to control that and limit the variations that they all had, they stipulated who we could go to.

D: What about other sectors. Why other sectors' clients do not need that kind of standardisation?

L: Ok, so, I think you will find that in different industries where you've got clients are working with more than one tier-1. If they are working only with two, then I would suggest that's probably not the case. But Severn Trent as a client a very switched on. So I would predict that you would see a lot more of that in future if a client is working with more than one contractor. It makes logical sense that you would limit different variances. Standardisation is the best way to drive efficiency.

D: Is there any other important specific problems?

L: No, nothing I've exposed to, not in Costain. But I've only worked in water for Costain for 16 months. A limited amount of time. So I've got quite amount of exposure to Costain.

D: There is a problem about experienced staff?

L: I think it's across all industries. Recruiting experienced and skilled people is always difficult. And retaining them in the business as well.

D: Do you have a problem like over depending to a single supplier?

L: Yes we do. Because they don't do as a team, not even as a procurement team, they don't share intelligence. One of the biggest issues we've got here is that they split the operations into three operational hubs. All of the hubs are only interested in their hub. They are not interested in anybody else. So the risk of overexposing a subcontractor is really really high.

D: There is a matrix in the literature, about supplier-buyer relations in terms of power. What's your idea about this?

L: Here, we've got a lot of supplier dominance. And that's enhanced by the Severn Trent agreements. So if you consider that we don't see the terms and conditions or the rates, which puts the supplier in a very preferential position. So we have a lot of issues with supplier dominance here. And because the water industry, there isn't lots of suppliers anyway they can deliver it, that gives them even more power. So in some instances you've only got two companies that you can go into and they split by the six tier-1s. So if you think, security of supply is very difficult.

D: In the water, can we say it is 80-90% of the project that you deliver via suppliers and subcontractors?

L: Yes, very high percentage. We are management contractors, that's all we are. Only management staff. Project managers, QSs. We have a joint venture with a design house, MWH. Everything else is subcontracted.

D: So the alignment of the design and construction is a very big problem, right?

L: Massive problem. We are not working collaboratively. Part of the reason, the commercial aggression and QSs are doing the procurement, this is part of problems, so unfortunately, we tried to rebrand us as SM6, because before we were Costain and MWH, SM6 supposed to be Costain and MWH together. But some of the old fractures are still there. So, they worked for five years in almost isolation, in a bit of blame culture, Costain blamed MWH and MWH blamed Costain. It's not a healthy relationship.

D: Is it only in water? That company?

L: Just water yes.

D: But other sectors might have the similar problems?

L: In oil and gas and nuclear, we have our own design, Costain design. Others outsource the design.

D: Non standardisation of the products and materials is an important problem according to the literature, right?

L: So, first interviewee has been working very hard on standard products. He is trying to get client agreed to standard products for strategic buying areas. Part of the problem is, possibly some of Costain is a little bit more advanced than the client in some cases, so Severn Trent have an all bells and whistles , approached things. So if you went to a supplier and said Severn Trent in cost us £1000, it only cost you £500 if you were another water company, why is that? They'll say because they like a pink button or a purple screen whereas the other supplier will just have a black button and a black screen. So they like additional things. Trying to get the client to agree what the standard product would be, it's been a massive undertaking for first interviewee and his team. That coupled with the fact that people within our business have not supported standard products. So if the standard product team have asked for spend information for example, so that they could conduct some analyses. That has been very difficult to hold up. If they ask for experience, technical people, provide governance to the scope, that's been very difficult for them. So the whole standardisation has been really difficult to achieve because both the client and the contractor have made it difficult to happen.

D: Is first interviewee also working for the water sector?

L: Yes, first interviewee works for the whole of the water sector but he spend a lot of time on Severn Trent working with the standard product team. He is kind of day to day running. He can talk to you actually in great detail about the tendering process the guys went through. All the scope, assessments, technical governance that they have to go through in Severn Trent. The internal policies within Severn Trent made it very difficult to agree what standard products would be. Issues they had, getting the standard products signed off, so we are the procurement team, a proper procurement team over at Severn Trent. I think they spend something like a million pound. And still don't have anything to show for. That was because the guys were really hard to believe proper category strategies for each of the standard products. And they had to be signed off by all tier 1s. Once that happened, then they have to go to market and start getting information, data gathering ready so that they could produce the tenders. That whole process is taking over a year which is a long time. Not procuring anything, still working on the project.

D: Literature also says there is a lack of visibility and proper information in the entire industry. So in the beginning of the project, you cannot plan the procurement effectively.

L: Still being designed. The problem that we have here is that, Severn Trent have a budget that they have to spend, they look all the projects, plans, all the jobs that need to be done, and it goes to a comity and they say: I think we can leave that for another year. Projects have to go through feasibility. And this is the whole process they understand exactly what needs to be done. Essentially what we do here is maintenance. Very little new built goes on here. It's all about maintaining the assets that Severn Trent have got. So this feasibility process is all about assessing the different plants, understanding what needs doing and then doing an assessment about what they can actually built. So that takes really long time. And sometime projects go through feasibility and then go back again. Severn Trent, on a number of occasions taken a project through feasibility and given the green light for the built and we could be progressing through the design, and the project gets polled. So it is a very inefficient way of working. Because that happens, the contractors are very reluctant to start procuring materials because unplanned pieces of equipment because if the projects gonna get polled, that's all expenditure they try to recoup from the client. So it becomes a very long process. It makes it very difficult.

D: What about relationships with suppliers?

L: For strategic guys we are working with, I've seen the benefit of having them involved early, so the early contract involvement, their expertise they bring to table, so you are not going to sign and then redesign to get the benefit their knowledge upfront. I'd be more concerned about the suppliers we don't spend time with. For the strategic ones, we spend time. And I think there is real benefit in doing that.

D: So you engage them before the contract, before the design, before everything in fact.

L: Before everything, yes. We get around a table, we tell them what we are trying to do, and we make sure we get them both in with the design team at the right time so they can make decisions about build ability. Because obviously what you don't wanna do is spend six months design and project then get the specialists of the contractor on site and say: well if you had just put that there, that would have saved you a million pounds. And it's important that you've got all the strategic guys there because moving a road might save a million pounds for the civils' package and might increase 2 million pound for something else. So for me, spending time for them adds real value.

D: Is there also a problem with specification of the needs in procurement? And you procure wrong materials as a result?

L: Yes, we do that a lot. It's an issue on projects. There are a lot packages that work with inadequate design, because obviously as I said earlier, it's very difficult for subcontractors to claim additional cost. So you've got to ask the question: I will be in very very silly or I will be in very very clever.

D: Industry is price-led.

L: Yes, price led.

D: In the literature, most mentioned feature of the construction industry is its fragmented structure.

L: There are many interferences.
D: I found these features as the major issues for construction industry (in my literature review)
L: (In addition to them) I think poor planning is a major issue in the construction industry as well. So we are absolutely horrendous at planning and management of programs is shocking. Lots of projects come in overtime and that means extra cost. Quality is also shocking, we have lots of defects. That I believe is a product of commercial aggression, because people are recouping their losses. They work in smaller teams, they use substandard materials. Because they are physically cannot build it for what they thought they could.
D: There are some drivers for effective practices (ones I found from the literature)
L: (Confirmed them and added) I think clear processes and procedures as well is really important. Not having people doing it with their own way.
D: Do you think that a general procurement process can work for all of the sectors that Costain operates in?
L: If you believe like I believe that procurement should be done by a procurement team, then yes it can apply across all the different sectors. If you believe that procurement can be done disjointed like is here, then you wouldn't say so. But having specialist procurement people procuring packages of work is got to be the right way to work.
D: Do you think that this kind of criteria for evaluating the suppliers is beneficial? (Criteria in the literature review)
L: Yes. I do think that a weighted score would be useful but having said that somethings have got to be yes or no. So if they don't have a safety management process, or don't have the relevant ISO or 80001 accreditation, then for me, I wouldn't necessarily want to work with that company.
D: Of course in that kind of table, you can add them as musts. Also, I've read a case study, contractor, client and suppliers and subcontractors collaborated, met before, during and after the project and they achieved great improvements. It seems very easy, so why?
L: None of them is difficult but for some reason we just don't do it. People do not communicate in construction. That is the problem. Only by e-mail or by phone. They don't meet face to face.
D: And they met in the construction site in the case study.
L: Exactly. For me, if you've got a team of people working on the project, you should as a manager go to that site and make sure people are ok. Even 10 minutes, not difficult isn't it. It's not complicated.

