

# Development of an Effective Model for Collaboration within the UK Construction Industry

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Volume 1 of 1

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## ABSTRACT

This work arose from Egan's speech in 2008 on the 10<sup>th</sup> anniversary of his report about collaboration in construction projects and also the Author's experience of procurement routes being used for such projects. The Author's research began with her MSc dissertation on this topic, from which two papers were published. This work was extended for this PhD thesis which has formulated a comprehensive and practical model as an aid to effective collaboration between parties to construction projects. No such model exists in the literature. The model is based on extensive consultation with professionals working within the construction industry, using a mixed qualitative and quantitative methodology.

In summary, the research had six distinct phases: identification of relevant aspects of collaboration from published literature; interviews to identify currently important aspects; rank ordering of these aspects; classification of the aspects and formulating definitions of collaboration; generation of the model; and validating the model.

Formulating the model began with 48 *aspects* which were derived from interviews with a range of professionals working within the construction industry. A structured questionnaire was then used to rank them statistically in order of their relative importance, from which 18 were identified as being essential. The data were then analysed for statistically significant patterns to validate its robustness. A definition of collaboration that represents the current use of the word within the UK construction industry was developed.

A further literature review, on actual practice in contrast to the previous review, focused on the essential *aspects* previously identified to produce a model that had practical relevance to improving collaboration in the UK construction industry. The model was designed initially to be read by *aspect* but when validating the model some Respondents expressed a preference to read the model by *project phase* or by *participant's role*. The model was then revised so it can be read in these three alternative ways.

The model was validated through structured discussion with a further set of professional Respondents, resulting in the final model, which is too comprehensive to sit sensibly within the thesis so it available as a website: <https://collaborationinconstruction.wordpress.com>.

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## GLOSSARY

**Group think** - A phenomenon that occurs within a group of people in which they start to conform together resulting in irrational decision-making.

**Pain / Gain** - The gain share involves splitting the difference between the target cost and the actual expenditure between the Client and Contractor whilst pain share is sharing any cost above the target cost.

**Theoretical lens** - The theory becomes the lens which shapes the types of questions asked in the research.

**Win / Win** - A way in which all participants can profit in one way or another.

**Worldview** - A comprehensive conception or apprehension of the world especially from a specific standpoint.

## ABBREVIATIONS

**BIM** - Building Information Modelling

**KPI's** - Key Performance Indicators

## DECLARATION

I hereby declare that neither this thesis nor any part of it has been presented or is being currently submitted in Candidature for any other Council for National Academic or University Degree

..... Candidate

## CERTIFICATE OF RESEARCH

This is to certify that, except where specific reference is made, the work described in this thesis is the result of the Candidate. Neither this Thesis nor any part of it has been presented, or is currently submitted, in candidature for any Degree at any other University

Signed: .....

Candidate

Signed: ..... 

Director of Studies

Date: .....2<sup>nd</sup> August 2018.....

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# *Chapter One*

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# *Introduction*

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# Chapter One

## Introduction

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### 1.1 INTRODUCTION

This thesis describes the research journey to produce an effective model for collaboration within the UK construction industry. This chapter begins by reviewing the Author's preliminary research which was instrumental in developing the focus for this PhD thesis. The aims and objectives which evolved from the preliminary research are set out. A research roadmap for this thesis is explained and also a flowchart is provided to aid the reader in describing how the model was achieved. Finally, the thesis structure is described chapter by chapter.

### 1.2 RESEARCH ROADMAP

This section sets out the research journey describing the logic behind the process.

#### 1.2.1 MSc Research

The research evolved from an MSc dissertation into this PhD thesis. The Author based her choice for the MSc topic on two factors:-

- It needed to be a subject she enjoyed; and
- Experience indicated that it was possible to make a contribution to knowledge.

Procurement, and specifically partnering/collaboration, was the subject chosen and the research began after reading Egan's speech of May 2008 as part of the literature review, where he stated "In summary, I guess if I were giving marks out of 10 after 10 years I'd probably only give the industry about 4 out of 10 and that's basically for trying". He continued by saying "I have to say that I would introduce, as early as possible in every possible project, a gain share between the Client and the industry, with a target based upon an agreed set of parameters, plus or minus I would say 15%" (Egan, 2008).

This seemed to the Author to indicate that Egan considered that incentivisation, specifically 'gain share' (or perhaps 'pain share') is essential to produce a successful project.

However Kadefors (2005) describes how this is not a good method for providing the best collaboration. She feels that incentivisation goes against the partnering ethos (Kadefors, 2005). These opposing views raise an important issue which was worthy of investigation for an MSc dissertation.

The MSc research examined whether the use of incentivisation is a precursor to the achievement of successful partnered projects within infrastructure projects in South Wales. Furthermore, the research examined whether the level at which the gain/pain share is set at is significant.

The aim of the MSc research was to test the following hypothesis:

“The use of incentivisation with a gain share of about 15% is a precursor to the achievement of successful infrastructure partnering projects in South Wales”.

Both qualitative and quantitative data were collected through questionnaires and interviews. Two infrastructure projects in South Wales were chosen and a selective sample of Clients and Consultants approached to complete the questionnaires.

Project A was a utilities company which uses strategic partnering while project B was a dockside regeneration project that had used tactical partnering previously. Project A has a formal partnering charter with different levels of pain share/gain share, while project B used an informal one-off partnering arrangement using an equal percentage of pain share and gain share.

To address the hypothesis, the Author focussed on the following questions:-

- Should incentivisation be used on every project?
- Should the target cost and incentive be set as early as possible?
- Should the incentives be set at 15%?
- Should the incentive percentage be the same for pain share and gain share?
- What makes a project successful?
- What factors are important in an incentive scheme?

The answers to these questions are described in full in Appendix 1 and an overall summary is given below.

This research demonstrated that partnering is not suitable for all projects. Incentivisation places a focus on cost and this can have a detrimental effect on the other aspects that exist within the oft-quoted triangle of time, cost and quality. The level at which to set the percentage for gain share is also a divisive issue but a substantial majority of respondents disagreed with the 15% suggested by Egan. The timing of the setting of the target cost was a problem on both projects with a reluctance by both Contractors to set it early in the process. Project B was not judged a partnering success, primarily because the target cost was not set early enough so placing most risk upon the Client. Project A had Contractors that were unhappy with the uneven pain/gain share and the lack of trust between the parties. Neither of these projects can be adjudged a success from the perspective of both parties. Incentivisation did not of itself appear to be the key to success and a level of 15% would not generally satisfy either party. Measures of success varied between parties with the Client for project A having a focus on cost, and B on quality. What represents success to one Client would not equal success to the other. Both Contractors had a focus on maximising gain.

Overall it must be concluded that the hypothesis was not proven. Egan's view appears to be too simplistic to apply in all situations and is not always the key to success as he suggests.

Two papers (Hughes *et al*, 2009 and Hughes *et al*, 2012a) were published from this research. The full papers are provided in Appendix 8 and 9 respectively. The results of this MSc research provided evidence that there was a range of relevant aspects, some of which appeared to be considered more important than others.

### **1.2.2 Preliminary PhD Direction**

When the PhD was suggested the Author reviewed her previous results and as with the MSc research examined Egan's speech. On returning to Egan's speech (2008) a few things were noted. Firstly, Egan only worked with Clients in writing *Rethinking Construction* (Egan, 1998). Secondly, he stated "if you remove any of the attributes of a good project you don't have a successful project." Then finally he indicated that there were other factors involved such as teamwork, the supply chain, training people to fulfil their role and accidents (Egan, 2008).

Evidence from the MSc research showed that different Clients focussed on different factors in gauging success and that the 'pain/gain' aspect highlighted by Egan, focussed upon cost.

During the MSc research both Client and Contractor were approached which may have contributed to the results but it was felt that the balanced picture was important i.e. that both/or all parties should feel that the project is a success. Egan (2008) mentioned other factors or aspects and also the Author's research interviews indicated that other aspects (other than 'pain/gain') may have equal or more importance in collaborative projects. The interviews provided anecdotal evidence that, due to the 'credit crunch', partnering was becoming unpopular with some Clients who associated it with increased cost. In spite of this there was an evolution of collaborative working and views that 'collaboration' was the new way forward. Their opinion was that partnering involved aspects that were poorly suited to the industry hence the emergence of collaboration. Green (1998) describes how the industry was told to use partnering. The anecdotal evidence may suggest that they are adapting partnering.

The above preliminary research led directly to the formulation of the research aims presented in the main body of this PhD thesis, namely:-

- i. Identify what 'aspects' participants require to produce a successful collaborative project;
- ii. Rank order the 'aspects' and utilise these to produce definitions for collaboration; and
- iii. Most importantly, to use these 'aspects' to inform a model for collaboration to achieve the 'successful' projects Egan had discussed.

Thus the 'contribution to knowledge' of this thesis is the formulation of an effective model for collaboration which aims to improve the likelihood of a successful project.

