School of Engineering and Mathematical Sciences

Identify the Current Status of the Supply Chain Management for SME's in the UK Construction Industry

By

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Abstract

The aim of the research is to identify the current status of the supply chain management (SCM) for the UK construction industry, after the famous reports that were written by Sir Latham and Sir Egan in 1994 and 1998. The research method used for this research consists of wide review of relevant literature on the history of supply chain coupled together with two case studies previously held and also collections and analysis of empirical data by way of questionnaires and interviews from the industry. The findings from this research have proven the outcomes from previous case studies. There are several barriers and challenges that stops the implementation of right SCM into the industry, other findings are, contractors doesn’t provide enough support to their suppliers e.g. Technical, informational and financial, to ease the information flow and a better SCM between contractors and suppliers. This dissertation further recommends to research and find out individual skills needed by the staff to accomplish their SCM tasks better. It also recommends to look at the same topic not only from the contractors’ perspective but also form the suppliers’ perspective.

Keywords

Supply Chain Management, Construction Industry, Barriers, Partnership, Contractors and Implementation.

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1 Introduction

This chapter includes the background to the research author passed through, together with research focuses, aim and objectives of the research and the values of this research.

1.1 Background

The author is currently doing his MSc in Construction Management at City University London, and as part of the university's requirements the author will produce a master thesis, under the supervision of Prof, Rob Melville.

The author's thesis is on a relatively new topic emerging recently, it is based on supply chain management (SCM) in the UK construction industry, and some researchers also use the word Lean Construction (LC). After looking at the literature for this area, it is obvious that not enough has been written. Especially if we look into the green aspect of it, this topic is indeed very important for the future of industry. Today more and more businesses are adopting their strategy and developing goals according to sustainability rules and codes of practices.

There is a growing awareness within the SCM industry, companies are understanding the importance and benefits they will get by introducing sustainable SCM systems.

But most of the construction industry pays inadequate attention to the protection of environment, companies see the responsibility as lying with others, and different authors believe the same way (Ofori, 1992; Tan et al., 1999 and Low, 1996). If we compare the construction industry with other industries we can see a huge difference, SCM has been effectively applied to several industries, the most obvious is the motor vehicle industry followed by manufacturing industry SCM is used for many years now (Landry, 1998), arguably the retail industry is the most successful in implementing SCM strategies, this is due to the effect of intense competition (Hollos, 1996).

In the past there are two very well-known and successful reports written by Sir, Michael Latham in (1994) followed by Sir, John Egan (1998). Both of them were recognised and got support from the UK construction industry and the UK government.

Latham initially identified the inefficiencies, ineffectiveness and fragmentation in the construction industry and reported it in his report. And Egan was in the car manufacturing industry but the government initiated him to look at the construction industry from a client's perspective and write a report. An in-depth analysis of both the reports are written in the literature review section 2.7 and 2.8.

This report will mainly focus on Small and Medium Enterprises (SME) in the UK construction industry.

1.2 Research focus

There is still some miscommunication between the construction site management and the SCM teams. (Vrijihoef and Koskela, 2000) points out the key roles for both the supply chain management team and the construction team. They also agree that, the majority of waste and problems are due to the traditional type of SCM and that industry is in need of new principles and methods for a better SCM.

The author will focus on the current status of SCM mainly in small and medium-sized enterprises (SME's) located in UK. Construction industry contributes significantly to the economic growth of the country, according to Fahlin (2004) construction industry is the vital economic sector of a country. Today the statistics show the Gross Domestic Product (GDP) for this industry is about 6.3% (Fitzpatrick, 2014) and a total business value over £65 billion (Cox and Ireland, 2002). It also has an effect in the employment sector as it employs in huge numbers. It is obvious that construction industry can affect a country's economic condition therefore any sort of waste, poor productivity or cost and time over run during construction must be minimised in order to avoid such situation. SCM in construction is the approach introduced to the industry by Latham (1994) and Egan (1998).

There are definitely challenges and barriers that affect the successful implementation of SCM. These could be the lack of senior management commitments, workplace culture or simply the lack of knowledge in SCM philosophy. This will be analysed by a case study approach including different studies conducted by different authors for example Sarhan and Fox (2011), Akintoye, MacIntosh and Fitzgerald (2000). This is an important objective because until and unless we aren't aware of the barriers that are slowing us from achieve our goals the industry will not move forward.

In order to implement SCM to construction industry, organisations should be able to know what sort of skills their staff and team need, there are several report written about the skills needed for general industry not specifically for the construction industry, therefore there is a gap in the literature specifically for construction industry. The author's objective one and two is to use case study method to assess and determine those skills needed for the construction industry.

The author will be doing a questionnaire, to find out how much are the SME's giving effort for implementing SCM in their projects. Not much research has been conducted in recent year, the latest literature about this topic was found in 2009 by Pryke. After analysing the data, it will show the current standing and the progress of the industry.

1.3 Research aim and individual research objectives

The overall aim of this research is to identify the current status of the supply chain management for SME's in the UK construction industry, this will be achieved by reviewing case studies done previously and collecting empirical data through questionnaire that will be distributed by the author.

Specifically, within the context of the higher education, objectives for this research are as follows:

1- Evaluate the challenges and barriers for applying supply change management in the construction industry.
2- Assess the skill types needed in the construction industry to be able to implement SCM successfully.
3- Determine how much are the SME’s imputing effort for implementing SCM in their projects.

Objectives one and two will be based on case study review picked up by the author, and will be compared with different literature. Whereas for objective three the author has prepared a questionnaire and will gather data from the industry. And finally analyse the data collected.

1.4 Value of this research

This research is important for number of reasons:

First, the literature review that is presented in this report has been collected from so many sources that include different sectors not just the construction, as SCM is a broad topic. What is unique in this literature review is that many authors say (Tennant and Fernie, 2013; Green et al., 2005) there are very few sources available in recent years therefore, it will be a valuable research at the end.

And for the empirical work that the author will do for objective three, determine how much are the SME’s imputing effort for implementing SCM in their projects, by way of questionnaire that he has prepared. The most recent research about it was done in 2009 by Wolstenholme, it has been almost 5 years it will be good to see up-to-date analysis. It might not be as complicated as his work, because he was backed up by the Government, but it can show a pattern when the end data is compared.

2 Literature Review

This literature review will clarify the term SCM, how it is originated in the construction industry and look at previous work done by different researchers. And it also includes the survey results which will be used as case study analysis for objective one and two.

2.1 What is supply chain management?

Supply chain is an involvement of all parties directly or indirectly, to fulfil the customers need. Supply chain does not only include manufacture and supplier it also includes retailers, transporters, warehouses and customers. A supply chain is a dynamic process it involves constant flow of information between different departments (Sunil and Meindl, 2004).

The concept of SCM is mainly based on two ideas according to Handfield (2011) the first idea is that every product or service that has reached to an end user shows the cumulative effort of multiple organisations and these organisations are referred as supply chain. The second is that many companies paid no attention on what's happening outside their office walls. The final results were disjointed and often an ineffective supply chain.

In recent years, many theories of purchasing and supplying has been studied, each focused on the different operation of an organisation but SCM is the most wide ranging approach in considering how companies utilise their suppliers, process, technologies and how to enhance their competitiveness advantage (Houlihan, 1985). Few example of definitions for SCM are:

"The delivery of enhanced customer, and economic value through synchronised management of the flow of physical goods and associated information from sourcing through consumption" (Londe, 1998)

"The process of strategically managing the movement, storage of parts, materials and finished inventories from different suppliers through the firm and to customers" (Johnston, 1995)

Lummus (1998) initiated that SCM is going to grow up in its importance because of the increase in market competition, the acceptance of wider focus for organisational evaluation change and its impact on company fortunes, which at the end, efficiency and innovation no longer can be only an internal management function.