Appendix F – Interview 1

24 JULY 2015 – WAKEFIELD – INTERVIEW 1

First Interviewee (S) - Head of Supply Chain in Costain's water sector (January 2014 – now). 5 years' work experience with another construction company before.

Deniz: Do you think that the construction industry has a fragmented structure affecting the procurement?
S: I think it does and I think that's because you've got some large construction companies that primarily subcontract and subcontractors by their nature tend to be regional and local rather than national.
D: How do you manage that vast portfolio, I'm asking from the strategic perspective?
S: That's one thing we are trying to address in September because my view is that we don't handle that particularly well within Costain.
D: Sorry but how should I consider your answers? For Costain in general or particular to the water sector?
S: Costain in general. I think if I answer across the group, there may be some slight variances but not much.
D: If your answer is particular to the water sector, could you please mention it?
S: Will do, ok. With regard to the strategy and managing support we don't have a documented approach so that for me is creating some problems because if you don't have a plan how can people who do have involvement in your function deliver our understanding. If it is not documented it can change day by day so it needs to be deliberate and it needs to be thought through and it needs to be progressed against your objectives. Your objectives need to be tracked, measured and we are not currently doing that. If you don't have three or four key objectives what you are trying to achieve in that year you will end up by the end of the year doing some stuff that might be the wrong stuff and it might not actually improve the matters and it could possibly get things worse.
D: Do you have a particular supply base strategy?
S: We don't, which is something we need to so group wide we don't have that. We think we have a hand on it, which is worse because we don't. We don't have consistent data. We don't make good use of the data we currently have so within Costain group in the water sector it is unknown how many supplies have we got. I would like to change that but I can only change that once I have got the facts. So once I know, then I can start doing something about it but at the moment, I have got more questions than answers myself. So that is what I am trying to change so that we are having a meeting in September that we'll try and document our approach as a group and as sectors so that they are aligned into 2016 so we are looking how many supplies do we have, how many do we need, what services and goods do those suppliers provide us with and we can build up more information on how those suppliers are actually performing for us; are they delivering on time, are they delivering on budget, are they delivering safely. We have got scraps of information but we don't have a coherent picture.
D: Do you try to develop different types of relationship with different suppliers?
S: Yes we do. We are quite good at the relationship side. We are good at supply chain management. Well I won't say we are good at supply chain management, I would say we are good at supplier relationship management. We in Costain call it supply chain management and I disagree with what we are classifying it as because what we are good at is handling the relationship with the supplier but we are not very good at setting out plans in conjunction with the supplier and without commercial colleagues and our operational colleagues so there is a gap that needs joining up to make us improve our performance and this lack of awareness for me is a bit odd, it is rather striking. For instance yesterday the relevancy is we were out with 50 or 60 suppliers walking, talking. Four hours with them but we don't sit down with our colleagues and commercial and operations to develop an end to end approach so there are some significant gaps for me. Our procurement and our supply chain activity are disconnected.
D: So what you are doing is narrow right?
S: It is quite narrow and it focuses on individuals and how they feel so it can be quite subjective rather than objective. So we can have suppliers who are performing well because we are measuring the wrong thing. We are not been entirely honest or candid with ourselves and if you don't ask yourself that question you will always be doing really well because that's how you say so. If you are asking the wrong question you get the wrong answer. And what we are doing at the moment for me is we are asking the wrong questions, we are getting the wrong answers and we are kidding ourselves better than we are and we are not delivering value through our supply chain at the moment for me.
D: I'm asking to justify my interview, how do you know the processes in the whole Costain group because you are working for the water sector?

S: I have been trying to push and promote consistent procurement policy right across the entire group and we are now looking at CIPSI accreditation which is the Chartered Institute of Procurement and Supply. If we invite you the rules than nobody knows the rules better than we do so we can ensure that we can align the business and give the business what they want by documenting the process that everybody has to follow and at the moment our process is a little bit random that differs from project to project and that can be confusing for the supply chain, confusing for our staff and our colleagues and our clients so it sends out mixed messages.
D: Is the strategy differ from project the project?
S: The strategy is barely defined. There is an absence of strategy currently. There is an absence of the vision, there is an absence of the strategic plan that gets delivered and yet we are still performing reasonably well. So if we have a clear vision and a well thought-out plan and strategy and we deliver it, our performance could improve considerably I feel.
D: What are the other problems in terms of procurement strategy?
S: I feel that procurement is not always undertaken by procurement professionals. In construction it is always done by Quantity Surveyors (QS). They focus on the cost.
D: Is it for water sector only?
S: No, construction as a group, construction as an industry actually. So you could say industry, group and sector. It is the same.
D: I asked because L told that it is different in oil, gas and nuclear sector. It is done by procurement team there.
S: Ah ok.
D: But you say it is a general problem for the construction industry.
S: I think it is this lack of awareness of what procurement delivers in supply chain. 80 % of what we do generally gets done through supply chain. Now if 80 % what we do is, then where is our chief procurement officer? We don't have one. Where is the supply chain director? We don't have one. So I don't think we will be alone in construction. You have a lot of industries that don't attach enough importance to the supply chain as it stands. The question is how do you promote awareness if the value of having strong supply chain brings through what you see as risks, improving profits, continuity supply etc. etc.
D: Who is responsible for identification of the needs? How it is done in a project?
S: We tend to look at how we have done it before.
D: So this is if there was a similar project right?
S: We use the historic information generally compiled on spreadsheets to give price data so a lot of projects will have common features and it will have certain price attached so there will be estimates made. Part of the problem we face is that if we don't involve the supply chain early enough we could make wrong assumptions so effectively we assume it needs xyz but actually it doesn't, it could be done in a different way, so we can either underestimate or overestimate. We seem to be very good at doing both but not great.
D: Is it also identification of the volumes, the types of products in addition to identification of the price?
S: Yes, and effectively it is identifying the right providers of that good, those goods and services you need. There is a problem in that traditionally. We have an estimating function that price is work up traditionally.
D: For the identification, is there a tendency for cheap materials and services?
S: There is an almost resistance to change. So it is almost 'we have done this before, it worked, that's what we are gonna do'. So it is almost like this is how we have done it before, it worked; we will carry on doing it this way. So there is a resistance to new techniques. I think that is not about the price or relative cheapness. It is more about familiarity with the goods, service, concepts, methods, methodology or approach. It is less about the actual price but more about this is how we have done it before. And it is this unwillingness to adapt to new methodology or approach or trying to evaluate it or even consider it in some cases- it is how big this problem is.
D: Doesn't it limit you from discovering recently introduced better value products? Maybe for the new cheaper products?
S: I think there is an obsession with price actually. If we paid more for something that got it quicker, for instance if you could get a train that took 30 minutes instead of an hour and a half, you would be willing to pay more for it because time is a commodity. I don't think enough attention is paid to the time aspect. We have a lot of guys who have a lot of mechanical and electrical equipment. We will employ a mechanical engineer and an electrical engineer and give them a box of bits to assemble whereas we could have that thing readily assembled, delivered to site and you just built it down and way you go. You don't do anything for that.
D: Do the projects carry a lot of uncertainties?
S: Uncertainties, yes there are. We often start projects. The client changes the scope. The clients were obsessed with starting projects on time but we are not very good at planning projects steadily so that when we land we are productive from day one. We are obsessed with getting a cab into site, getting some security, getting some fencing, getting some stuff and starting work without really thinking it through, planning it and delivering it in the most effective way.