### **1.2.3 Aspects Research**

With Egan's statement about removal of attributes leading to a failure to succeed it was decided that the focus of the Author's evolving research should be to identify what 'collaboration' is and to determine its attributes. Aspects were identified that all contributed towards collaboration but it was evident that these aspects did not hold equal standing in the minds of those involved.

#### **1.2.4 Definitions Research**

The next step of the research was to rank order the aspects to identify those essential for a successful project. This rank order could be used to complete a definition for collaboration. Different people in the industry view collaboration slightly differently and, although some aspects were common to all, several definitions were produced.

#### **1.2.5 Model Research**

The overall rank order could then be used to produce a model for a collaboration approach with the aim of achieving successful projects. Once an initial model was produced it became evident that people may want to access the model in different ways and so using the same data three perspectives of the model were produced. The three perspectives allowed searches of the model by Aspect, Phase or Role.

### **1.3 OBJECTIVES**

The PhD research developed from the Author's preliminary research the aim being first to identify the 'aspects' of collaboration. This would then allow definitions to be produced and these could be used to inform a model for collaboration. The objectives of this research were as follows:-

#### Aim One

- i. Identify aspects from the literature on collaboration and categorise them as hard or soft .
- ii. Identify an appropriate sample of personnel for targeted data collection.
- iii. List the aspects which practitioners consider should exist in collaborative arrangements.

#### Aim Two

- iv. Rank order the list of aspects and identify those considered essential.
- v. Produce from the data collected a series of definitions for collaboration.

### Aim Three

- vi. Identify the 'who, when and how' (or Elements) that contribute towards each aspect of collaboration.
- vii. Produce a model which guides practitioners in improving collaboration.
- viii. Validate the model with suitable qualified personnel.

The aims and objectives were used to steer the course of the research, which therefore had three distinct phases, each related to an aim and its related objectives.

## **1.4 QUESTIONS**

The aims and objectives of the thesis will be met by using the data obtained from secondary (literature) and primary (Author's data) sources to identify questions which will aid in achieving them. These questions include the following:-

### Aim One

- What are the aspects that currently make up collaboration?

### Aim Two

- What is the relative importance of these aspects to each other?
- What is the current definition for collaboration in the UK construction industry?
- Do people have different ideas of what the definition for collaboration should be?

### Aim Three

- Who should be involved / responsible for the essential aspects?
- When should the various personnel be involved in each of the essential aspects?
- What tools and techniques could be utilised to help bring about the essential aspects?
- Are there sufficient data on timing, personnel or techniques/tools?
- Can a model be designed using the tools/techniques and personnel at the right time, to help produce a successful project?
- Can the personnel in the industry identify with the model and make use of it?

To assist in following the logic of this research a diagrammatic methodological research roadmap is provided to assist the reader of this thesis.

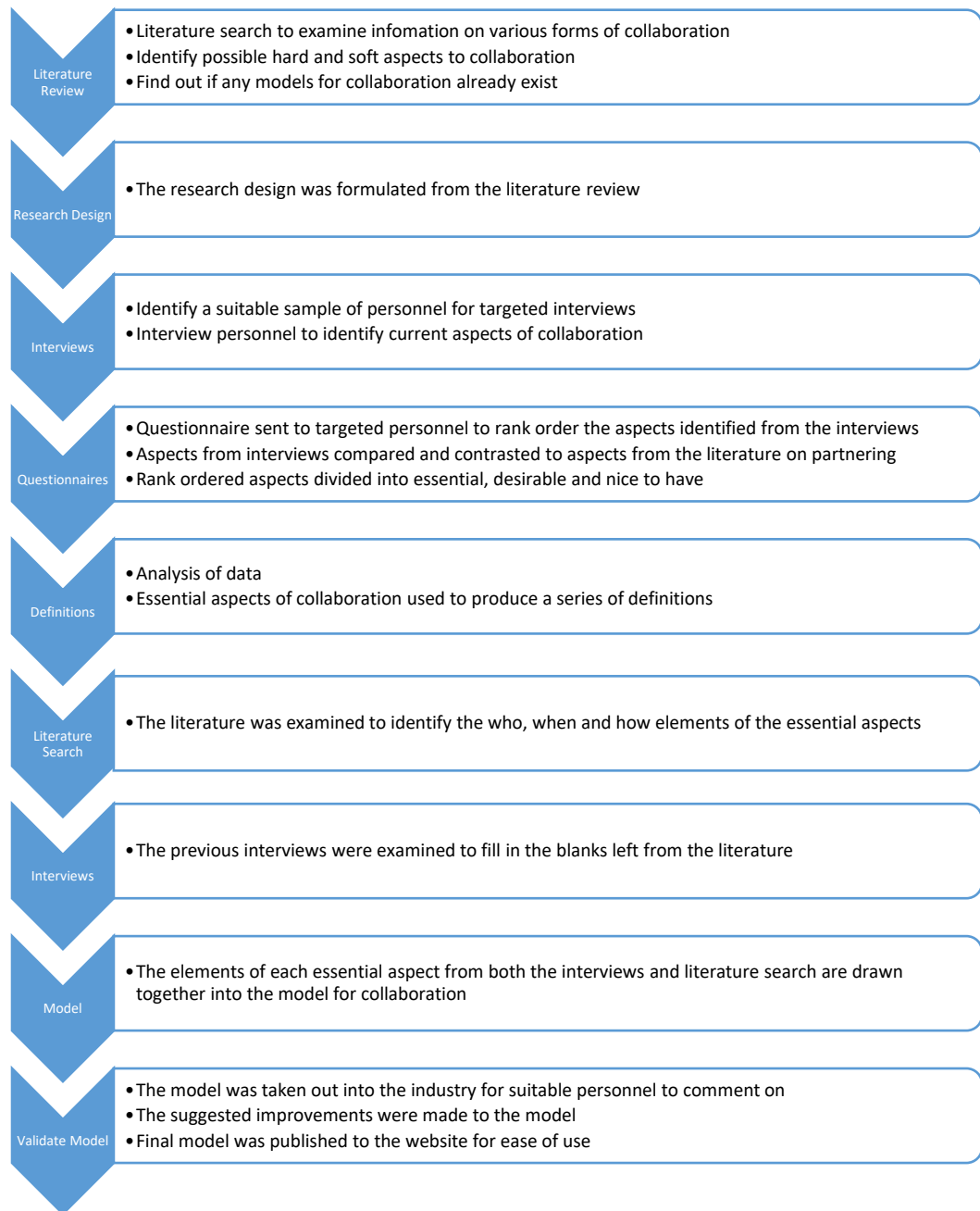


Figure 1. Research roadmap

## 1.5 THESIS CONTENT AND STRUCTURE

The thesis structure is described below again to assist the reader in understanding how this work is set out.

### 1.5.1 Chapter One - Introduction

This chapter briefly introduces the background to the research, sets out the aims and objectives for the research and finally describes the thesis structure.



### **1.5.2 Chapter Two – Literature Review on Aspects of Collaboration**

In this chapter a brief introduction to various forms of collaboration is provided with the focus being on their advantages and disadvantages. Secondary sources of data were used in describing aspects of collaboration. The chapter identifies the different types of collaborative working from the literature and how collaboration will be discussed in the rest of the thesis. In essence this chapter states the Researcher's perception of collaboration used in this thesis. The literature was found to relate primarily to partnering.

For ease of reference the aspects have been grouped into hard 'objective' aspects such as contracts and open book accounting, then soft 'subjective' aspects such as team spirit and mutual trust. This is because they will be handled differently in the model.

### **1.5.3 Chapter Three – Methodology**

Chapter Three examines methodology theory and then describes the methodology used throughout the research from the initial research through to the model with the rationale for its selection.

### **1.5.4 Chapter Four – Results and Analysis of First Stage Interviews on Collaborative Aspects**

Chapter Four presents and discusses the results of the research into aspects of collaboration. The research utilised interviews to ascertain aspects involved in collaboration as distinct from partnering. The results from the interviews are then presented in the form of a list of aspects involved in collaboration. The full interview transcripts are provided separately in the appendices.

### **1.5.5 Chapter Five – Results and Initial Analysis of Rank Order Questionnaires**

This chapter discusses how questionnaires were used in identifying the importance of an aspect. The results of the questionnaires were used to rank order the aspects and are provided as a series of summary tables.

### **1.5.6 Chapter Six – Analysis of the Effect of Perspective**

This chapter examines how the overall list of results provided can be separated by respondent's role, corporate affinity and experience with a discussion of whether these affect the person's view of what collaboration is. The effect this has on the definitions and therefore the model is also examined.

### **1.5.7 Chapter Seven – Identification of the Elements for the Model**

Chapter Seven comprises details of the Elements for the model for each of the 18 essential aspects discovered from primary research. The overall aim was to relate the relevant aspects to realistic practice. The review focussed on people, time, tools and techniques for use in the model.

### **1.5.8 Chapter Eight – Model Development**

This chapter explains how the literature and interviews were used to inform the model using both secondary sources and primary data. The format of the initial model is discussed with justification for the Author's choices. Finally, the initial model is presented.