The concept of SCM was criticised by Tompkins and Jernigan (1997) their idea was that it had to be replaced by Demand Flow Leadership which has a pull approach to produce flow for more efficient customer service.

2.2 Origins of supply chain management

The concept of SCM is originated initially in the manufacturing industry. The first know signs of it were when Toyota Introduced just in time delivery system as part of their car production (Shingo, 1988).

The system was introduced to have control over the suppliers of Toyota motor factory, and to reduce inventory and waste. This was way back in 1950's Deming stated that working with the suppliers as partners in the long term increases the loyalty and it decreases the cost of production (Deming, 1982).

2.3 SCM in construction

The construction industry definitely has been slower to adopt the concept of SCM compared to other sectors, Vollman et al. (1997) argued that construction SCM is increasingly seen as set of practices focused on managing the entire chain from raw material suppliers to the end user.

At the same time O'Brien (1999) reported the existing manufacturing reports in SCM is useful but doesn't fully translate to the construction environment, and concluded that very little is written about construction SCM. Meanwhile, (Atkin et al, 1995; Dainty and Brooke, 2004) effective SCM is definitely a key element in reducing construction cost. Wong and Kanji (1998) also believed that construction SCM together with partnering and Total Quality Management (TQM) can successfully address the issues in construction industry and its clients.

Number of discrete roles was identified by Vrijihoef and Koskela (2000) in an attempt to connect the SCM that is rooted in manufacturing industry to construction industry.

- The operational interface between construction contractor and sub-contractor.
- The flow of onsite construction activity to offsite offices.
- The operational capacity of upstream and downstream supply chain.
- Establishing a fully integrated and extended management of supply chain and
- The role of client and their importance in driving improvements in construction supply chain.

King and Pitt (2009) states the construction clients can exert important influent on working relationship in particular with their commercial relationship and product providers. As a result, the role of the construction client on the management of supply chain has been increased.

Even though the construction supply chain structure is fragmented and characteristically short, SCM is a central pillar in the formation of framework agreements. And this type of agreement captures both the client-led supply chain and contractor-led supply chain, which conceive an opportunity to explore best practice SCM in UK construction.

Between 1994 and 2009, these years were a key period for the construction industry, during this period a significant number of reports and reviews were published, at the same time the industry also significantly expanded. And these initiatives have changed the way construction industry works. There were three main reviews including the Latham report “constructing the team” (1994), the Egan report “Rethinking construction” (1998) and the Wolstenholme review “Never waste a good crisis” (2009). Each of them addressed key issues of the industry and encouraged them to make improvements over time. Plus a greater client involvement and to start implementing SCM approaches to construction projects.

2.4 The drivers involved in supply chain

All members in supply chain must adopt a similar, common terminology and a collaborative path. However, some people do get confused between collaboration and collusion. Shared set of values and agreed drivers must be transparently communicated and embraced by the supply chain members ICE (2009).

In construction current drivers largely involve financial return. In the engineering industry many organisation focuses on turnovers rather than profits. Hence it reduces the status and tone of the sector and gets regarded by many clients as adding minimum value for money.

In general construction industry does not use best practise or lessons learned from other industries. Where by the process, culture and people change has successfully taken place in other sectors, the construction industry should learn from them and apply it to themselves ICE (2009).

2.5 Supply chain structure

A case study has been carried out by Vrijhoef and Koskela (2000) involving 3 different projects, to find out a typical supply chain structure. They came out with a structure that looks like Figure 1. It is clear how the information flows from the end user that is the customer towards initial supplier and vise-versa for the material flow.

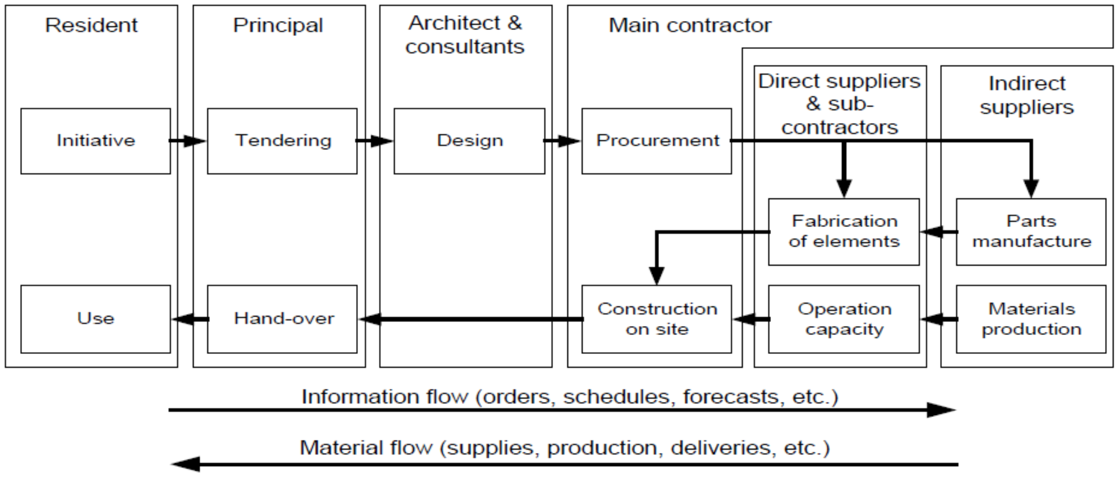

Figure 1 Generic configuration of a traditional supply chain in construction

Supply chain council McCormack et al. (2004) has developed a SCM maturity model levels:

Level 1: Ad Hoc – Supply chain and all its participants are unstructured and ill-defined. Organisational structure and activities are not processed properly. As a result, SCM costs are higher and customer satisfaction is low.

Level 2: Defined – Usual SCM processes are well defined and organised, were as the activities remain traditionally, SCM is still costly and customers are not satisfied.

Level 3: Linked – This is a level where it can be seen as a breakthrough, cooperation between company departments, customers and vendors are established Therefore, SCM costs decrease and customers' starts to get value for their money and become satisfied.

Level 4: Integrated – Companies their vendors, suppliers cooperate on the process level, all the SCM performance and management systems are applied, and as a consequence SCM costs will dramatically reduce.

Level 5: Extended – Competition will be based on supply chain. Companies will collaborate between each other, multi-firm SCM teams with common goals and broad authority will form.

All the above five levels show the progress of the activities to a more effective SCM. Placing the UK construction within the five levels mentioned above, it could be argued that the UK construction has to utilise SCM techniques for years (Pryke, 2009).

Even though there is limited value and benefits from ad hoc supply chain structure, it has showed that it worked due to the unpredictability nature of the construction process Cartlidge (2004). There are four levels termed "role of SCM", to implement SCM in the construction Vrijihoef and Koskela (2000), these levels are not mutually exclusive. Most of the times they are pursued jointly see Figure 2.