D: So how this changing of the scope by the client effects the identification of the needs?

S: There are emerging needs, changing needs. We start projects where the design is incomplete, it evolves as we are on the site and we tend to be anxious to deliver what the client wants, and in our anxiety to give them what they want, we sometimes met problems for ourselves and that's supply chain because we start off doing one thing and end up doing another and that's where I've given a comment about where the scope has changed. It should take longer; it should take less time to do. And that's where I think that's where a lot of problems arise.

D: So it is not the client's changing mind causing problems, also the design right?

S: Design has actually changed. Either they do that or they change the requirements so they start down a certain route as an outline design and occasionally the design can change completely. Occasionally elements get modified either through the designers' changing their mind of their approach and we tend not to go to site with a fixed design, with a fixed cost, fixed idea of how much it is gonna be and when it will be ready so it is quite elastic and we seem to accept that. We are more accepting that in construction. You don't build a car and think I am gonna build a hatchback and then end up building a five door instead. In construction you start with a three bedroom detached and end up with a five bedroom detached. So that's difficult.

D: Do you face the procurement of wrong items?

S: Occasionally. I would say that it is a question of incomplete specification. We sometimes don't know what we want until we have got it. We are good at telling people we didn't want that. We are not very good at telling them this is what we want. So we have incomplete and weak specifications.

D: What's the main reason for weak specifications?

S: I think there is a lot of people changing their minds, people doing things differently and we are not great at delivering and everybody being happy. It tends to be a change in specifications, a change in budget, a change in design causes complexity and problems arise then.

D: Is there a standardisation problem in the industry?

S: Yes there is. Within water we try to address that, we are bearing in mind in the water sector, we are only dealing with two products, water natural or waste and 26 different clients in water sector and they do at least 26 different ways of tackling the same problem whereas what we are trying to do currently is trying to work with some of the clients, identify standard products that can be delivered again and again. So we are close to landing it that with Trents Water, looking to do that with other client as well. So we are trying to address that particular issue so that you can: how much it is, how long it takes to deliver, where it is coming from, when it will be ready and everybody is happy. It just makes sense so why we wouldn't want to do it all the time?

D: How this problem affects you?

S: Increased time spent on design, everything is bespoke. If everything is bespoke, there is potential to get things wrong. If everything that you do is different then it is more difficult to operate. If everything is different, spares become an issue. If everything is different you are introducing new safety risks. So if you have consistency you can become familiar and it becomes easier so you can do things faster, cheaper, safer and it is just a problem that reflects the water sector. It could reflect to others as well. I feel great certain it's a common issue in infrastructure sectors but why not adapt and spread best practice common approach across the industry? It just seems bizarre.

D: Is there a time pressure on you from the client or suppliers also?

S: There are always time pressures. I think that if we can handle a project early and on budget we would have happy clients. I think our clients are sometimes guilty of being incapable of making decisions so they are unable to make timely decisions. They are very bureaucratic, they often delay making the decision, or opt out making one full stop, for fear of making the wrong decisions and that adds into the time we have to actually build it. The time we have to build it very rarely extends, achieving the time we have to do something contracts so it is an issue.

D: How this time pressure affects the identification of the needs?

S: As an industry we are very good at fire fighting. We are very good at creating problems for ourselves, then having to solve the problem quickly. There is almost like a hero status, causing the problem and resolving it rather than delivering professionally. So we don't put enough emphasis on best practice being consistent, giving people praise and credit for delivering on time and on budget. Our focus is sometimes on awarding kudos to individuals or groups that have been faced with a problem that potentially was foreseeable and avoidable, that being given credit for resolving it and if you praise someone for making a problem, well you are likely to bring that same behavior. If you get praised causing problem and resolving it, you may make more mistakes so you can resolve them again. I am not saying that is always the case. What I am saying is it is more of a conspiracy but I am certain about how willing people are to put the effort into get thing right straight away rather than, if there is a problem I'll do when it arises. We are quite good at dealing with last minute emergencies. It is almost like an urgency addiction. We are addicted to the, oh it's gone, I have a tight deadline, I got to get it right.

D: So the industry is experienced for last minute issues?
S: I think so. I do feel that means we don't plan effectively, we don't carry out valid or accurate risk assessments without putting people at risk, put them in danger. I don't think that is acceptable.
D: Everything emerges at the last minute.
S: That's when risk creeps in because you are doing something that you are not planned to do, you have not done before, you are not aware of it, certainly there is an accident. That is regretful because it is avoidable.
D: When you plan at the last minute, what's its affect for wrong procurement?
S: You could say that perhaps the all industries prepared to turn a blind eye. Let's not deal with that problem, they don't want to confront reality. I am not saying it is bad across the entire industry but it seems to be a problem people are unwilling to address. Where is the appetite for ensuring that everything gets done and it gets done to the plan? I am not so sure to see that demand.
D: Do you consider sustainability while identifying the needs?
S: Yes, I've now got the responsibility for sustainability in the water sector. I think sustainability is very important within supply chain because we can reduce waste and we can recycle products, we can ensure that we are profitable so there are more facets to sustainability in the simple environmental tick in a box but as it is subjected, a lot of people are prepared again, prepared to leave to somebody else assuming somebody else will pick it up. I feel if we adapt the right solution in the first place we should be more sustainable as a business. I mean sustainable means getting the right first time as well.
D: So should it start with procurement?
S: Absolutely. You get a quality. Quality is an important facet for sustainability as well. With the right quality, you get the right result.
D: For the identification of the needs, are there any other problems?
S: I would say specification and bespoke is done with the post construction, I would say that last minute changes introduced issues but I'm not so certain as any evidence that suggests that letting a contract on the Friday afternoon, starting on the Monday leads to accidents. But I would be surprised if there wasn't a correlation. I don't think that enough emphasis is placed on monitoring quality, defect price and safety performance. There is a lack of that kind of approach.
D: For supplier pre-evaluation, what's the affect of the fragmented structure of the industry? There are many different areas for supplier pre-evaluation.
S: I think we are reasonably good at doing this. We do discriminate with our supplier selection process. We have a pyramid where we have suppliers who are strategic, we have suppliers who are verified and we go through a European wide selection process called Achilles, so they go through a database where they have to answer a range of questions about their health and safety, quality, performance, financial strength etc. and they are audited. So effectively they are known but they are evaluated fairly but from there, if supplier is regional or local to project, we have a, at project level, we can also go out and undertake some basic questions that they have to respond to, we have to ensure that we are happy with their responses before we put them to work. So we have strategic and approved which is consistent of list that I would like to take things off from the project level to ensure that there is complete consistency across the sector and complete consistency across the group. I'm not actually certain that at the moment, if the supplier performs poorly, it might still be working with us for another project on another sector. We don't have that complete end to end visibility, some people may arguing about, I haven't seen evidence that proved that.
D: For pre-evaluation, which criteria do you use?
S: A lot of emphasis is placed on quality, a lot is placed on competence and technical capability. A lot of what goes on construction is centered around previous experience doing that typical type of work. We do look at health and safety performance, we do look at sustainability performance, we do look at their capability as well, capacity. We also look at their financial size. It's no good point of £3 million a year turn over business on a £2 million a year contract. The cash flow would just kill them. So you do take number of factors into consideration. I feel that evaluation is reasonably well addressed, not perfect but reasonably well addressed.
D: In the pre evaluation, do you directly eliminate the suppliers offering high prices without looking other qualifications?
S: It depends on the range of the price. If it is 5 to 10%, then you will perhaps have a look at that. And then see whether that is a price that's worth paying. If it is 50 %, it could be a supplier doing this deliberately because they are too polite to say they don't wanna work. Or the price is high and they are hopping they don't get it, but if they get it, they'll let somebody else do the job. So it's a tricky question. Price is a factor that can be negotiated or discussed. I certainly wouldn't throw somebody out on it. I would have at tender evaluation stage, but not at supplier evaluation stage or any contract award. So price becomes effective but if they can perform, they got the right quality, they got the right capability and they've got a great track record, or potentially it is a high risk or a high value project, it can be a price worth paying. It always depends on how much we estimated which is not we are always fantastic at. In the first place, it could well be a high price but it is affordable still.