### **1.5.9 Chapter Nine – Model for Collaboration Validation**

In this chapter the Author discusses the views of a sample population, drawn from experienced people with a working understanding of collaboration, on the initial model. The Interviewees were asked to comment on the initial model to ascertain if they felt any tools/techniques were missing or the wrong timing/personnel were being utilised. They were also asked to comment on the usefulness or value of the model subject to the changes they had mentioned. Then finally the results of the interviews are provided to validate the model in a summary form. The chapter goes on to describe the final model and its optimum implementation. It then introduces the presentation of the model on the website to aid utilisation of the model for everyday use. The website can be viewed at <https://collaborationinconstruction.wordpress.com>.

### **1.5.10 Chapter Ten – Conclusion**

In this final chapter the Author's work is discussed from the use of incentives to the definition of collaboration. The model is then reviewed against the aims and objectives

set at the beginning of the work. Finally, how the model itself forms the Author's contribution to knowledge is discussed together with suggestions for further research.

There are supplementary documents provided with this thesis, contained in the appendices, to support the claims made in the main document. The principal supplementary document is the model itself, which is presented in this way because it is so extensive that it does not fit within the thesis structure. A web site is being developed for the model and, in its current form, can be found at: <https://collaborationinconstruction.wordpress.com/>.

## **1.6 SUMMARY**

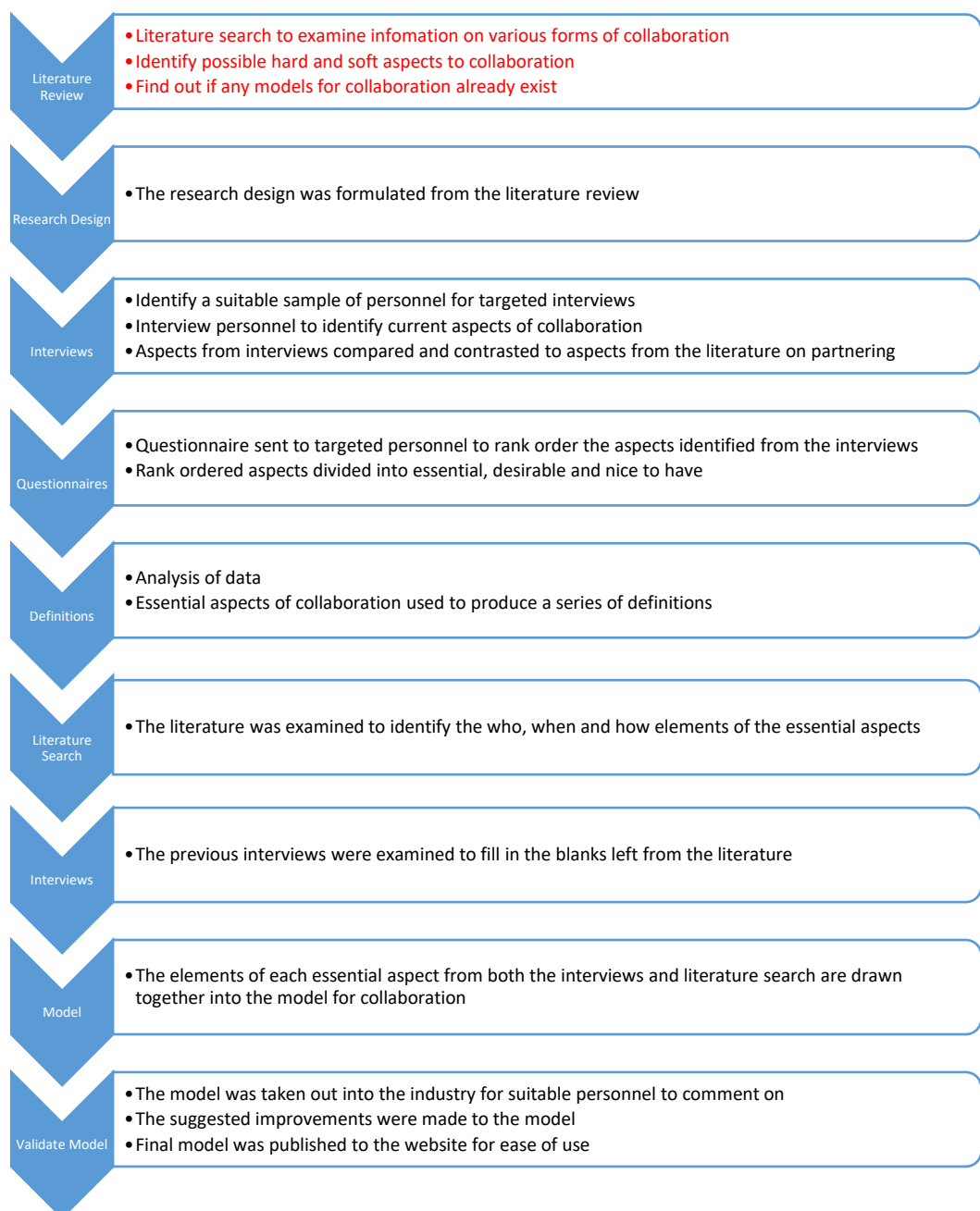
This chapter describes how the research arose out of the findings of the Author's preliminary research into incentivisation which found that this was not the total answer to producing a successful collaborative project. It then sets out the aims and objectives of this research which was to identify the aspects important to collaboration and utilise these to produce a model. Finally, it summarises each chapter to help the reader through the thesis and provides a road map which outlines the development of the research. The next chapter sets out the literature review used to inform the research design.

## *Chapter Two*

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# Literature Review on Aspects of Collaboration

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# Chapter Two

## Literature Review on Aspects of Collaboration

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### **Chapter Two Aims**

- 1. Review the different forms of collaboration.**
- 2. Define the various forms of collaboration.**
- 3. Identify the aspects of collaboration from the literature.**
- 4. Identify any existing models in the literature.**

### **2.1 INTRODUCTION**

This chapter summarises the research from the literature about collaboration. The chapter starts by examining the introduction of collaboration, or specifically partnering, into the UK. Partnering is examined as a form of collaboration which is a precursor to current collaboration. The different forms of 'collaboration' are discussed, followed by definitions of collaboration leading to a discussion of certain aspects to collaboration/partnering divided into hard and soft aspects. The review of the literature identified aspects potentially important to collaboration/partnering. Having completed an extensive examination gaps were identified in the aspects described in the literature. These are to be addressed through primary research necessary to complete this research. Finally, this chapter discusses models for collaboration that already exist in the literature.

### **2.2 WHAT IS 'COLLABORATION'?**

Collaboration is a relatively recent phenomenon. In the UK partnering is the earliest form of collaboration. Partnering evolved from the Japanese management approach of 'Kaizen'. In Japan a collaborative approach to working is normal according to Baylis *et al* (2004).

Kaizen is the Japanese word for 'continual improvement'. Kaizen is described by Wittenberg (1994) as an umbrella term for many management techniques such as

Total quality management (TQM), Just in time (JIT) and Quality circles. Kaizen is both process and people orientated (Wittenberg 1994). Kaizen therefore consists of both 'hard' and 'soft' aspects. This is seen throughout the literature which is why the Author examined the literature in terms of 'hard' and 'soft' aspects. Suárez-Barraza et al (2011) explains that the Japanese see kaizen in terms of people and ethics while the West see it in terms of processes.

This Japanese approach is credited with initiating the concept of Total quality management (TQM). This is described by Hellard (1995) as being “the philosophies of empowerment, teamwork, Kaizen, benchmarking or continuous improvement and the techniques used to develop a repetitive quality product and service to satisfy the long-term customers”.

Hellard (1995) then describes how TQM evolved into partnering using the change in culture.



Figure 2. Evolution of collaboration

Partnering would appear to have originated in the USA in the 1980's (Cox and Townsend 1998). Partnering evolved as a cure to the failure of traditional procurement methods to deliver client satisfaction (Naoum 2003; Bresnen and Marshall 2000c).

Circa 1987 the Construction Industry Institute was established to examine the feasibility of partnering to address the problems within the US construction industry (Beach *et al* 2005).

In the USA partnering is said to have been initiated by the US Army Corps of Engineers in 1988 in the construction of the William Bacon Oliver lock and dam in Alabama (Kwan and Ofori 2001; Glagola and Sheedy 2002). The main aspects they identified were trust and continuous joint evaluation (Kwan and Ofori 2001). The theme of trust being fundamental to partnering has continued to this day (Pao, et al 2015).

The UK followed the USA and commissioned reviews into improving the construction industry, such as 'the Movement for Innovation' and 'the Construction Best Practice Programme'. The most well-known is Latham's report in 1994 (Beach *et al* 2005). Latham's report (1994) is a comprehensive report drawn from the experience of a lot of consultees from the industry (Cox and Townsend 1997). Latham was commissioned to examine procurement and contracts in the UK construction industry. The report was well received by the industry and caused many to think about their attitudes (Cox and Townsend 1998).