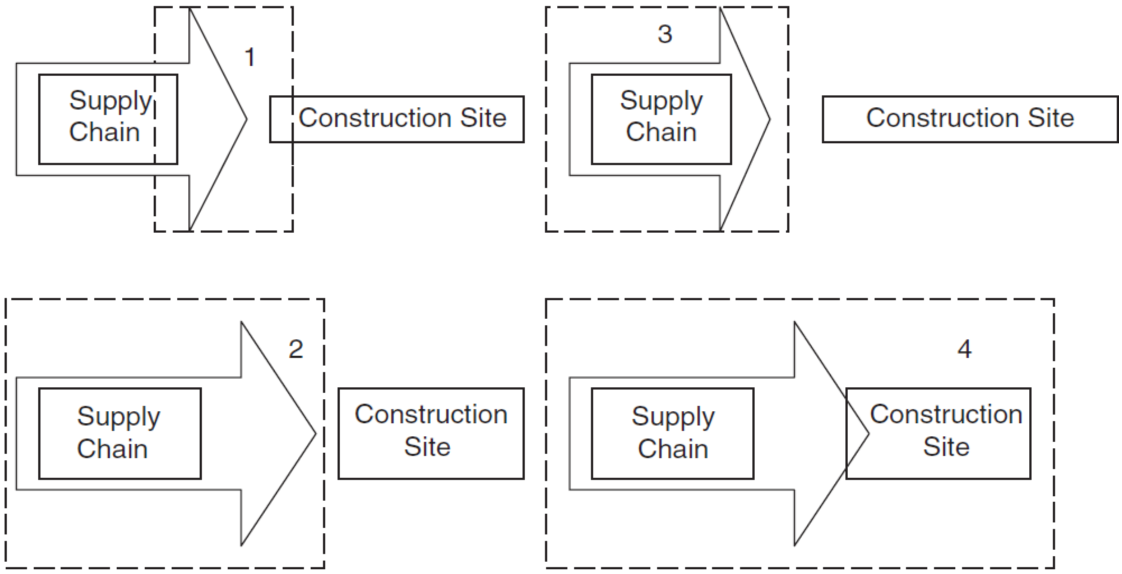

Figure 2 Four role of SCM in construction Vrijhoef and Koskela (2000)

- First picture shows the SCM focuses on the impact of SC in construction site and aims to reduce the duration and cost of the activities.
- Second shows the SCM focuses on the SC itself and its aim is to reduce costs related to logistics, time and inventories.
- Third focuses on transferring the activities from site to earlier stage in SC.
- Fourth focuses in integrated management and improvement of the SC and site production.

2.6 Benefit of SCM

There are many benefits when SCM is introduced to an organisation, it simplifies the objective of all the trading partners in achieving the common goals, which are reducing the waste and increasing the productivity (Akintoye, 2002). It shared the problems and results in working together to find a solution, this will not only be beneficial for the client, but also the organisation to improve their margins, reduce stress and aggravation (Hall, 2001).

It increases the visibility into the supply chain and its network, the organisation can be more responsive to quick changes and can benefit on new opportunities. It offers a common information centre that supports collaboration therefore it enables you to better adapt and meet the customer demands. It can also lower their operational expenses by up-to-date planning for procurement, manufacturing and transportation can lead in the improvement of performance quality and lower costs, and can future increase the margins through better communication with the partners.

Companies like Balfour Beatty and Tarmac within the construction industry together with their clients (e.g. British Aviation Authority, Tesco) has developed SCM techniques for rationalising their supplier base (Pryke, 2009).

2.7 The Latham report

In 1993, Sir Michael Latham was commissioned both by the UK construction industry and the UK government, to review the issues in the industry and look at the procurement methods and contract arrangements (BIS research paper, 2013). Latham identifies industry inefficiencies, accepting the existing industry practices as “ineffective”, ”fragmented”, ”adversarial” and “lack of respect for its employees” Latham (1994) In his report it also contains a reference of a presentation given by Dr Bernard Rimmer at a conference held by “Contract Journal” in 1993, where he was comparing the position of the client between a motor manufacturing industry and the construction industry.

Some of the recommendations about supply chain from Latham’s (1994) report as follows:

1- Support the “Re-engineering” of the structure and processes of the industry so as to improve their profitability, while sharing the benefits with clients and sub-contractors throughout the supply chain.
2- Figure out “world – class best practices” and develop the UK contracting practices for Engineers, architects, contractors, sub-contractors and suppliers.
3- Write guidelines of best practice also include the ethical practice throughout the supply chain taking into account UK and other international publications.

2.8 The Egan report

Is written by Sir John Egan in late 1998 and was titled as “Rethinking Construction”. In his report, he stated that the construction industry as a whole is “under achieving”. He mentioned ways to improve and called it “Dramatic improvements”. His suggestions were focused more on delivering value that a customer needs and to change the waste, poor quality arising from the existing workplaces and structures. Report sets an ambitious target per annum reduction of about 10% in the construction cost and 20% in construction defects. The report also lists few drivers for change:

- Partnering the supply chain
- Focusing on the customer needs
- Integrating teams and processes around the product
- Committed leadership
- Agenda that is driven by quality

When Egan was discussing about construction supply chain he identified that “supply chain is critical for driving innovation and it also sustains incremental and improvement in performance” Egan (1998). Egan was indeed clever and right to point out the critical contribution, but he might have forgot how highly fragmented structure and organisation, is the construction supply chain, his attempt for a change have been an ambitious.

2.9 Never waste a good crisis

Andrew Wolstenholme is the writer of the report, he was commissioned by the Constructing Excellence in 2009, to analyse the progress in the industry after about roughly 10 years from the publication of Egan report.

The name of the publication from Construction Excellence was “Never Waste a Good Crisis – A Review of Progress since Rethinking Construction and Thoughts for Our Future”. He managed to do a survey with about 1000 construction professionals, here are his key findings:

- “There is some progress visible, but no-were close to enough. Only few of the target set by Egan has been met, but most of them did not”
- “In targets where improvement has been achieved, most of the time the commitment to Egan’s principles has been skin deep”

2.10 Barriers and challenges in SCM

So far within the UK construction industry there is still an ongoing debate about best practice when applying SCM, Cox and Ireland (2002) more than 70 years researchers have continually blamed these problems of the industry due to the fragmentation of supply market and adversarial behaviour of main players. The insufficient interaction between the design and construction teams.

The necessity SCM imposes on contractors is to share traditionally proprietary information, planning, strategy and goals but for some reason or other most construction organisations do not feel comfortable exposing such information with others, Due to the fear of losing control or most focus on individual goal rather than the whole SCM goal.

Source	Barriers identified
McHenry and Benton (2010)	Fail to share project information, Lack of self-awareness, lack of partner awareness, unable to recognise project goals, lack of understanding of supply chain, myopic thinking.
Pryke (2009)	Short termism, lack of trust, adversarial relationship, large number of infrequent clients and transient nature of construction projects.
Hosseini (2007), Cooper (1994), Hsu et al. (2008), Grant (1996)	Resisting the advancement of technology, they are not willing to adobe the new technology.
Hosseini (2007), Mudgal et al. (2010)	Lack of governmental support which means the government must take initiatives and publish best practice for SCM in construction and provide benefits for those companies implementing SCM.
Department for business innovation & skills (2013)	Highly fragmented supply chain, Methods for contractor section and incentivisation, inappropriate type of risk transfer future down the supply chain.
Sarkis (2009), Mudgal et al. (2009), Zhu (2007)	Lack of top management commitment, they are not showing enough interest for implementing SCM. Poor understanding of the concept.
Green, Ferine and Stephanie (2005)	Industries cultural resistance to change.

In the recent years there is increasing interest among the large clients and contractors in UK construction firms to develop collaborative relationships (Smyth and Pryke, 2008). But so far these efforts are not very successful, however there are some improvements noted Cox and Thompson (1997).

Complexity and difficulty of SCM:

According to Xue et al. (2007), construction industry can be considered as one of the most complex and harsh industry. To be able to develop a construction it passes from different phases, like conceptual design, client's needs, maintenance etc. each of these phases are carried out by different specialist, whose goals are different. With the complex process of supply chain, it makes the chain members to not achieve an interlinked relation between each other and thus result in the conflict. Hence due to this challenges construction industry suffers from cost overrun, time overrun, poor work quality and finally client is dissatisfied.

Inefficient flow of information:

In construction supply chain large amount of information gets involved from various chain members. As a result the information gets difficult to be managed and information errors and delays start to arise which eventually will lead to disputes (Shin et al., 2009). The effectiveness of supply chain is mostly dependent on information sharing between the supply chains, we know the nature of supply chain is temporary in construction industry, since the information sharing needs trust between members this is not quite possible as the supply chain members do not work together enough, this is also supported by many writers Sun and Zhang (2006).