D: Is sustainability a pre-evaluation criteria for you?

S: It is yes.

D: Do you eliminate suppliers which are not capable of providing sustainable solutions?

S: Not yet, but in 12 months' time, I would like to think that if suppliers are not members of the 'Action Sustainability Supply Chain Scoring' or that they are not able to demonstrate a culture that shows they are aligned to sustainability well, I think we should edge them of our supply list. We are not there yet. We are working towards.

D: Are there any other problems you want to mention for the pre-evaluation?

S: I think it's about ensuring there is a level of consistent approach so that suppliers feel that they are treated fairly. I don't think a supplier would have a problem in not being selected for a project, if we feed back to them areas where it need to improve. Provided it's not another five years before there is another project similarly they can quote for. I think they'll accept the fact that they had been given some feedback and it was in their best interest that they had been given the contract too. I think the worst thing you can do is not telling suppliers why you haven't selected them. They just don't know. I feel that's poor relationship management. If you tell them that why they have not been successful, that may not accept it but at least they'll know whereas if they just don't hear from you, they don't care filling the blanks with their own interpretations.

D: For the actual supplier selection, what is the effect of fragmented structure?

S: It can lead to very low performance. Some of our subcontractors are not actually capable of becoming any bigger. They are as big as they can be. You know there is a problem in, there is only so much work to go around and if they take on too much work, they could fail to deliver. If they don't deliver, you're less likely to use them again. So it's about having a balance really. I just feel that the consistent approach, consistent evaluation and consistent analyses of their performance and by talking to them about their capacity, their capability, you can reduce the risk from supplier failure by doing that.

D: You mean it should start with a robust strategy in the beginning?

S: It starts with what is it you want to say how to do. Once you know what you want to do when you need to, you select the suppliers who have best capability for delivering that, and then you need to talk to them regularly to ensure that they know what your plan is, and your plan can be adjusted. A plan that fits for next twelve months is fine but you know a plan shouldn't be so fixed that it's not possible of being changed. However a plan that changes week to week is not a plan either, is it? So we need in a clear vision, this is what we are trying to achieve. The plan needs to be flexible enough to allow our adjustments, but needs to be consistent enough to ensure that people are enough certain about what you are trying to achieve.

D: What is the effect of client's intervention in supplier selection?

S: We do face that. We do have to work with clients, particularly in water, where clients specify building equipment or framework by design. So we have no say or influence on that. That can complicate factors but that tends to be for equipment or material, occasionally we have one or two subcontract providers, especially an issue with clients but I do feel if we could exercise really good supply chain management, we could deliver to our clients quicker, cheaper, more reliably and which client isn't gonna want that? So if we can manage our supply chain, procurement really well, we can go to our client and say that, this is how we performed, this is how much money we saved you, this is how innovative we've been, and this is how sustainable we've been. So we have all those kind of benefits for the client, why would they not want to?

D: Do you select suppliers from project to project or try to work with same ones in different projects?

S: We can say we have a pretty stable supplier pool. We are quite niche in the range of products and services we provide. We do look for new suppliers but I also feel that we've got quite consistent supply chain. We don't shake things up too radically. We don't deliberately delete payment to our supply chain. We treat them fairly. I think they like working for us.

D: What are the most important five criteria for supplier selection in construction industry in general?

S: Safety, quality, behavior – it is about cultural fit, about understanding how we work and how our client works-, innovative and sustainable. For me those are the factors that I look at all the time. Are they safe, will they deliver high quality work, do they understand how we are working, have they got innovation and sustainability, we are a long way towards the price then. It is almost an irrelevance. You need to talk about the solution rather than the cost or something. Trying to get this cup of coffee for £2 instead of £2.15.

D: But if you think what actually happens rather than what should happen, can you keep price out of these five criteria?

S: Yes, it isn't in mind, that's deliberate. I think I'm assuming all of the things to be equal that the price is within acceptable bandwidth. I think then, you can negotiate. What you can't do is pick the lowest price and expect all those of the five requirements to be met. You are kidding yourself. What you have to do is ensure that you've got the best balance. If something is too cheap or too expensive, that means something is wrong.

D: What about when QSs do the procurement. Do they take these criteria into consideration?

S: QSs in general just look how much something is. They are to argue about the rest later. They see it as part of their role. Their role is to have an argument about how much something is. I think they are wrong.
D: Can you weight your five most important criteria?
S: It would depend on the kind of project really. The rating will change. Safety would always be first, you would never choose to pay less for something less safe. It's a pointless exercise. If somebody is not safe, you just don't work with them. It's a must.
D: For other criteria?
S: Quality is key, cultural fit can be 5%, 10%, 15%. It's not equal, it's no good employing somebody if you don't get on with him. If you are not gonna get on, why getting the contract with them in the first place. You're gonna buy an argument, what's the point? You need to ensure that you can work with the suppliers you've selected. If you've selected people who you don't like, it's not gonna work.
D: What are the other important problems and issues in supplier selection?
S: I think it is about capacity, competence, capability, and maybe about deeper understanding, how well do they understand you, how well do they understand the market, how proactive are they. If you ask everybody and say do you provide quality etc., they will all say yes. The question is well, great, where is the evidence? Where are the statistics? That's what comes back to my earlier point about data. Where is the data? That means, when you sat down with somebody and QSs tempt to point somebody who is cheap, they are not very good, is overstretched, or financially unstable. You need the evidence to underpin the fact that the decision that you are recommending is valid.
D: When you think about a typical project, do you have more close relationships or simple relationships with most of your suppliers?
S: We have strategic relationship with a number, we used to call it top 100. But we now call it strategic relationships which I think is better. It is not question of how many, it is a question of how close those relationships are. It's of course important to have a relationship with the right supplier, no point having a relationship with somebody who you don't spend any money with the original low risk activity. We are quite good at managing the relationship.
D: This is independent from projects right? You use those suppliers in any project.
S: Any project, really. It's in conjunction with projects. The projects have to feed into that. So it is something that I think Costain excels on actually. But it is called supply chain management, actually it isn't. It is supplier relationship management. The chain is the value which is the procurement, the planning, the strategy, the quality. We tend to just focus on the relationship. It does answer, it does ask questions about safety, quality, performance but it is not detailed enough for me.
D: For a typical project, how many suppliers and subcontractors do you have?
S: I couldn't answer to any degree certainty. I've been involved in factory thinking for 15 months and I've been doing this role for couple of months only. So I've got those kind of questions and haven't got the answers. A lot of data but not a lot information unfortunately.
D: How can you influence the behaviors of your suppliers?
S: We have a supply chain academy which we invite people to. That gives them advice on a number of facets of their business, and how to improve. We have pre-start meetings, site visits so that people understand what is expected to do and where, when and why. Yes I think that's something that we are quite good at.
D: Is that academy for all of your suppliers? Or all strategic suppliers?
S: Strategic yes but whether every supplier gets the same level treatment, we don't have the resource to do that. So we tend to spend time with the suppliers who we feel gonna make the difference. You can make or break a project, which is a subjective view. It has to be a judgement, doesn't it?
D: When your client selects a supplier for a project, how do you manage the relationship with that supplier?
S: We have very very few areas that we have suppliers never worked before. We've got a lot of repeat customers. 90% of our business is through repeat customers.
D: What about if it is a new customer?
S: I would suggest that, meet with the supplier. Just have a chat with them about what we expect from them. They do have an induction on site. Explain to them what behaviour is acceptable to us. I feel that when there is new supplier area, a longstanding one would be treated the same which is good. Is a consistent approach.
D: Do you engage with your suppliers before the initiation of the projects?
S: Not as much as I'd like. We do have a supply conference. Something I'd like to see, more formulized actually. It does happen. We do have supplier meetings. But it would be great to engage with them and involve them in the outset of the project rather than a little bit later. So I'd love to get a lot more early supply chain involvement in the design phase, in the suggested approach. Those kind of things that we can benefit from their experience elsewhere really.
D: Do you measure your suppliers' performances project by project?