However, it did not take long for industry to identify that the concept could not be implemented as Latham intended. In 1997 Cox and Townsend started to discuss how Latham treated the symptoms but did not address the root cause. They have reservations about the participants that took part in the research due to their vested interests.

Latham's report produced 30 main recommendations and more than 50 separate tasks. This number of recommendations is hard to achieve and so cherry picking was used and therefore the potential improvements were not seen claim Cox and Townsend (1997).

Cox and Townsend (1998) suggest that the reason Latham's ideas did not work is because they did not identify when collaboration should be used. The focus of the report is on team building and that by doing this it ignores the importance that cost and quality play in the supply chain (Cox and Townsend 1998). This raises the practicality of Latham's ideas within the construction industry. Although the Author has left it to the industry to decide if collaboration is the correct form of procurement the research presented within this Thesis and the model clearly describes when aspects to collaboration should be carried out. The model also incorporates cost and quality within the model.

Cox and Townsend (1998) claim that Latham's report uses the wrong methodological approach in using solutions from the automotive industry and applying them to the construction industry. The automotive industry is a continuous process with long term relationships while the construction industry frequently consists of a group of strangers brought together for short term projects. This makes comparison between the industries difficult.



Glagola and Sheedy (2002) agree with Cox and Townsend (1997) that partnering will fail if applied in the wrong situation but also believe that if the process is incorrectly applied it will also fail. Giving the example that if you don't have the correct people in the team or don't use the contract correctly it will fail. This indicates both the use of 'soft' and 'hard' aspects. The Author aims to improve this through the correct use of the model she has developed.

The use of Latham's report was optional and therefore some ignored it, a few implemented it in total but often certain parts were cherry picked. Despite this reception to Latham's report the concept of partnering was not discarded and Egan (1998), amongst others, have continued to examine the construction industry in order to change the poor and adversarial image that it portrayed (Cox and Townsend 1997). Since these publications the Constructing Excellence for example have looked improve collaboration through the use of BIM and soft landings (Constructing Excellence 2018).

Hellard (1995) describes how the process of collaboration has changed and states that partnering "is a culture that mankind, after millions of years of evolution, should surely be able to achieve even in the construction industry by AD 2000!". This evolution of collaboration is described in Figure 3.

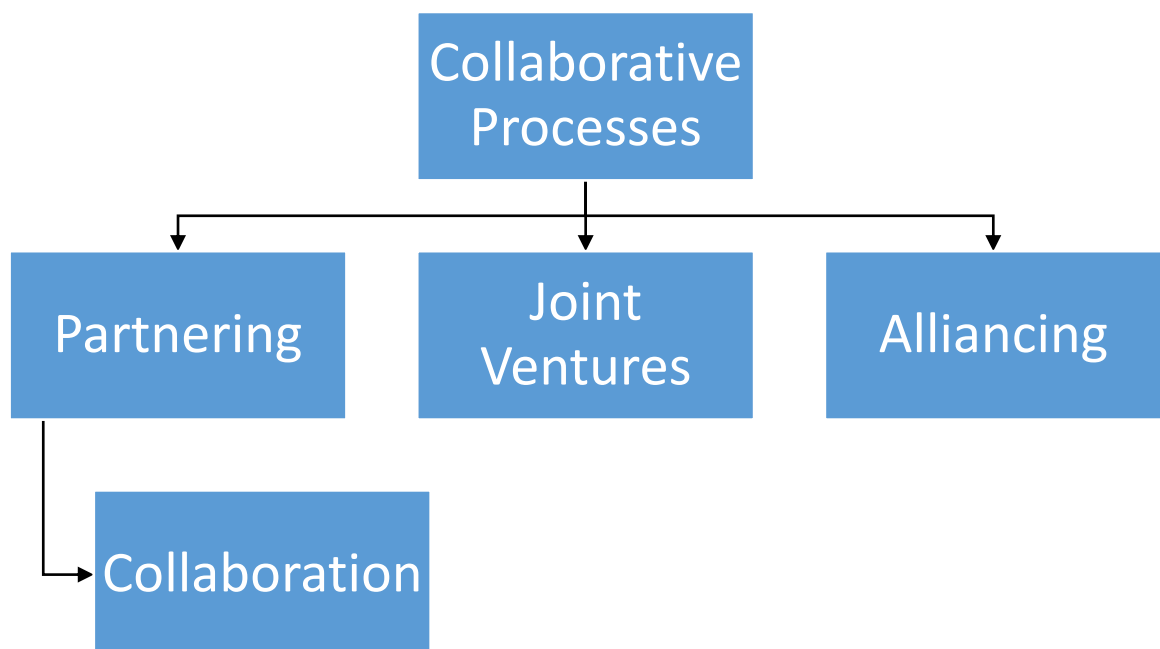


Figure 3. Continuous evolution of collaboration

Figure 3 is based on Hibbert *et al's* (2008) interpretation of the evolution on collaboration as described below. The Author's opinion is that there is an evolving concept coming through from the literature. Together with Anecdotal evidence from the Author's MSc Research (Appendix 1) that the industry wants to make partnering work.

Fiedler and Deegan (2007) summarised the reasons why collaboration was adopted in the industry. Some of the reasons were external pressures such as setting an example, publicity and Government pressure. Other reasons were internal pressures such as economic efficiency, stability and stakeholder analysis. Yet others were asymmetry, expertise, legitimacy and reciprocity. Asymmetry is a result of the uneven distribution of power within the relationship. Reciprocity is the opposite and is a result of mutually beneficial goals where there is an incentive to collaborate. Legitimacy is the result of organisations being faced with institutional pressures to conform to norms and practices (Fieldler and Deegan 2007). Partnering, as a form of collaboration, was seen as the answer to the low quality of construction and the lack of Client satisfaction (Cheung *et al*, 2003). Since Latham's report in 1994 there has been extensive and wider research into 'collaboration'. For example, Hibbert *et al* (2008) described how collaboration was used as a general term to encompass all forms of situations where different parties worked together. These situations included partnering, alliancing and joint ventures.

### **2.2.1 Partnering**

The term partnering has received a lot of attention in the literature. Partnering is a major form of collaboration in the industry and there has been a lot of research into it. This was used therefore as the starting point for the research presented in this thesis into the essential aspects of collaboration, as there is so much similarity between the two. In the Author's opinion collaboration appears to incorporate more soft aspects or culture while the literature on partnering focusses on hard aspects or tools and techniques.

There are different types of partnering. For example, strategic partnering is a voluntary form of partnering that is long term in nature (Ngowi, 2001); short term partnering is called project partnering or occasionally tactical partnering (Beach *et al*, 2005). Researchers have discussed however that partnering can only form over the long term

and single projects are unsuitable for partnering (Cox and Townsend, 1997). The industry however still uses collaboration for single projects as well as strategically over the longer term. The Author's research aims to provide advice on improving collaboration for single projects as well as strategically.

Beach et al (2005) questioned whether collaboration would ever be possible in an industry where one-off projects and short-term relationships are the norm. However the industry has kept on trying to make collaboration work, which is supported by the research still being carried out into the subject such as Andres (2013); Andersson and Wikstrom (2014); Badi and Pryke (2015) and Dainty *et al* (2013).

Kwan and Ofori (2001) argue that partnering relationships evolve over time and therefore project partnering will not work.

The benefits of partnering described in the literature tended to be intangible and therefore difficult to measure (Emsley, 2005). In the Author's opinion the 'soft' aspects are subjective and therefore harder to measure; however, it is still possible to measure them. Through the use of more general management theory it is possible to measure success through the collection of indirect data or people's opinions. For example, the Construction Industry Council (2001) describe how alternative dispute resolution can help a non-adversarial environment (as described in Chapter 7 section 7.2.10.2) and it can be recorded how many times this is utilised. The Office of Government Commerce (2003c) describe how key performance indicators can be used to measure team spirit (as described in Chapter 7 section 7.2.7.6). The Author also found that personnel in the industry were using questionnaires periodically to assess these subjective aspects (as shown in Appendix 33).

The literature also stated that partnering must be worked at if it is to succeed. Maheshwari *et al* (2006) believe that there are four phases to a partnership life cycle. These are "Foundation, Implementation, Shakedown and Onwards and Upwards".

The literature also describes other forms of collaboration and how they differ from partnering.

### **2.2.2 Alliancing**

Stanek (2004) states that many of the various aspects of partnering found in the literature are relevant to alliancing. Alliances can improve risk sharing and help in a competitive environment and that, like partnering, alliancing requires trust and communication. Yeung *et al* (2007) describe how support for the alliance should be led by the management for alliancing to be successful. A 'win-win' situation for the Contractor and the Client is important. Alliancing requires dispute resolution systems and early involvement of personnel. Alliancing can provide a competitive advantage in the market (Ngowi, 2001). According to Stanek (2004), alliances are not the easy option and in the USA industry as a whole, 50-80% of alliances failed. The Author examined these sources and found Stanek (2004) based his statement on five references which do not reflect this. Two of the references Mol (2000) and Dyer *et al* (2001) state that about 50% of alliances fail but do not reference this or provide any data. Park and Ungson (1997) discusses how dissolution rates of 50.3% were found in companies from 1950-1986. Das and Teng (1999) also describe a 50% mortality rate which they back up with references. Parkhe (1993) was the only reference that suggested higher rates of about 70% mortality which dates from the mid to late 1980s. Therefore, the average rate of these failure from these sources is closer to 50%. The main reason put forward for this high level of failure was that expectations were different from results.