Fragmentation and subcontracting:

In both the cases fragmentation and subcontracting in construction blocks the incentives for participation within the project to corporate and learn as a team together (Mossman, 2009). The participants can have different objectives or priorities, but they should all have the same aim to successfully finish the project on budget and time (Thomas and Thomas, 2005), therefore, all parties should communicate with each other by integrating team work together.

Moreover, in most of the construction industry main contractors do sub-contract the work to a smaller company, and they usually do not have any communication with the client, therefore this can cause the final quality of the work to drop and finally unsatisfied clients do not work with same contractors (Forbes et al., 2002).

Cultural issues:

To be able to implement supply chain management (Lean Construction) to the industry it needs a fresh approach in thinking about the whole process, in order to remove 'waste, reduce cost' and enhance value for money. On the other hand researches show that UK construction industries culture is known to be opportunistic and it mainly resists to change Rooke et al. (2003). There have been many other researches written about cultural issues like Johansen et al. (2004), Alarcon et al. (2005), and Abdullah et al. (2009).

Lack of top management commitment:

Any type of new innovation to be able to implement within a company it has to be supported by the top management (Sarhan and Fox, 2013). This top level management has to spare time and find resources to develop a plan for implementing the changes in the organisation (Bashir et al., 2010). Few researches argue about the level of managers that are responsible, Mossman, (2009) believes that it's not the top level management who is more responsible for these changes it's the middle management, but most of the researches think that it's the top level manager who is more responsible like Abdullah et al. (2009) and Alinaitwe (2009). Various research also lists many managerial issues such as lack of participative managers, lack of understanding the clients, poor planning, lack of vision, etc. Johansen and Porter (2003), olatunji, (2008) and Alinaitwe, (2009).

2.11 Survey 1: To identify supply chain collaboration and key barriers

This survey was conducted by Akintoye, A., McIntosh, G and Fitzgerald, E. in 2000, the survey is a questionnaire type format where they asked the companies about their opinion in supply chain collaboration and key barriers.

The results show that a significant number of attendees' at least wanted a partnership or collaboration with the supply chain followed after the publication of Latham (1994) and Eagan (1998) report. It also shows the SCM is still in the swaddle but some sort of awareness within the industry is obvious.

This survey questionnaires were a replicate from previous researches conducted in (1991, 1994, and 1997). The questionnaire was divided into seven sections which included: Exploring supply chain relations, how efficient are tendering process, how clients and suppliers valued, their opening on partnering and most importantly which the author will use in his research the key barriers in successful implementation of SCM.

100 questionnaires were sent to organisations and 40 got back with answers and here are the statistics, Table 1 shows the number of responded and their categorised classification.

Group	Turnover (£ m)	Frequency	%
Large	Less than 100	14	35
Very large	100 – 250	15	37.5
Mega large	Greater than 250	11	27.5

Table 1 Distribution for the responding organisations

As we can see from Table 2 the questionnaire had six type of key barriers, the respondents had a scale from 1 to 5 (1 indicates low importance and 5 is the highest importance) and the answers show the most important barrier behind SCM is the lack of top management commitment with overall value of 4.03 out of 5 followed by poor understanding of the concept of SCM. The rest can be seen below.

Function	Overall	Less than 100	100 – 250	Greater than 250
Lack of top management commitment	4.03	3.86	4.40	3.73
Poor understanding of the concept	3.98	3.86	4.13	3.91
Inappropriate organisation structure	3.90	3.57	3.93	4.27
Low commitment of partners	3.85	4.00	3.80	3.73

Table 2 Barriers affecting the Implementation of SCM in construction

A more in-depth analysis is done in the analysis section and these results will be compared with other case study conducted.

After exploring these barriers, it seems like SCM is an extremely difficult task for most of the construction firms to adopt or even necessary for willing to integrate the chain. So far it is a distant goal to be reached, but it is a critical factor in the long-term success of construction firms

2.12 Survey 2: Challenges to develop lean construction (SCM)

This survey was conducted by Sarhan, S. and Fox, A. (2011), to find out the barriers that are affecting the implementation of Lean Construction (SCM) in UK construction industry, this is a more recent survey compared to previous survey 1.

This research employed a typical questionnaire method approach. In it there were 36 questions and the aim was to find out various aspects of the conceptual framework. The author will be focusing on questions 34 and 35 the most as they are going to give the statistics for the key barriers.

A total of 198 organisations were contacted and sent questionnaire, 140 responses were received which is approximately 70% replied. The respondents are further classified into categories we can see it in Table 3.

[1] AAT in £ Millions			[2] Size of organisations		[3] Major Client		
1-100	100-1000	1000 +	<500 employ	>500 employ	Private	Public	Both
40%	31%	29%	46%	54%	14%	26%	60%

Table 3 Distribution of participants in percentage

Before coming up with a list of barriers that needs to be written in the questionnaire an extensive research was conducted by Sarhan and fox (2011), after identifying the top 10 key barriers. They tried to find out the most effective one from practical point of view. Because so far everything was just in theory.

Table 4 show the list of top 10 barriers and the responses given by the organisations, the scale was 1 being very low and 5 is strongly agree.

Rank	ID	Key barriers	Mean	St. Dev.
1	B3	Lack of adequate Lean awareness	4.30	0.76
2	B7	Lack of top management commitment	4.06	0.94
3	B4	Culture & human attitudinal issues	4.04	0.86
4	B5	Time & commercial pressure	3.89	0.97
5	B1	Fragmentation & subcontracting	3.76	0.99
6	B2	Procurement & contracts	3.69	0.95
7	B9	Educational issues	3.58	1.03
8	B10	Lack of process based PMSs	3.54	0.98
9	B6	Financial issues	3.47	1.01
10	B8	Design / construction dichotomy	3.34	1.18

Table 4 Barriers to successful implementation of lean construction (SCM)

As we can see the top three are listed as follows, lack of understanding to Lean construction (SCM), lack of top management commitment and cultural issues of the organisation.

3 Research Methodology

3.1 Introduction

This section will include how did the author implemented his own research study, what is the strategy followed in order to complete the empirical study.

Research findings are the result of compounding literature review and the empirical findings Biggman (2011). There are three main objectives in this research set within the context of higher education, they are to:

- Evaluate the barriers and challenges the construction industry is facing when implementing SCM,
- To assess the skills needed in order to perform SCM and
- To find out how much are the construction industry is trying, giving effort to implement SCM.

There is a gap in the literature and case studies, however that said there are two specific case studies which is also addressed in section 2 that the author has used to research and analyse the first two objectives in the form of literature review. The data collected by the author was used specifically for objective three, this is because not a lot has been written so far about this topic and the data would be new, up-to-date and reliable.

Objective three takes the research one step ahead by collecting the empirical data and analysing it, as this will give us the full understanding of the topic and where the industry is standing currently in implementing SCM.

This section will provide the detail for the research strategy that has been adopted in order to achieve the objectives specified above, together with how the data has been collected and how will it be used in the analysis procedure. In addition to that, the author will also specify the potential limitations that were faced when committing for this research strategy.

3.2 Research strategy

There are three objective in this report, all of them have to be analysed specifically, and the strategy followed by the author to conduct the research is a mix approach of case study, questionnaire and a semi-structured interview that will back up the questionnaire results in the later stages. The reasons why the author has chosen the mix method analysing are as such,

Facilitation: During the research stage one method of research may lead to the discovery of the new insights which will follow the use of other method.

Interpretation: For example one method “quantitative” maybe used to help us understand the variables emerging from the others “qualitative”.

Focus: Using only one method might focus on one attributes “quantitative on macro aspects” but if mixed method will be used then it catches other attributes like “qualitative on micro aspects”

Bryman (2006)

In this research paper quantitative and qualitative both will be used when collecting the data and analysing it, here are a few ideas written by scholars regarding the differences.

Biggman (2011) has wrote the difference between the quantitative and qualitative method are: quantitative research is concerned with numbers and quantities while qualitative is more involved with in depth researching and understanding the studies.