S: We do. We are very good at gathering that data.
D: According to which criteria?
S: It's predetermined, it's set but I haven't got the template. There are number of facets that covered on time, quality, their approach, their attitude, their safety and we have some quite detailed questions about that and there are set answers. We are trying to remove the subjectivity of it. So that people know, that's why I have given a three, that's why I have given a four, that's why we've got a Costain blue standard which is you are going to exceed the expectations consistently perform well.
D: So you need quantitative and objective criteria?
S: Yes, we do that, have information but I just feel it's not as really valuable as I would like.
D: Do you measure the performances of all suppliers or only the strategic and important ones?
S: On the strategic importance. It is a question of you know how much value or benefit from recording the performance with suppliers providing you with £500 of labour. It doesn't really matter. It's about ensuring that you target where you gonna get return. You know you can get your blanket from every supplier but really it's not gonna transform our performance.
D: How is the communication, information sharing between you and your suppliers? Low, medium or high?
S: We do have regular communication with the key suppliers. We do have a conference, we do have regular communication with the supply chain. It could be improved. It would be great to have a supply chain newsletter went out to all our suppliers, we told them what our strategic plan was, how we will perform against that plan, which suppliers are we currently looking for in what disciplines. But we don't have the technology platform to do that. So, we are reasonably good, I would say medium to high really. We are not always as good as we would like to be but comparing to others, we are quite good at that.
D: What are the other problems for managing your suppliers?
S: I think it would be good if we had an automatic data collection and matrix. So we could understand in real time, our projects are managed week to week, month to month, I would like them to be managed minute by minute, hour by hour. You know if you can monitor actual performance live like you can in a factory, that gives you more idea about how things are happening. If you can see what your work in progress is, which suppliers are working on which site, how they are progressing, why would you not have it. But we don't have it. As an industry, we are poor at automating data collection and capturing and distribution. We are quite poor. What we have done is by spreadsheets and is always historic. You can't change the cost. But if you had live information, you could pick the phone and ask what's going on. As it stands, we tend to put a lot managing effort into resolving issues once they have happened. And of course you can never change the past so it's too late.
D: Can you put these success drivers in order? And if you think some of them are not important, or there are other drivers, can you please mention.
S:

1) Early Engagement: Vital to engage with suppliers early. They need to know where they can add value.
2) Collaboration: Essential that suppliers, contractors and client can all meet together and collaborate. Builds trust and reduces risk. The better conversation you can have, the more understanding you've got. We need suppliers to be talking to each other.
3) Standardisation: A lot of work is bespoke which adds cost and time to a project.
4) Design-Construction Alignment
5) Information Sharing
6) Effective Portfolio Management
7) Complex Decision Criteria
8) Reduced Supply Base

D: What are the other general problems or issues that you want to mention for construction industry?
S: Irrespective of whether it is construction or any other industry, procurement is one of them. I think that we focus on saving costs. We need to move away from saying we reduced costs and saved money to saying we improved margins and add to profitability. If you talk about cost reduction, you are always saying it is sub serving and late in the process. If you say that we improved margin and increased market share, client satisfaction and the rest of it, you then become more important. And I feel that type procurement in supply chain industry has got an issue. It's got a lot of people doing more QS'ing. I can get it for £2. I'm not interested. You know we are here, we got a chat, I paid £2.15 to get this facility, and I think a lot of people misunderstand supply chain. They think we just order stuff but we don't. What we do is we review market, we understand the various drivers of price, quality, safety, we understand the options, we can engage early, we

can have a lot more value, be more sustainable. We are not bullish enough about the value that we had. So consequently we tend to be treated as almost second class within businesses, its functions. So we are seen as a necessary evil rather than a vital contributor to a successful business.
D: For the price problem, literature says one of the reasons is the low value of the contract that client offers to the main contractor. What do you think?
S: Clients don't have realistic expectations or is it that we need a different type of debate. Do we need to have clients disclose the budget they've got and then get us to deliver against that budget. We are dealing with almost, not dishonest expectations but unrealistic expectations. If we were a little bit more realistic about what is we want and what we are prepared to pay for it as a client, a contractor and supply chain, I think we would be a lot better off. We would not have always waste time and energy on kind of something which was undeliverable.
D: You put the early engagement of suppliers as the most important success driver.
S: Yes. I would say what is missing in your criteria, we've got early engagement, but visibility of demand? What do you need, when do you need it, where do you need it? That's visibility. If you engage in early, you provide the visibility of the demand.

Appendix G – Interviews 2 and 3

20 JULY 2015 – MANCHESTER COSTAIN OFFICE – INTERVIEWS 2 and 3

Interviewee 2 (L) - Head of Supply Chain in Nuclear, Oil and Gas sector. She was a supply chain manager in water sector before (01 March 2013 – 30 June 2015).
Interviewee 3 (J) - Buyer. For the project she is currently working on, she started in 01 March 2014. Prior to that, she was working for procurement for one year. Working in Costain for more than seven years.

Deniz: Do you think the construction industry has a fragmented structure?
L: We have a group strategy for procurement across all sectors. That is to identify strategic suppliers, a small number of them and have a very close working relationship with them. So all of the commercials are pre agreed, they don't competitively tender. We allocate work to them based on performance. We have underneath that, a layer of suppliers that we do competitively tender with. Who would be considered approved or preferred suppliers. So that is our strategy to work with the small number of industry leading subcontract organisations to help us to deliver.
D: So you have a segregation strategy. You have close relationships with strategic suppliers. You do not tender with them?
L: No. We do performance. We monitor performance with them. We do quarterly business to business meetings with the managing director with ours and our senior head of supply chain for group as well as the head of supply chain for the sector. And possibly the supply chain managers as well.
D: Do you want to add something J?
J: She has kind of said everything. B2B meetings, I kind of as a buyer get involved in that quite a lot on the projects. Because obviously we are working with them all the time. We do that quarterly.
D: Do you use a particular supply base strategy? For instance reduction in the supply base? Or keeping high amount of suppliers to have the competitiveness?
L: We are doing quite work on that at the moment. J is heading up a project for us to look at rationalising in the different processes that will adopt with the supply chain.
J: Just to make some improvements basically about how we manage them.
L: Because it's not the best at the moment. So we got a couple of lists going on in tandem and a couple of people have got them in different places. So we are looking into have a centralised database with limited access. Only a couple of people could administer. It will be on our iCosNet page. So we will have a section for the database and what would do is we will religiously have a look at that. So if they are not performing, they will be removed from the list. So there will be a natural kind of process of adding people into the supply chain, also removing them if they are not performing to the level. I think we gonna do some sort of scoring criteria as well as part of the approval process. So we don't do that currently but is something that we are looking to put in place.
D: Scoring according to their performance or?
L: No, as in where they are. So at the minute you could approve two mobile phone companies. And at the moment we know that we got two companies approved but we wouldn't necessarily know who is the best of those two. So it's about just taking it to the next level and doing a bit more. Due diligent at the front end, so we can make more informed decisions because that mobile phone supplier might not be suitable for a particular project whereas this phone might be. So it's taking it a step further what we do currently.
D: Do you determine strategies project by project, change them in each project do you have a robust strategy for all projects?
L: So the strategic people are always strategic people and they are always given the first opportunity to deliver. But for materials, particularly with long lead items and things of that nature, it would be a project specific strategy. Because the guys here buy some really technical pieces of kit, from some really specialist engineering companies. Lead times can be huge (J approves). They obviously are the make or break of us winning the work so when you do your original tender, the strategy for secure and the supplier is technical pieces of kit, is kind of fundamental to our big response. So a lot of the clients will want to know what is our strategy, what are the lead times, how we gonna use our kind of position within the market place to ensure that we can deliver for that client.
D: What about the general problems you have in your procurement strategy? It can be unique to this sector, or more general.
L: Would you say that the strategy that we adopt works or does it need tweakıng, or...
J: It works. On the majority it works. Might need tweaking a little bit. Doesn't work across all the sectors. Kind of does work. We drill that quite at the beginning.