### **2.2.3 Joint Ventures**

Morledge and Adnan (2005) show how joint ventures also share many aspects of similarity with partnering. It is important that mutual objectives are held by all parties. Joint ventures can provide market advantage but require trust and open communication.

## **2.3 PARTNERING/COLLABORATION DEFINITIONS**

The Interviewees in the Author's MSc research (see Appendix One) saw partnering as the ultimate form of collaboration but recently it has gone out of fashion after the 2008 economic crisis. Collaboration is perceived as the industry's new way forward. The collaboration they discuss however is an evolution of partnering which takes forward some aspects but which drops aspects such as charters which the industry found are unnecessary. However the literature on the subject uses the term collaboration

interchangeably with partnering, alliances and joint ventures as it is used as a term to describe any type of working together (Hibbert *et al*, 2008).

Definitions begin to appear in the construction literature in the mid-1990s. Himes (1995) states that partnering can be described as “a long term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant’s resources. The relationship is based on trust, dedication to common goals and an understanding of each other’s individual expectations and values”. This definition however is quite general and therefore also represents other forms of collaboration such as alliancing. Partnering was also described by Walker *et al* (2002) as reaping rewards at others’ expense, while in alliancing every member is risking any profit. Therefore, everyone profits or everyone loses in an alliance. Alliancing can be defined as to “establish inter-organisational relations and to engage in collaborative behaviour for a specific purpose.” (Yeung *et al*, 2007). A joint venture was defined by Morledge and Adnan (2005) as “two or more firms pool their resources and create a new legal entity to undertake productive economic activity.”

The only definition which cannot be interchanged with the other collaborative terms is joint venture because the parties form a new legal entity. Both Bititchi *et al* (2004) and Chang and Tang (2005) discussed how partnering and alliances are the same thing and Bresnen and Marshall (2002) describe alliancing as strategic partnering. Then Yeung *et al* (2007) described joint venture as one end of the alliancing spectrum with partnering at the other.

The literature contains a lot of definitions for the term partnering within the construction industry. Although not exhaustive Table 1 hereunder shows a representative selection of definitions for partnering.

Source	Definition
Bennett and Jayes (1995)	“Partnering is a management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of each participant’s resources. The approach is based on mutual objectives, an agreed method of problem resolution and an active search for continuous measurable improvements.”
Crowley and Karim (1995)	“Partnering is conceptually defined as an organisation formed through the implementation of cooperative strategy by modifying

	and supplementing the traditional boundaries that separate companies in a competitive climate.”
Himes (1995)	Partnering is “a long term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant’s resources. The relationship is based on trust, dedication to common goals and an understanding of each other’s individual expectations and values”.
Hellard (1995)	“The ‘partnering’ philosophy is the master key that will unlock the techniques and principles of total quality management to provide customer satisfaction on construction projects.”
Rackham <i>et al</i> (1996)	“Partnering is about a fundamentally different kind of relationship between organisations.”
Barlow <i>et al</i> (1997)	“Partnering can therefore be seen as a set of collaborative processes. Process-based approaches which emphasise the importance of common goals, raise such questions as how goals are agreed upon, at what level they are specified and how they are articulated.”
Cox and Townsend (1997)	“Many in the industry believe that ‘partnering’ provides the ultimate answer to the question of which relationship type should be used in the procurement of construction works.”
Bennett and Jayes (1998)	“Partnering is a set of strategic actions which embody the mutual objectives of a number of firms achieved by cooperative decision making aimed at using feedback to continuously improve their joint performance.”
Barlow (2000)	Partnering is “an approach designed to enhance collaboration between organisations – as a tool for stimulating performance gains at the project level and innovation and learning benefits at the organisational level.”
Bresnen and Marshall (2000c)	“Partnering is an imprecise and inclusive concept capturing within it a wide range of behaviour, attitudes, values, practices, tools and techniques.”
Matthews <i>et al</i> (2000)	“Partnering is not a technique which establishes rules and regulations, documentation and procedures but is a proactive approach to the management of business relationships.”
Kwan and Ofori (2001)	“Partnering is based on the principles of trust, mutual respect and cooperation towards the achievement of a common goal.”
Glagola and Sheedy (2002)	“Partnering is the essence of good business practices. Its roots are founded in the tenets of trust, mutual respect and integrity. It achieves its goals and objectives through open communication and mutual risk taking and profit sharing.”
Cheung <i>et al</i> (2003)	Partnering “is regarded as an important management tool to improve quality and programme, to reduce confrontations between parties, thus enabling an open and non-adversarial contracting environment.”
Naoum (2003)	“Partnering is a concept which provides a framework for the establishment of mutual objectives among the building team with an attempt to reach an agreed dispute resolution procedure as well as encouraging the principle of continuous improvement.”
Sorrell (2003)	“Partnering greatly reduces the transaction costs of tendering and drawing up contracts. These are replaced by performance

	measurement and improvement targets for quality, timeliness and costs.”
Bayliss <i>et al</i> (2004)	Partnering “has been advocated as a means to improve working relationships and project performance in terms of quality, cost and time.”
Beach <i>et al</i> (2005)	Partnering is a “generic term for a variety of formal or less formal arrangements that embrace a range of practices designed to promote greater collaboration and involve differing time frames.”
Thomas (2005)	Partnering has been defined as “an integrated team-working approach to achieve better value for all partners by reducing duplication and waste of resources, based on mutual objectives, a robust approach to issue resolution and a proactive approach to measurable continuous improvement.”
Ngowi (2007)	“Partnering on the other hand, is essentially the establishment of an informal group among construction partners such as a client and contractor to create ‘permanent’ relationship.”
Swan and Khalfan (2007)	“Partnering at its most basic level is a non-adversarial approach to producing and engaging in construction projects”
Lu and Yan (2007a)	“In general, partnering is mainly defined as a working relationship between stakeholders through respect, trust, teamwork, commitment and shared goals.”
Eriksson <i>et al</i> (2008)	“Partnering aims to increase cooperation and integration between the actors by building trust and commitment whilst decreasing disputes.”
British Standards Institution (2010a)	“Formal and/or informal business arrangements where two or more discrete organizations collaborate to create mutual value.”

Table 1. Definitions for Partnering.

Whilst Table one is provided in chronological order there is no discernible development in the definitions. Examining the definitions of partnering within the literature it becomes clear that the definitions are almost exclusively based upon the worldview of the authors concerned. Worldview meaning the authors take a particular standpoint or perspective as described below.

Attempts have been made in the past to categorise the various definitions of partnering. Crowley and Karim (1995) were the first to categorise the definitions found in the literature. They found that partnering was described in three ways:-

1. By its attributes such as trust and team working
2. By the process (verb) such as alternative dispute resolution and workshops
3. Partnering organisation

These categories can still be seen in more recent definitions of partnering. An example of a definition describing the attributes of partnering is provided by Kwan and Ofori (2001). They describe partnering as “based on the principles of trust, mutual respect and cooperation” (Kwan and Ofori, 2001). In contrast Barlow *et al* (1997) describe partnering in terms of processes. They describe partnering as a set of “process-based approaches which emphasise the importance of common goals” (Barlow *et al*, 1997). Crowley and Karim (1995) by using the terms attributes and process appear to be dividing partnering into ‘soft’ and ‘hard’ aspects respectively. With Kwan and Ofori (2001) seeing partnering as ‘soft’. While Barlow *et al* (1997) sees it as ‘hard’. This division is also the basis of the Author’s research.

With Crowley and Karim’s (1995) third category of partnering organisation they appear to be almost a lone voice in describing partnering solely as the organisation. The only other similar definition would appear to be Ngowi (2007) who describes the “establishment of an informal group”.

The Author found that the first two categories described by Crowley and Karim (1995) were very noticeable in the literature hence in identifying possible aspects the Author divided the aspects as hard and soft or processes and attributes.

Barlow *et al* (1997) examined the published definitions and found three main perspectives. These perspectives are:-

1. Partnering is a tool
2. Partnering is a management process
3. Partnering is a series of contractual and relational implications

Barlow *et al* (1997) seem to view partnering as process driven and a progression of the traditional relationship. An example of a definition of partnering as a tool would be Barlow (2000). He states that partnering is “an approach designed to enhance collaboration between organisations – as a tool for stimulating performance gains at the project level and innovation and learning benefits at the organisational level.” In contrast Cheung *et al* (2003) states that partnering “is regarded as an important management tool to improve quality and programme, to reduce confrontations between parties, thus enabling an open and non-adversarial contracting environment.” This is an example of partnering being viewed as a management process. Finally Bennett and Jayes’s (1995) definition describes partnering in terms of its implications.