Crowther and Lancaster (2009) qualitative data are usually difficult to quantify, unlike quantitative data that is only related to data that can be quantified.

In essence, this research is primarily qualitative in nature but because of the questionnaires that have conducted. Some numbers will be involved, therefore, it is a mix of both quantitative and qualitative.

As mentioned previously a single case study approach will be used for objectives one and two, this means for each objective, one case study is used. What is case study approach? And why is it suitable for this report?

A case study is the study of one example previously conducted of a particular type of research, in this case it is, SCM in construction industry. Cohen and Manion (1995) defines case study as:

A case study researcher typically observes the characteristic of the individual unit – a class, a school or a community. The main purpose of such an observation is to probe deeply and analyse intensely the multifarious phenomena which constitute the lifecycle of the unit.

The author has chosen to do the research with single case study, this is because the topic SCM in construction is a new idea, and very few research has been conducted, therefore is it a better approach. This research will be using the mix approach strategy therefore, other than the case study, questionnaires have also been conducted for objective three.

Data is different to information, you can get information from the case study but when survey or questionnaire is used you also get data. Data is the basis of research and investigation, and information is derived from the analysing and conclusion of raw data (Crowther & Lancaster, 2009).

And finally two interviews have conducted, these interviews weren't planned initially but as the research moved on, due to the percentage of responses author had from the questionnaires, having interviews would strengthen the report. The interviews were semi-structured, and the questions are from the questionnaire, and face to face talk was a better opportunity for open-ended questions. As Maccoby (1954) said, interviews are one of the most used techniques for collecting data by means of questioning.

There are advantages and disadvantages for the strategies selected in order to accomplish this research.

3.2.1 Case studies: advantages and disadvantages

Case studies usually are a lot more detailed and well thought, it is not easy to get this much information with other research strategy, the information is normally a lot more richer and in depth.

Case studies are conducted for rare case situation, where not a lot has been researched or thought, and this reports situation is similar to that, Sarhan, S. and Fox, A. (2013) has succeeded in their report.

The main criticism is the generalisation of the result obtained from data collected to a wider population, this is because the data might have been collected over a longitudinal case studies and that it is not relevant to the generalised use.

If case studies are done by one person, especially in data collecting procedure, this might lead to a bias unintentionally which can influence the final result.

3.2.2 Questionnaire: advantages and disadvantages

Questionnaire is a quick way of collecting data from a wide range of population. It can be quantified faster as the results are usually quantitative which makes it easier and faster to analyse. It can be used to measure different researches conducted previously and match them to find the changes in the pattern.

There are limitations or disadvantages as well, such as bias results from the candidates as the author has no control over them when they are filling the answers. Questionnaires are also not suitable to get qualitative and in-depth data Walliman (2011).

3.2.3 Interviews: advantages and disadvantages

Interviews are a beneficial way of obtaining data specially a face to face interviews, the interviewer has the chance to modify the questions by the response the interviewee is giving, observing facial signs like nods, smile, anger, etc. do also give a different perspective to the interviewer.

Interviews provide much more rich data as compare to a questionnaire, it also helps get deeper and closer look of people experience, they also give more faithful and fruitful results in organisational and management related research Riley et al. (2010).

4 Data collection

The researcher have used more than one technique of collecting data, using more than one source of data allows the researcher to get triangulated results. Triangulation does occur when multiple sources are used to get a range of perspectives, as a result a more rounded picture Geertz (1973).

Adopting qualitative perspective do get more concerned to understand individuals' perception of the topic, this is the central target of the project, to understand where the construction industry is standing in regards with the SCM implementation. In the process of collecting data, both qualitative and quantitative approaches are used.

4.1 Questionnaire

Before the decision was made to use questionnaire method as a tool for collecting data, researcher has answered few questions in order to find if it was the right way to do so. Some of them are as follows:

Do you need an open ended question? Do you need an explanatory question?

For this research the questions required are more straightforward and strategic not a lot of explanatory required, the questions are mainly to find the relationship between variables. Therefore, this method was chosen by the researcher.

There are different types of questionnaire, in this report the author have used self-completed questionnaire and used web-based communication (e-mail). Due to the research ethics and participants privacy no data was collected regarding their company name of their position within the company.

The questionnaire is attached in appendix b, together with the cover letter that was send to introduce the participants to the topic and give brief information about the research see (Appendix a), A total of 14 questions were asked most of them are List questions (where the respondent tick the box), Category questions, ranking questions, rating questions and very few comment if any type.

First few questions are to get to know the size and position of the company in the industry, then the main aim of the report on to how much are they imputing to adopt SCM in their strategies, and finally if they think it has a positive or negative effect on them.

4.2 Interview

The interviews are structured in a way to ensure that it will be clear and beneficial for the report, the direction of the interview should be pre prepared. But of course there should be opportunity for the interviewees to express their view if they needed to. The structured questions were send to the interviewee in advance to be prepared, to get maximum benefit out of the meeting.

The interview is semi structured and the questions are from the questionnaires prepared for the survey purpose. Same questions will be asked to see interviewee' reaction and the additional comments they add on, if they do. It will also provide an opportunity to find out if the questions are well though and structured.

Interviews will also introduce the concept of triangulation, as previously said by adding another source of data collection method it will enhance and give the opportunity for the researcher to compare and contrast the differences between. Due to richness and complexity of human behaviour by studying the topic from different standpoints Cohen and Manion (1995)

The interview questions are classified into three sections. The questions are prepared keeping in mind the three objectives and the gap in the literature that was previously identified.

The first section of the interview is therefore to get to know about the company, how big is the company? How many employees they have? Whether or not if they deal with SC, and what are they specialised in, could be a house builder or school, or road etc.

In the second section it is mostly about the importance of SC, asking the interviewee' to rate the items that are more important to them about SCM, and if they do or will include environmental issues, the main purpose of these questions is to explore the real practices and challenges they are facing, and also it give the opportunity for the interviewee to share ideas or scenarios they have faced previously.

And finally in the third section, questions are like what is stopping or the challenges they are facing when introducing SCM into the company, and if possible rate them to find the most severe and important once. Therefore, we can conclude if SCM is adding positive effect or negative to their company.

4.3 Framework for data analysis

In order to help in simplifying the understanding of questionnaire the framework has been divided into three section, the first stage is to get to know about the company, second stage it to find out how much importance is the company giving for building up relationship with their suppliers and finally what type of help do they provide for their supplier to keep them satisfied and up to the speed in the industry.

These sections are there to help whoever is filling up the questionnaire and also to help in interpreting an analysis out of it.

Similarly with the interviews, they are semi-structured, and the questions are mostly open-ended, but the questions are in the same order of the questionnaire, this is done on purpose to follow the logical order and will be easier to link and compare it with questionnaires.

The interviews are carried out face to face, and notes are taken during the session. As the questions are taken from the questionnaire mostly the answers will be to tick the boxes only in few occasion there will be a comment section where the interviewee will be commenting. By following this method interviews will be completed within the time and no room will be provided to get distracted and diverted from the main aim of the interview.

Figure 3 below shows graphically the approach that is followed for analysing the data from both the questionnaire and the interview, this method is found by Wolcott (1994). However analysing the qualitative data is not a linear or straightforward activity, it requires an iterative approach to understand fully the pattern. Miles and Huberman (1984).