L: We are going through a lot detail, don't we?

J: We do. We are going through a lot detail at the beginning. That's crucial at that stage. We got a lot knowledge on suppliers in house. We got a lot expertise and knowledge already.

L: We have our own design team here. So the difference between here and Severn Trent is that in Severn Trent they subcontract to MWH so the front end engineering and solution finding became long and drawn out because there is a design partner on the side that we had particularly costing relationship, whereas here the design is all done in house so you have that engineering expertise. So when you are looking at your strategy, you've already got really good idea of buildability whereas you did not have that (D: you can engage the design into the process), exactly, you can bring engineering into the strategy.

J: A lot of historic data we fall back on which is really useful.

D: For identification of the needs, who is actually responsible for that?

L: In supply chain, that will be me. It will be my job to make sure that we've got the right suppliers on the supply chain list to be able to deliver to the business.

D: What about the actual needs for a particular project? How do you define, for this project we need these materials and services?

J: It is the programme that creates them. What is required, what needs ordering, what needs procuring?

D: You are doing it with a programme?

L: Yes. Depending on what kind of construction project it is, what kind of contract that we are in with the employer. We may receive a bill of quantities from the employer. So the two contracts and mechanisms, they are to give us a specification and say provides us with the price for delivering this work. We would sit down with a multi-disciplinary team including engineering, procurement, quality, health and safety, design. All the different kind of bits that we've got within the business. And then we come up with a solution that will be a fully designed solution. And in that incidents, we've got BIM. We've got some software where we can actually, intelligently model a delivery kind of piece. We can draw bill of quantities straight from that. That will give us a full bill of materials. The other way that it will work is that the customer might give us a bill of materials and say provide me with a price for building that. And if that happens, our engineering and technical department will review it, make sure that they believe they've got everything in that. That would pull out a procurement schedule that would go to the procurement team as well. But that would solely be for materials. The subcontracts would remain in the strategic strategy. That is where we agree that the strategic partners to put the subcontract packages together. So that will be early contractor involvement, literally as soon as that bid lands, we will get our strategic partners in and we will start talking through the engineering solution. And then they will come in and they will actually put into, they would do sections of design, they would do whole packages of work for us.

D: So you are using a programme (BIM) but how can you overcome the standardisation problem?

L: It is very different in this industry. In water, the whole push was about standard products. In this sector, it is different because it is petro chemical in particular, it is really high value, technical pieces of kit. So the ability to standardise is reduced but the ability to manufacture offsite has increased. So in water, getting people to do an offsite solution was like knitting fog (impossible to do), but here we've been manufacturing offsite for years and years. So moved to one of our strategic partners, they deal with all the logistics. So essentially, we build big kind of nuclear process plants, big pieces of kit, as big as this room and then just move just take literally plug and play. So all of it is created, done its all engineered in side, and then they just literally transported to the nuclear facility.

D: So you identify needs which were not manufactured before, specific to particular projects.

L: Yes.

D: In the identification, is there a tendency for defining cheap needs and materials?

L: Not here, no. Not for this sector. Because if you think about it, oil and gas and nuclear incredibly...

D: What about other sectors?

L: Best value, you still need to demonstrate best value, but in water, because of the nature of the relationship with the client, the client was constantly pushing down the price, we had the cost curve models, very difficult to make money in that sector. So that encourage the contractors to do things as cheaply as possible. So yes they would try to demonstrate best value but you could guarantee that they will be picking the cheapest, quickest and dirtiest. In terms of long durability, they were only interested in building the product to last until they finish their framework. Here, entirely different mechanism. It is about making sure that the assets are built to the correct standard to the correct quality and long durability or whole life of the asset is considered.

D: It's because of nature of the sector?

L: Exactly.

D: Apart from this sector, there is a pressure from the client for cheap materials then, right?

L: Always. And they are getting pressure from the regulators. If you remember from Severn Trent, they've got the most ridiculous targets that have been set by the water regulator. And they get charged something like 15 million pounds per year if they are not hitting their target. So for them, cost is key.

D: Do you think that projects carry lots of uncertainties in their nature?

L: Yes, definitely.

D: What's its effect for identification of the needs?

L: The problem that we had in water was the design team were not integrated, so that costed relationship that I spoke about. If the projects weren't designed to the correct stage or gate or whatever you want to refer to it as by the client that then went to the subcontractor, and so you had almost a line of inadequate design from day one and then that became a bit of a bonfire between the contract and the designer in the client. So that uncertainty made it very difficult to build long term relationships with the supply chain. So we start out with a strategic model, but what actually happened is Costain lost a considerable amount of work from the client. So when they were final accounting the year five of the five year framework to go into year one of a new five year framework, Severn Trent removed all of Costain's year 2-3-4-5 work. And then once that had been agreed, they then gave visibility of year two again. So if you think without suppliers in from two years ago, we want to build a long term relationship with you and this is the program for the next five years, all of a sudden, that was taken away from Costain. So it was also taken away from the supply chain. So that made life very difficult.

D: Do you face the procurement of wrong items?

L: Yes, definitely. It was absolutely right on Severn Trent. Because they had to be onsite. Because they were paid to be onsite. The design hadn't progressed enough for them to be onsite. So what they would do is, they would take a chance on a piece of kit. They would select it because it's the cheapest. They had it onsite and then it would be sat there for two years. By the time, design had progressed to the point where that piece of kit could actually be installed. It was the wrong piece of kit.

D: How about when the design is in-house like here?

J: No we don't really because it is sole designed and it's all in house as well, isn't it. We don't have that kind of things.

D: So the key point is the alignment between design and construction?

L: Integrating engineering and design team, yes, definitely.

D: Is there a time pressure for identification of the needs?

L: Definitely, you have no time to do anything in the water sector. Really difficult environment to work in.

D: Is it same for other steps, supplier selection, ordering materials.

L: Everything. You know from the last time we spoke, the QSs do the procurement, not the procurement team. So that has its own kind of issues because you've got people that aren't qualified to buy materials and pieces of technical equipment, who are making decisions on a daily basis. They are not thinking about whole life cost, or standard or anything of that nature. They just buy the cheapest because that is there. That's what their target is, isn't it, it's about cheapest, not best.

J: So in this sector, sometimes it's delivery that drives the project rather than price. It's not always price.

L: Your lead times are kind of right up there.

J: Project Princo is driven by deliveries rather than price.

D: Do you consider sustainability in the identification of the needs?

L: Across the group, we have a sustainability policy. Sustainability is always high up there. But as we kind discussed this morning, what we have to do is, we have a kind of sustainability baseline, you have additional drivers from the client so if sustainability is really important for the client, then obviously they may have a policy or process which takes it to higher level than us. But as a group, we have a very good standard in terms of sustainability and guidance how we should view it from a procurement perspective.

D: Well if you find a supplier capable of other qualifications but not sustainability, do you work with that supplier? Does sustainability make a difference for selection?

L: We have a supply chain academy. We have a policy where we work with SMEs. So as you can appreciate, some SMEs have got fantastic ideas on sustainability, others not so much. So we work very closely with the supply chain about that benchmark that we were just talking about. If they are not to the level that we need them to be, then we will work with them to develop them in lots of different things but sustainability would be one of those. Just informing them on how to make better choices about products and solutions.

D: Do you face any other problems in the identification of the needs?

L: I don't think so.