They state that “Partnering is a management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of each participant’s resources....” Barlow’s (2000) approach unlike Crowley and Karim’s (1995) is to only acknowledge the ‘hard’ aspects. The Author does not agree with this worldview. The model presented within this Thesis presents both ‘hard’ and ‘soft’ aspects.

In 2007 Swan and Khalfan again looked at the definitions found within the literature and identified three different categories. These categories are:-

1. Partnering is an ethical framework
2. Partnering is a procurement approach
3. Partnering is a series of tools and techniques

Swan and Khalfan (2007) take a more subjective stance as they appear to see partnering from a more relational viewpoint than Barlow *et al* (1997). Again this division of ‘hard’ and ‘soft’ aspects can be seen in Swan and Khalfan’s (2007) categories. Which is why the Author has continued this theme through the rest of this chapter. Falling into one of Swan and Khalfan’s categories Glagola and Sheedy (2002) describe partnering as an ethical framework with their definition that “partnering is the essence of good business practices. Its roots are founded in the tenets of trust, mutual respect and integrity. It achieves its goals and objectives through open communication and mutual risk taking and profit sharing.” Their approach is to see partnering as a series of ‘soft’ aspects.

Examples are frequently seen in the literature describing partnering as a series of tools and techniques as shown in Sorrell’s (2003) definition describing how “partnering greatly reduces the transaction costs of tendering and drawing up contracts. These are replaced by performance measurement and improvement targets for quality, timeliness and costs.” Sorrell’s (2003) approach is the opposite of Glagola and Sheedy (2002) and consists of a series of ‘hard’ aspects.

The classification of partnering as a procurement approach however is not common in the literature. Swan and Khalfan (2007) cite Cox and Townsend (1998) as an example of a procurement approach. However the Author could not find another example. The type of source for this definition is within books on procurement such as Morledge *et al* (2006). These books clearly list partnering as the fifth form of procurement.

The range of definitions contained within Table 1 show that partnering has many facets. However, each individual definition only provides a simple definition with a few aspects for what is an extremely complex process.

A key definition cited within the literature is Bennett and Jayes definition from 1995:

“Partnering is a management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of each participant’s resources. The approach is based on mutual objectives, an agreed method of problem resolution and an active search for continuous measurable improvements.”

Although published over 20 years ago this definition is still frequently cited today. However Rackman et al (1996) describes how partnering does not have a ‘neat and tidy’ definition because it is evolving so rapidly. The Author has anecdotal evidence that would seem to suggest that the construction industry in the UK is moving away from partnering and instead uses the term collaboration. However, it is being used in the sense of partnering or alliancing, not just a term to encompass all working together.

Two things became clear from the literature review on definitions. The first is that the literature provided various definitions for partnering and alliancing and joint ventures but not for the current use of the word collaboration. The term collaboration is defined in Webster’s dictionary as “The act of working together; united labour” (*Webster’s Dictionary*, 2010). The second is that the definitions tend to be biased towards a single worldview or perspective. They see it as either a culture or a series of tools and techniques. In the Author’s opinion more balance is required between the two perspectives.

The Author’s perspective on collaboration differs somewhat to Barlow *et al’s* (1997) view of partnering. The Author believes that it is important to separate contractual and relational implications.

Crowley and Karim’s (1995) categories are similar to Swan and Khalfan’s (2007) categories. On reviewing the literature, the Author agrees with these categories but for the purpose of the model found it more useful to categorise aspects as hard or soft. This is explained in more detail later in the chapter but hard aspects are objective and can therefore be measured directly which is often the same as Swan and Khalfan’s (2007) tools and techniques or Crowley and Karim’s (1995) process such as contracts

and open book. While soft aspects are subjective and cannot be measured directly. These are often the same as Swan and Khalfan's (2007) ethics or Crowley and Karim's (1995) attributes, such as trust and team spirit. There are some aspects however, such as quality, which would be classed by Swan and Khalfan's (2007) as a tool or technique but by the Author as a soft aspect. This approach of separating soft and hard aspects was taken as the method of measuring their success within the model would require different techniques.

As described in Chapter One the second aim of the research is to rank order the 'aspects' of collaboration to identify the 'essential' aspects and utilise these to produce definitions for collaboration. The Author did not want to produce another definition biased towards one worldview. Therefore by working with various industry personnel with different worldviews it should be possible to produce a more rounded and detailed definition of collaboration that cannot be categorised from a single worldview but that represents the industry's voice. The identification of these essential aspects was also necessary to produce the model for collaboration.

The literature on partnering/collaboration clearly shows that there are many aspects that support or facilitate collaboration. The next section describes the aspects identified from an extensive literature review.

## **2.4 ASPECTS TO PARTNERING**

The literature talks about collaboration as an umbrella term which includes partnering, joint ventures etc. Anecdotal evidence from the Author's MSc research (see Appendix seven for the transcribed interviews) indicated that what people in the industry are calling collaboration is actually a version of partnering. Rather than giving it another name or calling it partnering version two, they refer to it as collaboration. This MSc research also indicated to the Author that they placed no importance on charters and placed more importance on culture and ethos. Therefore, in carrying out the literature search the Author searched collaboration, as an umbrella term, but with a focus on partnering.

Bresnen and Marshall (2000c) discuss that it is only through understanding the complexity that a 'realistic and practical approach' to establishing partnering will develop. They question whether partnering can be engineered through the use of tools

and techniques. However Kadefors (2004) argues against this and believes that team building activities and incentives can be used to encourage partnering.

The Author wants to use both the formal tools but also the techniques that encourages the cultural aspects of collaboration.

The literature contains a lot of information on the aspects that promote or discourage collaboration especially between Clients and Contractors. However the exact conditions that form collaboration remain elusive (Bresnen and Marshall 2000c). Bygballe et al (2010) point out that the literature is biased towards research into the relationship between Clients and Contractors.

This focus on the Client/Contractor relationship to the exclusion of the Supply chain is blamed by some researchers as the reason why the construction industry has not seen the same benefits from partnering as other industries (Dainty *et al* 2001).

Cox and Ireland (2002) describe how the most important people should be involved in collaboration including the Subcontractors and Suppliers and that this will change over the course of the project but does not elaborate on this.

Bygballe *et al* (2010) argues that it is the public procurement regulations and competitive tendering procedures that keep the industry in the adversarial state.

As seen with the definitions on partnering the literature can be broadly divided into two groups depending on the particular author's worldview. In this Author's opinion these groups are:

- Culture/ethos
- Tools and techniques

The culture/ethos refers to 'soft' or subjective aspects while tools and techniques refer to 'hard' or objective aspects. The literature discusses many aspects to both collaboration and partnering. However the literature, specifically those into partnering, lacks research into the social or soft aspects of collaboration as a way of promoting its use (Bresnen and Marshall 2000c, Bygballe *et al* 2010). They also describe the division between the formal form of partnering and the form that develops naturally over time. Much of the literature discusses the importance of cultural alignment in partnering (Bresnen and Marshall 2000c). For this reason, the Author

decided to broaden her literature search to encompass the broader management theories in construction. The more general construction management literature contains more information on the social aspects. The aspects from the literature can be broadly divided into hard and soft. Richmond-Coogen (2001) describes issues as hard (deliverable) or soft (behavioural). Hard issues are processes, procedures, systems and contracts, while soft issues are to do with leadership, skills and motivation (*British Standards Institution, 2010a*). The issues vary in importance and need to be handled differently. Hard issues are more commercially justifiable, while soft issues may have benefits which are not so obvious (Richmond-Coogen, 2001). Hard aspects can be measured objectively while soft aspects can only be measured subjectively. The aspects will be now discussed in general and then some specific hard and soft aspects that are prominent in the literature discussed in turn.

Bygballe *et al* (2010) describes how a preoccupation with the hard aspects is in direct contradiction to the commonly quoted definitions such as Himes (1995).

Bygballe *et al* (2010) discuss in depth how the partnering literature focusses on the use of tools and techniques such as charters, contracts, incentives and workshops. They claim the literature ignores the evolutionary processes or social or cultural development and the management style adopted.

The Author has therefore examined the literature for methods which promote this cultural change as well as the harder tools and techniques that dominate the literature.

#### **2.4.1 Aspects Listed in the Literature**

As discussed in Chapter Three (page 77) this literature review focuses on identification of aspects which are seen by researchers to be important in partnering. This section lists many of the aspects identified from an extensive literature review of papers identified as being about partnering/collaboration.

The literature discusses collaboration often in terms of 'advantages of' or 'problems with': both of these are important sources of aspects to collaboration. Ngowi (2001) discussed how the global market had increased competition and how partnering provided a competitive advantage by the pooling together of resources. However this competitive advantage could provide both private and common benefits. He then discussed how a mixture of both private and common benefits could produce torn

loyalties to the organisation and to the partnership. Other potential advantages to partnering included increased Client base, access to new work, reduction in risk, higher productivity, increased profits and increase in market share (Ngowi, 2001).