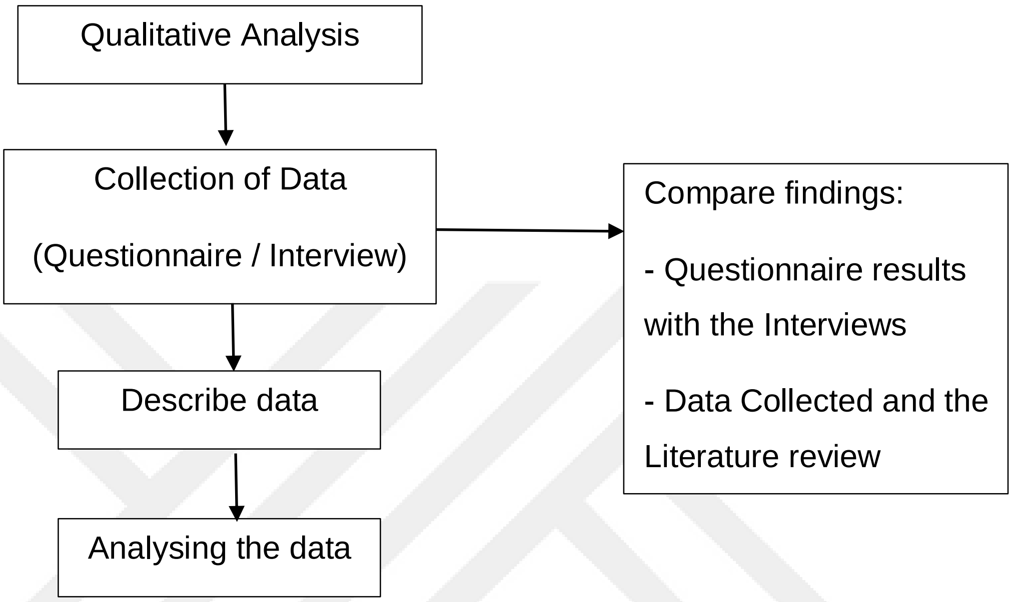

Figure 3 Data analysis process for the SCM that is followed

4.4 Limitations and potential problems

There could be so many factors that will contribute to the limitation of the research and therefore its validity and effectiveness. And generalising the result that is found in this research through the entire industry could also be wrong interpretation.

Access for data collection:

In the initial stages of project, it was a challenging process in order to find way to collect data, due to the busy nature of the industry very few people from the industry do spare their times for academic researchers, as they think it is not adding any value to their work. Therefore finding the right person was a challenge also a limitation as very few of them was interested.

Time was a significant factor of limitation, conducting the research and writing it up in only half an academic year do limit the project. The questions had to be very specific and less in number. As the time is very limited everything cannot be analysed, reasonable amount of data should be collected in order to have an effective and useful report as an outcome.

Questionnaire introduced limitations such as the number of questions that could be asked. The length of the questionnaire has to be little not more than ten to fifteen questions, if it is more, then the participants might not complete it. And the questions have to be straight forward mostly ticking the box, not a lot of comments can be extracted from the participant.

Other limitations could be that few participants could not take it serious and could randomly tick boxes in order to finish the survey as quick as possible. Risk of less reply percentage, from previous experiences the response rate of replying are usually low.

Interviews are specifically conducted to eliminate or minimise the limitation that could rise from the questionnaire method (e.g. getting additional comments, changing the question type with the response from the interviewee, etc.).

But interviews also has its own limitations, the interviewee can exhibit bias or poor memory recall, to avoid any problems that might come to him in future, to avoid this type of limitation the interviewee will be informed that his or her name will not be used directly, it will be replaced by interviewee A and Interviewee B. if the participants are very talkative they might divert from the topic easily, therefore the interviewer should be attentive and have the full control of the structure.

5 Data Obtained

This chapter will include the data obtained from the case studies for Objectives one and two, and the survey data from objective three.

5.1 Objective 1

The data obtained from this case study is a survey conducted in early 2000's involving 100 UK leading construction companies. This particular survey was designed using previous surveys like, "Long-term partnerships, or Just living together (1991)", "Supply chain partnerships, Who wins? (1994)" and Efficient consumer response, SCM for the new millennium (1997)".

The companies were categorised into three sections in respect to their annual turnover, these sections are (turnovers less than £100m, between £100m - £250m and greater than £250m).The frequency distribution of the companies attended the survey can be seen in Table 1.

Sets of data obtained from the case study includes the Length of partnership agreements with suppliers or clients, the importance of supply chain collaboration and management, the reasons why build supply chain relationship with suppliers and clients, main objectives in developing supply chain collaboration, key issues that can effect supply chain relationships, and the major barriers that effects supply chain relationships.

Below are the lengths of partnership agreements with the supply chain.

Length of partnership (years)	**Frequency**	**Percentage %**
0	14	35
1-2	10	25
3-5	12	30
6-10	4	10
>10		
Total	40	100

Table 5 Length of partnership between the contractors and the suppliers

Table 6 below shows that almost 90% of the participants agreed on how important it is to create a supply chain collaboration with the suppliers and the clients, however about 10% believes it is not important.

Importance	Frequency	Percentage %
Not important	1	2.5
Limited importance	3	7.5
Important	17	42.5
Critical	19	47.5
Total	40	100

Table 6 The importance of supply chain collaboration and management:

The factors that affect contractors in supply chain relationship, typically the contractor would want a better quality of products with minimum cost, and this can be also seen in the survey Table 7.

Function	Rating (out of 5)
Better quality service	4.63
Cost benefits	4.55
Simplifying the construction process	4.23
Simplifying the overall process	3.48

Table 7 Factors in supply chain relationship with supplier

Whereas the factors that are important for contractor supply chain relationship with clients are, cost benefits and simplifying the construction process see Table 8 for the responses and their ratings.

Function	Rating (out of 5)
Cost benefits	4.55
Simplifying the construction process	4.15
Simplifying the tendering process	4.03
Simplifying the design stage	3.98

Table 8 Factors in supply chain relationship with client

And the most important and useful section of this case study for the thesis is section 9 where the companies has identified the major barriers that stops contractors from building supply chain relationships with the suppliers and contractors.

Function	**Rating (out of 5)**
Lack of top management commitment	4.03
Poor understanding of the concept	3.98
Inappropriate organisation structure to support system	3.90
Low commitment of partners	3.85
Strategic benefits are unclear	3.48
Lack of appropriate IT	3.13

Table 9 The major barriers for supply chain relationships

This shows the lack of upper management commitment is at top of the reason why large construction companies don't achieve high standards of SCM compare to other industries. Other reasons such as lack of understand in the concept and the inappropriate business structure within the companies does effect it.

The discussion of this case study together with the comparison of its results with the survey done for object three has been compared and presented in section 6.

5.2 Objective 2

This case study was conducted in 2011, the data is more up-to-date compared to the previous case study. A similar approach has been used by Sarhan, and Fox (2011). The data has been collected from 140 construction companies.

List of barriers and the rating given to each with their percentages are listed in Table 10.

ID	List of the key barriers	Strong influence%	Week influence%
B1	Fragmentation & subcontracting	68.8	31.2
B2	Procurement & contracts	63.6	36.7
B3	Lack of adequate awareness	88.2	11.2
B4	Culture & human attitudes	80.1	19.8
B5	Time & commercial pressure	72.7	27.2
B6	Financial issues	54.0	45.9
B7	Lack of top management commitment	77.4	22.5
B8	Design	50.4	49.5
B9	Educational issues	64.2	35.7
B10	Lack of the use of process base PMS's	59.1	40.9

Table 10 List of barriers and their percentages

The data shows similar result as the previous case study, lack of top management commitment with 88% and lack of the concept understanding 80% are the main barriers pointing out,

To overcome these type of barriers companies should invest and put pressure at top managers, to take SCM serious and possibly should provide them more knowledge about the topic and show them the possible outcome benefits.

5.3 Objective 3

The data for objective three is from two sources, one is the questionnaires and the other from interviews conducted that will be used in comparing and backing up the theory initially formed.

A total of 12% Feedback has been achieved from the questionnaires as shown below how it is divided:

Size of the company	**Employee**	**Number of feedback**
Small	1-10	3
Medium	11-50	3
Large	51-250	2

Table 11 Distribution of the responding companies

As previously discussed the questionnaire was divided into three sections, and with the help of Excel sheet three table are formed and the percentages of importance for each has been calculated the results can be seen in Table 12, Table 13 and Table 14. Which is further analysed on what these percentages mean in section 6.