J: I think we have kind of covered everything. I mean that there are times we have to, we would like to go out for three bids. Sometimes we have to do single sourcing because the pretty unique product that we require so we can’t always tender competitively. That’s one area it can be, that single sourcing.
D: And that program is working well, you say, for identification (BIM)?
L: BIM works well, yes.
D: The stages are overlapping. I might be asking same questions. Now it is supplier pre-evaluation. What is the importance of supplier pre-evaluation for you? In construction industry, there are several areas that you need to find suppliers and subcontractors and the market is full of suppliers, maybe thousands of suppliers?
L: This is one of the projects that J is working on at the moment.
J: We are doing a PQQ process which is the pre-qualification of all vendors. They have to be pre-qualified before we use any supplier. They have to be on our system as pre-qualified.
L: And then what we do is, we send them out the pre-qualification questionnaire, we like them to fill a whole information that would detail things like accreditations, insurance policies.....
D: Sorry but to whom do you send this questionnaire? Which ones, how do you select?
L: Ok, in some sectors we got a very well established supply chain, but not so much in the others. So at the moment, we are very ad-hoc and we are very reactive. So one of the big things that we need to do in this particular sector is to establish a fuller supply chain. The issue that we have in this sector is, the work peaks and troughs over a large period of time. So it’s very difficult to maintain the same suppliers if you are not maintaining a project kind of base for them. So what we need to do in this sector is get a little bit better and maintain in a relationship. So currently what would happen is a bit would come in or a project requirement would come in, we would do a selection, competitively tender possibly depending on the value, in other instances it would be an identify suppliers from things like Achilles or Linkup. Then bring them in, have a discussion with them, get to know them a little bit better, introduce them to a project team that have a bit of a beauty parade. Once with gathered some intel on what they are about, we would then make the decision on whether we want to pre-qualify them or not. So in an ideal world, what we would do is all of the key trades, so things like surveys, things that are high risk or high value, we would competitively tender that, and those guys would be one of the ones that we would making strategic suppliers. The other way they can became a strategic supplier, as if they work with us for a period of time and they perform exceptionally well. It’s a kind of a two pronged attack for strategic guys.
D: When you go to the market and see the price a supplier offers is considerably high, but other qualifications might be well. Do you directly eliminate that supplier?
J: Price is not the main driving factor, no.
L: Price wouldn’t be the main factor, not in this sector. But in water, definitely. They would eliminate them. If they couldn’t negotiate with them, obviously, you will always get a high price, but you need to be more careful about the low price because people want to have Costain so they are putting a price they can’t possibly deliver to. So one of the front line areas that we need to be really hard on is the low price, and negotiate and interrogate more importantly. Exactly what they have put into the quotation, so we are the first defence essentially for making sure the people have got their cash flow and the ability to actually deliver what they have said they can do.
J: We’ve got an example at the moment of a vendor that did go in at a low price. Whilst the product is ok, it fit for purpose, its constant amendments now because it realised it didn’t factor this in the price, it didn’t factor that. So we’re having constantly doing amendments, and I think we are up to something like amendment twelve to the original order, because they really sold themselves shortly and they haven’t factored in everything we needed in the design, so we had to amend the orders and we had to agree time and time again. That’s a lot changes.
D: So it becomes more costly.
J: It is, yes.
L: And the issue that we have there is if that supplier goes pop, a particular as J identified earlier, there are not that many suppliers that can deliver the highly technical engineered solutions that we require in this industry. So if one of our suppliers has got it wrong, and if they have gone in too low, if they go out of business, that’s gonna cost us an extremely large amount money. We need to make sure that we’re doing a front end due diligence to prevent...
J: It can affect the programme on site .To prevent a knock out effect.
D: For general construction, what is the role of price?
L: General construction is about price.
D: For supplier selection, what is the effect of client’s intervention?
L: If we are given a subcontractor, then it is the Costain, we need to make sure we take it through our approval process, and identify any areas where it needs support. If it is client-led, we’ve got to use regardless, what we can do is to make sure we get it to the level that would expect our supply chain to be, so we don’t have any issues later.

J: On the project I'm on at the moment, we make a lot of the choices. Client is there every step of the way, every form it signed off, we are using those, that gets a signature, then we will go with the ITTs, asking them to submit quotes, and we get the quotes back they even sit with us while we open all the quotes and then we sign off the form. And then we actually select a particular vendor of choice. Client then decides so that they are at every step of the way, all the way right through to the end.
D: What about in water?
L: In water, they had so many frameworks, essentially they had gone to the next level so if I was a client under exactly the same and look at the key spend areas, and I would have a relationship with tier-2, to kind of lock down the tier-1, so that reduces the buying gain for the tier-1. So what Severn Trent did is, all of the key spend areas, they had the arrangement with tier-2s. The tier-1s could call off against those frameworks but the terms and conditions and rates would lock down. So effectively Costain only had three areas where they could make any decisions. And that was the general constructability so it was civils, mechanical and electrical. And any small subcontracts. That was it. So it was a very difficult contract.
D: But those three areas are also strategic right?
L: With identify strategic suppliers, as I said to you earlier, Severn Trent used year 2-3-4-5 as a bargaining tool to get Costain to sign off first year for framework. So when that discussion happened, the relationship of the supply chain effectively became fractured and then because the QSs were doing a lot of the procurement and they don't do procurement how we do procurement, that had a massive impact on the supply chain. Even though they supposed to be strategic.
D: How do you segregate suppliers for the nature of the relationship you have?
L: We have three categories; verified, preferred and strategic. So verified are essentially, if we are looking to get a quotation and we don't have somebody within the supply chain, we send them a PQQ that would be verified. If not really done any due diligence, we just basically collect all the information and we have kind of got them on our system. The preferred, they are the next stage, so I would expect that we have done some due diligence with, we got a pretty good understanding of what they do, we may be use them for a number of small packages -low risk, low value-. The strategic guys are high risk and high value.
D: Can a supplier start directly as a strategic supplier?
L: No. Unless we did a competitively tendered process or they performed well as a preferred supplier for a number of years, and we needed them for a really big project and they require a key to the delivery of that project that would be the only way that they could become strategic supplier.
D: If I ask you the most important five criteria for supplier selection, for the general construction industry, what would you say?
L: For me it would be quality and performance, financial standard, ability to fit with processes and procedures and sustainability.
D: Sustainability yes, I saw the government's report, construction 2025, mentioning sustainability a lot.
L: Yes, sustainability is massive, is massive for everybody. Not just Costain. We don't have any manufacturing facility as a business so for us, strategic suppliers and people are able to manufacture offsite in their own facilities. So sustainability is kind of runs through all of the decisions that we make on a day to day basis. Because we are not doing proactively, we are doing on an ad-hoc risk or last minute requirement. We're not fully considering everything that we need to, I would suggest.
D: What about safety?
L: It is a must do. So obviously if people have got any kind of legal or accident or that we did a part of our questionnaire identifies the accident frequency rates, if they had redo's or anything of that nature, so health and safety I would suggest is number one for Costain.
J: This is the section on sheet within the PQQ. And health and environment.
D: How do you weight the criteria you mentioned?
L: I think health and safety is always gonna be number one. Then the quality has got to be number two.
D: What about price? You did not mention in your top criteria?
L: So when we are looking and identifying, price is not the key driver. It's about do they fit with that culture, including health and safety and sustainability, are they able to deliver high quality product, do they have the financial capacity to be able to provide what they said can provide. So when I'm saying culture, I mean culture to me is health and safety, sustainability, it is quality.
D: So if these criteria are okay and if they offer high prices, it can be acceptable right?
L: Depending on the industry. Because in some sectors, quality is more important than the price. In other sectors, the price is more important than the quality.
D: If we are talking about general procurement industry?