Some researchers were very positive about partnering and highlight the financial savings and the opportunity for innovation (e.g. Cox and Townsend, 1997). However not everyone is positive about partnering and as described previously one criticism levelled in some studies is that partnering addresses the symptoms but does not deal with the cause (Chang and Tang, 2005 and Cox and Townsend, 1997). They believe that it is the structure of the industry which is at fault. Other researchers however felt that if the trust is blind then it is a chance for exploitation (e.g. Cheung *et al*, 2003). Contractors and Clients have shown a more positive attitude to partnering than Consultants (Black *et al*, 2000). The model therefore will need to engage with the Consultants and draw them into the process.

Cheung *et al* (2003) summarised the successful factors in partnering observed by other researchers. These include trust, open communication and equity. The full table is provided in Appendix 10. Identification of these aspects is important to identify if the industry is changing collaboration.

The Office of Government Commerce (2003b) discusses the factors critical to the success of the projects. These are:

- A shared risk register
- Targets set for health and safety
- Clearly defined roles
- Performance measurement
- Target cost set and open book accounting
- Sharing of efficiency gains
- Clear design quality targets set (*Office of Government Commerce, 2003b*).

Other factors that can be added to this list include adequate resources, partnering experience, top management support, effective coordination and a learning culture (Cheng and Li, 2001). Aspects like effective coordination is not elaborated upon but will be important to address within the model.

Different papers give slightly different lists. Ten principles are cited in Akintoye and Main (2007) from Sonnenbery (1992). These are:-

- Make promises only on what can be delivered
- Everyone should be treated with respect
- Both partners should gain from the partnering
- Specific objectives should be set at the start
- Commitment from everyone for a successful partnership
- There needs to be an understanding of other people's culture
- Champions of the partnership should be developed
- Open communication
- Make sure decisions are made as a group
- Maintain the continuity of the relationship

Sonnenbery's (1992) view of partnering is that of a culture or ethos. While this provides a list of aspects to identify if attitudes are changing it provides the Author with little information of how these can be addressed in the model.

Ng *et al* (2002) list the key elements of partnering as:-

- Commitment
- Trust
- Preparation and training
- Understanding
- Equity
- Development of mutual goals
- Inclusion of appropriate parties
- Continuous joint evaluation
- Use of project partnering tools and procedures
- Leadership
- Improvement of communication
- Empowerment of stakeholders
- Evaluation methodology
- Willingness to accept mistakes

Ng *et al* (2002) also views partnering mainly as a culture or ethos but whilst acknowledging tools and procedures doesn't provide the Reader with any information on what these should be.

Bayliss *et al* (2004) discuss the partnering mechanism and list the required components as:-

- Partnering workshops for executives
- Partnering workshops for the contract
- Monthly review meetings
- Social events
- Newsletters
- Incentivisation
- Evaluation framework
- Effect on partnering spirit
- Effect on contract elements

Baylis *et al* (2004) take a far more 'tools and techniques' approach to partnering which the Author can refer to for use within the model.

The barriers to partnering can also provide information on aspects of collaboration. These barriers to partnering include:-

- Short term focus
- Adversarial attitudes
- Conservative industry culture
- Lack of sub-supplier involvement in specification
- Focus on projects instead of processes
- Labour unions
- New competences are required
- Traditional organisation of the construction process
- Traditional procurement procedures
- Laws and regulations
- Rules and standard contracts



These barriers may indicate other possible aspects to collaboration such as training, relationship management and processes (Eriksson *et al*, 2008). Eriksson *et al* (2008) does not seem to view partnering as a form of procurement. However, they do provide useful information such as using standard contracts. They also suggest that the focus on projects instead of processes hinders partnering. In the Author's experience the project needs to be at the centre but that the processes are also important to make sure that the aims and objectives are achieved.

However, partnering projects are not always successful and can fail due to lack of commitment, poor management, poor communication, cultural differences and personal differences (Akintoye and Main, 2007). Therefore, by extension would appear to be important.

Second generation partnering now consists of the "seven pillars" of strategy, membership, equity, integration, benchmarks, project process and feedback (Humphreys *et al*, 2003). However, this is not second generation as thought of by the industry.

Olsson and Espling (2004) described partnering as a way to avoid litigation, keep costs low, to complete the project within time and to produce a better working environment.

These lists from various papers provide an idea of aspects that may be of importance to collaboration in its current sense. Chapter Four analyses the differences between the literature and how collaboration is currently perceived based upon this list of aspects. The full list of aspects is to be found on page 72. Certain aspects that feature heavily in the literature are discussed in greater depth. Having identified aspects from within the partnering/collaboration literature the literature was re-examined by the Author to identify why these aspects were important and how they are encouraged or controlled. The Author examined both partnering and general construction management theory literature to identify these. This has produced a large amount of information and to avoid repetition some of this work is presented in Chapter Seven due to its relevance to the production of the model. The work presented in the next section represents the aspects from the literature that were most frequently discussed.

## 2.4.2 Hard Aspects

As described in the introduction (Section 2.1) the research required the identification of 'hard' aspects from the literature for comparison with the contemporaneous views of current industry participants in Chapter 4. This will be used to identify changing attitudes or an evolution of collaboration in the industry. This next section sets out these aspects.

### 2.4.2.1 Contracts

Kadefors (2004) argues that the negotiation of a contract is adversarial and therefore goes against the partnering ethos. Wong and Cheung (2004) however disagree and discuss how a contract can be used to improve trust between the parties. Elliman and Orange (2003) see contracts as a method of regulating relationships. Contracts specifically allowing collaborative working have been introduced including PPC 2000, JCT CE and NEC3 with the partnering option (Rich, 2008). This will now also apply to NEC4. Contracts have also been introduced which include incentives, generally called target cost contracts or cost-plus-incentive-fee contracts (Broome and Perry, 2002). In these the Client and Contractor need a formal meeting to agree on a target cost and a ratio allocated in regard to sharing any losses or gains made in the course of the project (Al-Subhi Al-Harbi, 1998). The Contractor finds contract clarity important to achieve project success (Phua and Rowlinson, 2004).

Some aspects like contracts are discussed in greater depth in the identification of elements in Chapter Seven (section 7.2.9) to avoid repetition as they feature in the model.

The use of contracts in collaboration can be controversial as described in Chapter four. However, in the Author's opinion, having a contract in place is essential and contracts such as NEC 3/4 aim to be non-adversarial and can help to put processes in place that can keep communication open and improve trust.

### 2.4.2.2 Supply chain

Akintoye *et al* (2000) discussed how partnering can occur between the various levels of the supply chain and, that to obtain the most from partnering, they argued that it is important to include all of the supply chain from the Client through to the Suppliers in the partnering arrangement. Supply chain management could offer a competitive

advantage, with better lead times and customer satisfaction (Akintoye *et al*, 2000). Up to 90% of a project's turnover is spent on goods and services which makes the supply chain important. In recent years the Client's focus is less on cost and more on sustainability and innovation, to which the supply chain inputs (Bemelmans *et al*, 2012). The supply chain is important in waste management (Vrijhoef and Koskela, 2000). Quality can also be improved through the integration of the supply chain (Briscoe and Dainty, 2005) but the supply chain should be paid promptly which would improve trust as well as promoting cash flow stability (Dainty *et al*, 2001).

#### **2.4.2.3 Value**

Alvarado *et al* (2004) discussed how the planned value needs to be discussed prior to the project starting so the performance can be measured during the project. Griffith (2007) lists nine factors which must be addressed to achieve best value in a construction project. These are:-

- cost
- duration
- quality
- responsiveness
- risk
- Client satisfaction
- added value to business
- safety
- environmental safeguards

A project Facilitator should be responsible for collecting the data for value management and a workshop is a good environment to brainstorm to generate ideas and greater value via value engineering (Simister and Green, 1997).

#### **2.4.2.4 Incentives**

Boone and Kurtz (1992) define motivation as forces leading to behaviour directed toward the satisfaction of some needs. Incentives are used to motivate personnel or a party to behave in a certain manner or to achieve set targets. They can be financial or non-financial or a combination of the two" (*Construction Industry Council*, 2001). An incentive mechanism is a process whereby parties to a contract are rewarded for

performance significantly over and above that contracted for. Incentives work by increasing motivation which encourages the desired behaviour and increases effort (Mohd-Sanusi and Mohd-Iskandar, 2007). Incentives and pain share/gain share contracts are discussed further in Chapter Seven (section 7.4.2).

#### **2.4.2.5 Win/win**

Both partners gaining from the partnership, or a win-win situation, comes through in many of the research papers and appears to be an important aspect for successful projects (Akintoye and Main, 2007). Egan (1998) discusses how every member of the partnership should make a fair and reasonable return.