	Company		
Item	Small (%)	Medium (%)	Large (%)
Quality	18	22	20
Cost	23	20	20
Availability of supplier	20	13	10
Environmental performance	8	13	15
Accepts partnering	16	12	20
Transport	15	20	15

Table 12 The Importance of supplier characteristic for the company

Key barriers	Company		
	Small (%)	Medium (%)	Large (%)
Lack of adequate Lean awareness	16	20	11
Lack of Top Management commitment	12	18	16
Culture and human attitudinal issues	13	17	12
Time and commercial pressure	12	0	12
Fragmentation and subcontracting	13	14	11
Procurement and contracts	11	0	15
Educational issues	10	15	11
Financial issues	13	16	12

Table 13 The main barriers of engaging with the suppliers

Types of support for suppliers	Company		
	Small (%)	Medium (%)	Large (%)
Financial	0	10	15
Training	10	40	45
Information	90	50	40

Table 14 Types of support contractors provide to suppliers

6 Discussion of the Results

This report examined practices on how construction companies try to implement SCM into their systems. The study, also examined the challenges and barriers faced by the industry to overcome them.

Many believe that the industry needs to pay more attention in SCM to increase the profitability and to be sustainable in the future (Low, 1996). However to be able to achieve these standards companies has to invest in their strategies by looking deep into reports and articles written that shows, where the industry is lacking behind.

Therefore, based on the objectives initially fixed and the study conducted and the literature reviewed the data will be analysed and presented as shown below:

- Challenges and barriers that stop contractors from implementing SCM in construction
- Skills needed by the industry to implement SCM
- How much time and money are companies sacrificing to implement SCM?

6.1 Barriers that slow contractors from implementing SCM in construction.

This is a common topic that has been researched many times. Case study one author Akintoye (2000) and his team for example in their research has provided a list of barriers that they think is important together with a comment section, if they think there are other barriers, from the feedback they could see that the top three reasons were, Lack in top management commitment, Poor understanding of the concept and Inappropriate organisational structure to support the system (see Table 2).

Egan in his report (1998), did mention the importance of SCM in construction and how to achieve it, one of his first suggestion was to introduce partnership with the suppliers. This seems to be achieved a bit, when we look at Akintoye's report (see Table 2), partnering is not in the top three reasons.

It is also clear from Table 5 that 65% of the participants did have a partnership agreement with their suppliers for at least more than 1 year and in some occasions goes up to 10 year. And Table 6 shows almost 90% of the participants again agreed that partnering is important and necessary for the industry.

Case study two had identified similar results, Sarhan and Fox (2011) in their report they had a lot more feedback from the industry with about 140 replies, but the outcome were the same (see Table 10) the top three barriers were Lack of lean awareness and understanding, Lack of top management commitment and Culture, human attitudinal issues. Almost identical with case study one. The highlight of the two experiment was that top managers in the industry are the main barriers those are slowing the SCM implementation.

They have an important position within the company without changing their views, companies will always struggle.

The researchers' survey has proven it as well (see Table 13), the companies are divided into three sizes small, medium and large. Medium and large companies both have the highest percentages in, Lack of top management commitment and Lack of understanding the concept. Whereas when we look at the small companies they also think Financial issues is a barrier in front of SCM implementation.

This was also discussed with the Interviewee A, he thinks "Small companies do not think on implementing SCM because of time and money consumption fears" he means that small companies when they agree with their suppliers, they do not sign any partnering, they change their suppliers as they market situation changes. This is due to the workload they have, he said "In one year the small companies might have worked for 3 months, and stay still for another 9 months. Or vice versa" therefore even if they are willing to do partnering with the suppliers, the suppliers them self will not agree sometimes.

We can see the difference between small and large companies by looking at the, supplier characteristic requirements are different in Table 12. Small companies are more interested in the cost and availability of their suppliers, whereas the large companies look at the quality of the products and the acceptance of partnering in the long term.

Interviewee B, has expressed his opinion for the large companies, "Large companies mainly do not struggle with the financial or the time pressure of this situation, they have issues in the overall structure of the company system and the way top managers think in these companies". Therefore large companies have to change the supply chain system within their organisation and also provide skills needed for top managers to overcome these barriers.

6.2 Skills needed by the industry to implement SCM.

New innovations, concepts and ideas can only be implemented within an organisation only when the top management is fully involved in the process Sarhan and Fox (2013). And Mossman 2009 says companies should not wait for a crisis and then make effort to change, because it might be too late to learn a new skill.

Skills are important, BIS (Department for Business Innovation & skills) 2011 has written in its report "Infrastructure supply chains" that companies should take more action towards providing their staff with skill learnings activities

In case study two, Table 4 shows that educational issues have a mean value of 3.58 out of 5. This also shows that skill is an important factor and it needs to be learned and thought within a company, similar result was found by the questionnaire done, Table 13 shows that educational issues has about 10 % of importance.

Interviewee B have said that, in large companies it is true that the staff needs to be skilled, not all staff has to know everything but they have to categorise those people who are dealing with the supply chain and provide them the skills needed to carry out their work effectively.

Whereas interviewee A in this case did not have much to say, he insisted that small companies will not spend specific time and effort to introduce these skills to their staff.

6.3 Time and money companies invest for implementing SCM

Construction industry is a complex and harsh environment Xue (2007). To be able to develop a new system within this complex structure, one will need to invest a lot.

For objective three, the researcher has included this question in the questionnaire. The results (see Table 14) produced has shown that small companies does not invest financially to help support their suppliers, to be able to implement SCM in their company, they only provide information.

In medium and large companies only 10 to 15 % financial support, 40 to 45 % training and 50 % informational support. Here we can see that bigger companies do invest but the numbers are still not where it has to be at this stage.

Similar question was asked to Interviewee A and B.

Interviewee A gave his opinion on small companies, he insisted “Small companies are not consistent in the market, every year so many of them start their career and finish it even before completing one proper project, and the ones who do complete has a very small percentage of profit at the end of his task due to the changes introduced by the client during the construction period. Therefore, these type of small business are not willing to spend their budget on improving relationship with the suppliers’. This answer also supports the outcome from the questionnaire conducted (Table 14).

Interviewee B spoke on large companies from his previous experience, “Large construction companies these days do believe suppliers are an important factor in achieving a high quality of work, and it does promise in finishing the job on time, suppliers needs to be reliable. And to achieve this short of communication level with them, large companies do provide financial and training support to them, keeping in mind that these suppliers will be beneficial to them in the long run” this is the similar result achieved by the researcher in Table 14, shows 45% of large companies provide training and 15% provide financial support.

7 Conclusion

To conclude, the aim of this research was to identify the currently status of SCM in SME's in the UK construction industry, in addition to that, to find out the challenges the industry has been facing to implement SCM into the system, and types of skills needed by the staff to overcome these challenges. The literature review has shown us what was done previously and how the industry was looking at SCM. In line with these literature, a case study was analysed and questionnaire was produced and used to collect up-to-date data.

Case study one has showed about 90% of the industry thinks SCM is important and partnering with the suppliers is more important. Majority of the responders ticked the top three reason on why SCM is not implementing fast to construction industry is because of, Lack in top management commitment, Poor understanding of the concept and Inappropriate organisational structure. The complete list can be seen in Table 9.

Almost identical results were found in case study two, 140 respondents gave their rankings from a list of 10 reasons. In this survey the top three was also due to similar reasons, Lack of adequate awareness, Lack of top management commitment and Culture and human attitudes. The full list for these results is in Table 10.

After analysing the two case study which were conducted in 2000 and 2011 respectively, the author has prepared a new questionnaire. The questionnaires was send to construction contractors via email, and two face to face interviews have conducted by following the similar structure of the questionnaire.