L: Price is important but it also depends on the sector and the client you are working for. Because not all clients want the best quality. Some clients want functional, fits for purpose at the cheapest price.
D: So it depends from project to project and also client to client?
J: It is the whole package really that deals which I were use the whole, all those five.
L: It wouldn't be a good idea to create a supply chain based on price.
D: What about administrative and transactional costs? Because you order a lot in each project.
L: Of course it is important. In this particular sector we all need to be charge enough time to projects. If we don't have enough projects, than obviously we reduce our numbers. So our model here is based on a consistent amount of, on the book so directly employed staff and then we manage the peaks, as I said we peak and trough in this sector, the peaks we manage with agency staff. And that's across every discipline, not just procurement.
D: Is there any specific problems you face in the supplier selection?
L: We just need to make the system more robust.
D: What do you mean with more robust?
L: So all the things that we have spoken about this morning, so we said we want to centralise database, we said we want to proactively identify suppliers, not react as we get a bit of project in. So that would be our big project.
J: And keeping information up to date, and managing information on a day to day basis.
D: Shouldn't it be a huge pool of suppliers for construction industry?
L: Not necessarily a huge pool. What you've got to think about is, in some sectors you would have a decent size supply chain but if you have got 5000 people, you are not gonna be providing best value or have the relationship with any of them. Because you gonna be given more small amount of work. From a procurement perspective, what we need is we need suppliers that are built into us because we are one of their main clients without overstretching them or given them things they aren't able to deliver. So it's about that balance so you need just enough but not too many.
J: We rely on repeat business rather than a massive supply chain. We need repeat business and good relationships within that.
D: On a general project, how many tier-2 suppliers and subcontractors you have?
L: I don't know. If we look at the project we are working on at the minute, with a typical bid, we got ten strategic suppliers, we got approximately ten subcontractors and then we will be procuring main things like aggregates...
D: So this ten are for different areas? Are they providing different kind of materials?
L: All of them providing something different. The strategic guys will all provide something different. The ones where we've got approximately ten subcontract packages identified, that will be competitively tendered. So actually you'll have thirty suppliers. Even that you've only got ten categories or requirements, you will still competitively tender.
D: For supplier management, do you have close relationship with most of your suppliers?
L: Our strategy is, let's not have too many, let's keep it just right and let's have a good relationship with them. Even the preferred guys, so we do our supply chain academy, so we identify 20 SMEs, they are doing supply chain academy with us at the minute, that gives us a fantastic relationship because they are coming in, they are getting into the world of big cooperation, we talk them about commercials, we teach them about equality, legal kind of applications (D: they are all SMEs?). Yes, they are all SMEs. We do performance monitoring with them. We do a course of approximately seven different workshops where they are coming for a day. Doesn't cost them anything. We are getting industry leading speakers from other companies, leaders in their field essentially to come in and talk to them about how to do things.
D: Are SMEs in local areas?
L: We have one here in Manchester, we have some done in London.
D: They doesn't necessarily be in local areas?
L: No. We just get a whole host of suppliers together and try to keep as local to them as possible. Obviously for working in the Scotland, we'll try and have people that are local to the works. That doesn't make sense to be shipping people from London to Scotland if you've got local capability.
D: How can you influence your supplier's behaviours? To have a shared goal with them.
L: For me, it's about education. So we understand what their capabilities are, what the shortcomings if any are, and then we work with them to get them to the level we would expect, maybe a bigger subcontractor particularly for health and safety, quality, sustainability. That really helps us build a good relationship with them because where teaching them about Costain processes and procedures, what you wouldn't want to do is identifying an SME, spend no time with them and then when we turn upon day one, they realise that actually we are gonna have to spend a lot more money on health and safety, a lot more money on quality and they didn't fully understand the commercials because they are not used to this corporate world. And that gets you the buying you need essentially to have a long term relationship.
D: What about when your client selects the supplier?

L: That's why we have supply chain managers within our business. So communication with the supply chain has been identified as kind of .numero uno in our strategy. So if we are in a situation where the supplier isn't someone we normally work with, the supply chain manager for that sector would be assigned to that supplier and that person would be making sure that company is working with Costain in the way that we like to work with them.

D: It might be harder?

L: Sure, it is a new relationship, it is always hard.

D: Do you engage with your suppliers before the initiation of the projects?

L: Always yes. We always do early contract engagement if we can. If it is possible, if we have enough time. For example, the bid that we are working on now, our strategic suppliers have already been in, have already met the team, have already had all of the information from the client, everybody is introduced to everybody, we are already talking about ideas, how we can deliver the project more effectively.

D: How do you measure the performances of your suppliers? Against which criteria? And is it project by project or different?

L: We have got a standard across group, we measure them on people, time, quality, cost and health and safety. It is approximately three to five questions and each one of those sections is multiple choice, scored out five, and the questions are the same across the group. So that allows us to benchmark our supply chain across the sectors.

D: Can you provide me sample documents for this?

L: Yes, sure. What I can do for you is I can show you what we do with that information as well. So we collect the data, upload into E1, what I did for water is create reports from that so identify trends and things of that nature. So if a supplier is not performing to the right level, we would do something called improvement plan session, we will sit down with the supplier and we can either do an improvement plan that is advisory, so we could say something like, a couple of your guys turned up without harder source something about nature, we are giving you an advice, we're note to say this is something we're gonna be monitoring closely in the future, that gets recorded on the system, anyone within the business can see that we have given them advisory, or we can do an improvement plan which gives over the period of three months, so we would go back to them, it will be something more serious so if you had a redo something in that nature, we would sit with them to do a back to work plan. That would be for them to identify what they are doing as a business, to prevent that from happening again, take any learning from that. That is then monitoring over three month period so that's a lot more in depth supplier of zoom.

D: Why do you keep working with that supplier? What is the level in which you eliminate a supplier?

L: Well if you think that our strategy is to have long term relationships with the supplier, we wouldn't stop working with the supplier just because they've had a redo. What we do is we try to understand the reasons behind that, and generally if there is an accident on the site, there is usually wrong on both sides, not generally just the supplier made a mistake or omitted to do something. It's usually a whole chain of events. And the contractor is normally a part of that chain as well. So what we would do is identify the root cause of the issue. And we would work with them to make sure that it wouldn't happen again. If we get to a point with the supplier where we didn't feel they will take it seriously or weren't able to prevent that from happening again, then we will take the decision not to work with them. But that would be after a considered process of learning and engagement to try to improve and prevent essentially.

D: How can you define the information sharing level between you and your suppliers?

L: I think communication can always be improved. I don't think anyone communicates the best they could ever. We could always do something different. I think generally Costain is better, particularly in this sector. You know I have very strong views on communication in water sector, absolutely important, but I believe that's because the procurement is done different there.

J: We have expediters in this sector. We manage the packages so once the buyers procured the equipment, then the expediters take the package and manage the package right through to the end. Constantly visiting, communicating, emails. Is managed right from beginning to the end.

D: Do you face any particular problems in the management of suppliers?

L: No I don't think so, not here because again the procurement is different. When you are trying to manage the supply chain where the commercial team are doing the procurement, it's a hard issue because you got a different goal level, different drivers, and different targets. So communication is not the most important thing, cost is a more important thing.

D: I found these success drivers from the literature review. Can you put them in order for a general construction procurement process? And if you think some are not important, and there are some additional drivers to these which are important, please say.

L:

1) Complex Decision Criteria
2) Reduced Supply Base

3) Collaboration *
4) Early Engagement *
5) Effective Portfolio Management *
6) Design-Construction Alignment *
7) Information Sharing *
8) Standardisation

These are really important. The ones with the stars for me are really important. There isn't a drive for standardisation in this industry. Complex criteria is the first stage, you've got to have that.
J:

1) Complex Decision Criteria
2) Design-Construction Alignment
3) Early Engagement
4) Collaboration
5) Information Sharing
6) Effective Portfolio Management
7) Design-Construction Alignment *

Reduced supply base and standardisation is not important for me.

D: Do you want to mention any other issues, problems in the procurement process?
J: We are always up against and become with time. Lead times, you know, trying to meet the program. Very often, we sometimes don't engage early enough with the suppliers with the specifications also. We need this and we need in two weeks, whereas if we perhaps told them or engaged a bit sooner with them, given them an idea what we are looking for... Given them two weeks, that's a problem I think we need to address.