The questionnaire sample is present in appendix b. And the data collected is presented in section 5.3. The companies were divided into three sections, small, medium and large. Small companies responded that the main barrier for implementation of SCM is the lack of awareness of the term, this shows the small companies are not aware of the term and how it functions. Whereas medium sized companies ticked mostly the lack of top management commitment and culture and human attitudinal issue. Finally, the large compare chose the issue as the lack of top management commitment, these results were also similar to previous studies, like the case study one and two.

For the last objective, the author has managed to find out how much time and money are the companies willing to spend. Table 14 shows small companies only support its supplier with information very few training and no financial support. Whereas in medium and large companies they do support by way of training facilities, providing information and financial support.

From these results, we can conclude that construction industry still has a long way to reach the level of SCM as of the motor vehicle or manufacturing industry but surely is much better than the time when Sir Egan and Sir Lather wrote their reports.

7.1 Recommendation for future work

This project can be continued in many ways, the following are a few recommendations:

- Types of skills needed: This is a hard section and a whole dissertation can be dedicated for this question. The researchers can try to find the best suitable skills needed for both the side, Contractors and suppliers in order to achieve a good SCM relationship or partnering.
- Looking at the SCM from supplier perspective: In this thesis the authors' focus was on contractors' view towards SCM, similar research can be adjusted and modified slightly, which will enable us to find out the suppliers viewpoint.
- Involvement of larger construction companies: In this thesis medium and small construction companies were used for data collection, this questionnaire can be used for larger companies. It is more difficult to get data from those companies as they are usually very busy, but getting useful data can show how large companies react and structure their system around SCM.
- Ways of collecting data: In this report the way of collecting data was mainly questionnaire and few interviews, the layout of the questionnaire

is very well structured, but instead of using email, it could be more effective if companies are interviewed, it does add another layer of data while interacting with the interviewee.

A final recommendation for this research can be made about the research topic, this is a growing area in construction industry and more similar researcher has to be conducted, more in-depth questions can be used to slowly go into the roots of the real problems.

Word count: 11,200

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9 Appendix

a. Questionnaire cover letter

Supply Chain Management

Your view on supply chain management systems in construction

CITY UNIVERSITY LONDON

Northampton Square,

London, EC1V 0HB

Email: cmeng@city.ac.uk

17 June 2014

Dear Madam / Sir,

Good afternoon. my name is Furkan Colak, I am doing a research on Supply chain management, this questionnaire is a part of a research thesis to understand the current status of supply chain management in the UK construction industry, your responses are important to enable me in obtaining as full an understanding as possible for this topical issue. However, taking part in this questionnaire is entirely voluntary.

The questionnaire should take you 5 minutes to complete. If you wish to add a comment please feel free to do so. The information you will be providing will be treated in a strict confidence, as you might also notice that you are not asked to provide name or address anywhere in the questionnaire.

All the answers will be used as my main data set for my research thesis for my degree in MSc construction management at City University London.

I hope that you will complete the questionnaire enjoyable. Please return the completed questionnaire Word sheet that is attached in the e-mail, before the date of 15th July 2014, to the following email address furkan.colak.1@city.ac.uk, If you have any questions or would like a further information, please do not hesitate to email me or call me on 0795 6135 602.

Thank you for your help.

Furkan Colak *Rob Melville*

Eng. Furkan Colak (student) Prof. Rob Melville (supervisor)

b. Questionnaire

Q1. What is the size of company?

Size	Employee numbers	Tick
Very small	1 - 10	☐
Small	11 - 50	☐
Medium	51 - 250	☐
Large	251 - 500	☐
Very large	> 500	☐

Q2. What type of services does the company provide?

Services	Tick	Comment (if any)
Buildings	☐	
Defence	☐	
Education / Healthcare	☐	
Energy / Power	☐	
Marine & Coastal	☐	
Road & Bridges	☒	
Environmental / Government	☐	
Other	☐	

Q3. Does the company have an Environmental Management System?

Choose	Tick	
Yes	☐	
No	☐	
Not applicable	☐	
If yes, Chose which one	**Tick**	**Comment (do you find it effective)**
LEED	☐	
BREEAM	☐	
CEEQUAL	☐	
ISO14001	☐	
Other	☐	

Q4. How many suppliers does the company have on average for daily operations?

Number of suppliers	**Tick**
Fewer than 15	☐
Between 16 & 30	☐
Between 31 & 50	☐
More than 50	☐

Q5. How important are the characteristic of suppliers when your company is doing business with them?

Item	**Scale (1 = less important, 5 = Very important)**				
	1	**2**	**3**	**4**	**5**
Quality / Performance	☐	☐	☐	☐	☐
Cost	☐	☐	☐	☐	☐
Availability of suppliers	☐	☐	☐	☐	☐
Environmental performance	☐	☐	☐	☐	☐
Accepts partnering	☐	☐	☐	☐	☐
Transport / Distance	☐	☐	☐	☐	☐

Q6. Does your company have or plan to include environmental issue in their supply chain management process?

Choose	**Tick**
Yes	☐
No	☐
Not applicable	☐

If not, Why?	

Q7. If yes, what are the strategies the company adopted or would adopt to include environmental issues on supply chain management process?

Strategies	Not needed	Optional	Obligatory
Recycling	☐	☐	☐
Eco-design	☐	☐	☐
Life cycle assessment	☐	☐	☐
Environmental policy	☐	☐	☐
Waste management plans	☐	☐	☐
Environmental audits	☐	☐	☐
EMS certificate	☐	☐	☐

Q9. What are the main barriers to engage with the suppliers?

Key barriers	Tick (as many as you want)	Rate (1 = less important, 5 = Very important)				
		1	2	3	4	5
Lack of adequate Lean awareness	☐	☐	☐	☐	☐	☐
Lack of Top Management commitment	☐	☐	☐	☐	☐	☐
Culture and human attitudinal issues	☐	☐	☐	☐	☐	☐
Time and commercial pressure	☐	☐	☐	☐	☐	☐
Fragmentation and subcontracting	☐	☐	☐	☐	☐	☐
Procurement and contracts	☐	☐	☐	☐	☐	☐
Educational issues	☐	☐	☐	☐	☐	☐
Financial issues	☐	☐	☐	☐	☐	☐

Q10. Does the company support its suppliers in order to achieve a sustainable supply chain management?

Choose	Tick
Yes	☐
No	☐
Not applicable	☐

If not, Why?	

Q11. If yes, what are the supports available for the suppliers?

Types of support	Tick	Comment (if any)
Financial	☐	
Training / Guidance	☐	
Information	☐	
Other	☐	

Q12. What kind of economic impact has the company experienced or might experience in the future?

	Scale (1 = less likely, 5 = Very likely)				
	1	2	3	4	5
Positive Impacts					
Decrease of costs in energy consumption	☐	☐	☐	☐	☐
Decrease of fees for waste treatment and disposal	☐	☐	☐	☐	☐
Negative Impacts					
Investment to implement selected strategies	☐	☐	☐	☐	☐
Increase in operational costs	☐	☐	☐	☐	☐

Q13. Any other comment?

Q14. Would you like to receive a copy of the results?

Choose	Tick
Yes	☐
No	☐

Thank You for your time.

Please attach this file and return the completed questionnaire Word sheet, to the following email address furkan.colak.1@city.ac.uk

c. Schedule for thesis write up

Activity	March				April				May				June				July				August				September			
Week number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Read Literature																												
Finalise Aim and Objectives																												
Draft Literature Review																												
Draft & Submit Research Proposal																												
Read Methodology Literature																												
Device Reach Approach																												
Develop Questionnaire																												
Get Feedback From Questionnaire											Exam Period					Holiday												
Enter The Data Into Computer																												
Analyse Data																												
Draft Finding Chapter																												
Update The Literature																												
Complete The Remaining Chapters																												
Draft Submit To Tutor																												
Revise Draft And Format																												
Print and Bind																												
Submit																												