The feeling of equity is important in a partnership and the feeling that one partner is gaining more from the partnership may cause them to commit less to the partnership (Das and Teng, 2001). Cheung *et al* (2005) noted that only the Client benefited from the partnering arrangement while the Contractor absorbed the extra cost of the partnering arrangement to increase chances of further work. Again, like incentives win/win is an important aspect within the model and therefore the is discussed further in Chapter 7 (Section 7.2.9).

#### **2.4.2.6 Cost**

According to Black *et al* (2000) adjusting price is the most difficult of procedures to establish within a partnering arrangement and it is important that cost control is maintained. Olsson and Espling (2004) cite Barlow et al's (1997) work and claim that the possible cost savings ranged from 5 to 30% within partnering. These results were the result of five case studies which included new build and refurbishment projects and both project and long term partnering (Barlow et al 1997). According to Aje *et al* (2009) the Contractor has the largest influence on the cost of a project. The Author found that Clients seem to think partnering often increased cost due to the administration costs and incorrect target costs.

#### **2.4.2.7 Alternative dispute resolution**

Conflicts will occur during a project and therefore conflict prevention and a resolution process is essential within a collaborative process (Ross, 2009). Modern contracts such as NEC 3/4 and JCT include options for dispute resolution (*Arup Project Management*, 2008). In the Author's opinion if disputes can be resolved without the need for

involving others then this could have a positive effect on other aspects such as trust and communication.

#### **2.4.2.8 Objectives**

Aligned objectives are held to be very important for successful collaboration (Swan and Khalfan, 2007), especially early in the project (Famakin *et al*, 2012). The Client's brief is essential in achieving the project objectives (Lindahl and Ryd, 2007). The brief needs to be detailed and contain information on value and risk management (Othman *et al*, 2006). Othman *et al* (2004) suggest the use of a dynamic brief that evolves during the project. A workshop is a good way of achieving a set of common objectives (Swan and Khalfan, 2007). In the Author's opinion by setting objectives together everyone can take possession of them increasing the motivation for them to be achieved.

#### **2.4.2.9 Open book**

There is a need for transparency to demonstrate fairness within a partnering arrangement (*Construction Industry Council*, 2001). A system of checks and balances can be used to reduce the chances of people using partnering for their own ends. However, this does go against the need for trust in partnering (Evans and Weir, 1995). Further information on target cost contracts is in Chapter 7 (Section 7.4.2). However, in the Author's opinion while this can play a very important role in trust there is often resistance against it or incompatibility between recording mechanisms making it difficult to interpret.

#### **2.4.2.10 Time**

Olsson and Espling (2004) claim that the possible time savings ranged from 10 to 40% within partnering. However, this is an estimate as the exact time savings cannot be measured. The Contractor's management capability is obviously important to the time performance of the project. This is also relevant to cost as well due to the interdependence of the two factors within projects (Aje *et al*, 2009).

### **2.4.3 Soft Aspects**

As described previously the research required the identification of 'soft' aspects from the literature for comparison with the contemporaneous views of current industry participants in Chapter 4.

Bresnen and Marshall (2002) discussed how partnering had been dealt with as a technical-managerial problem and ignored the socio-human aspect of partnering. They describe how the partnering research may benefit from utilising more generalised organisational theory about the aspects/problems that have been identified about partnering.

Bresnen and Marshall (2000c) describe how the soft aspects or 'subjective interpretation' are more important than the hard aspects or 'formal structures'. Therefore the Author, in researching tools and techniques from the literature, focused on mechanisms to encourage the correct behaviour from the team. A lot of the literature discusses how appropriate tools and techniques will bring about the changes required for collaboration with regards to motivation etc. Bresnen and Marshall (2002) also emphasise the need for performance improvement practices. The Author also felt that this was important for the model and therefore the literature was examined for 'soft' aspects. However, the Author found that while trust and team spirit were discussed frequently the total number of soft aspects was lower than hard aspects within the partnering literature. This may be due to the subjective nature of the aspects which makes research more complicated.

#### **2.4.3.1 Trust**

Trust is fundamental within a partnering arrangement (Barlow *et al*, 1997). McDermott *et al* (2005) discuss how relationships, communication, commitment and reliability are important to trust. People must behave in a trustworthy manner and cooperate (Moye and Henkin, 2006). Dietz and Hartog (2006) expand on this saying that people should exhibit ability, benevolence, integrity and predictability.

Many people start out trusting and it is important that this is sustained and not allowed to slip into distrust through apathy. Managers are very important to their subordinates' feelings of 'fairness' through the management of different situations (Searle and Ball, 2004). There are three bases to trust: competence, integrity and intuitive trust (Wong and Cheung, 2004). Trust builds up over time (Dwyer, 2008). Incentives with joint objectives have been suggested as a way of increasing trust (Eriksson and Laan, 2007).

Leadership and trust are considered to be of most significance by Chin *et al* (2008). Trust can be built with control measures in the form of monitoring in place or information sharing but this won't increase performance (Kabadayi and Ryu, 2007).

#### **2.4.3.2 Risk**

Risk is described by Ahmed *et al* (2007) as an exposure to losses in a project. Risk is an important consideration and partnering should mean a sharing of the risks inherent in the construction project and incentives have a role to play in this. The research by Black *et al* (2000) indicates that parties prefer collaborating when both risk and trust is high. The risk considered is both relational risk (will the partner commit) and also performance risk (relationship with the environment). Risk management is collaborative in nature and requires input from the whole team (Ahmed *et al*, 2007). Risk is affected by the size and complexity of the project, the location, speed of construction and degree of familiarity (Dey, 2001). Risk should be allocated to the party able to efficiently deal with it (Mills, 2001).

#### **2.4.3.3 Team spirit**

The choice of the Client's representative is important in the formation of the project team (Walker, 1998). The whole team should be carefully selected for their team working ability (Laan *et al*, 2011). Partnering should be established early in the project and a partnering session used to aid the formation of a 'team' (Ross, 2009). Site meetings play an important part in the formation of relationships (Gorse and Emmitt, 2003). Continuity of personnel plays an important role in team spirit (Richmond-Coggan, 2001). Empowerment can be important in producing a feeling of being valuable to a team (Greasley *et al*, 2005).

There is a chance that groupthink could become an issue with a team of people involved in a project, which may result in the group not being open to new ideas or innovation (Forgues and Koskela, 2009). Boone and Kurtz (1992, p569) define groupthink as a "*phenomenon in which the desire for group cohesiveness and consensus becomes stronger than the desire for the best possible decision*".

#### **2.4.3.4 Communication**

Successful projects have open routes of communication, decisions made as a team, clear objectives and everyone treated with respect amongst others (Akintoye and Main,

2007). Open communication is seen as a positive influence on a project (Phua and Rowlinson, 2004). The creation of protocols for project data exchange is required so that overload does not occur (Xie *et al*, 2010). Davis and Love (2011) suggest the use of performance measurement systems should be used to assess communication. Communication plays an important role in customer satisfaction (Karna *et al*, 2009).

Face to face communication is better for facilitating the soft aspects, such as people can judge facial expressions etc. (Andres, 2013). Koutsikouri *et al* (2008) describe how different disciplines use a different sort of language which makes understanding difficult. Alshawi and Faraj (2002) discuss how the use of IT can cause problems due to incompatibility between systems and the different abilities of people to access the data on the system. Briscoe and Dainty (2005) discuss how information failures can be attributed to a lack of trust. According to Khosrowshahi and Arayici (2012), Building Information Modelling (BIM) improves productivity by managing the information. Sebastian (2011) states that there are five factors to the successful implementation of BIM:-

- Product information sharing
- Organisational roles synergy
- Work processes coordination
- Environment for teamwork
- Reference data consolidation.

The BIM industry working group recognises four levels of BIM; these are 0-3:-

Level 0: Unmanaged CAD

Level 1: Managed CAD

Level 2: Managed 3D environment

Level 3: Full open process with data integration

(Taken from Neale *et al*, 2016).

Level 1 introduces the idea of collaboration but only at level 3 does the collaborative model server form part of BIM (Neale *et al*, 2016).



Barber's (2016) opinion on BIM is that the use of BIM does not ensure collaboration. BIM is a 'methodology' and not a set of 'procedural definitions'.

BIM will only work if people are collaborating rather than that BIM brings about collaboration (Barber, 2016).

#### **2.4.3.5 Leadership**

For partnering to be effective it is important that the partnering relates to the Company's corporate strategy (Olsson and Espling, 2004). Also that it has the backing of the Senior Management (Black *et al*, 2000). Leadership is important for the success of a project (Aje *et al*, 2009). According to Chin *et al* (2008) leadership is one of the most important factors.

#### **2.4.3.6 Innovation**

Innovation can improve the product and be more profitable. Innovation requires leadership, a customer focus, integrated supply chain quality and a focus on the end user (Khalfan and McDermott, 2006). According to Ansell *et al* (2009) there are six main factors affecting innovation:-

- Manufacturers and Clients
- Relationships through supply chain and with stakeholders
- Production structure
- Procurements method
- Standards and regulations
- Organisational resources and quality

Eriksson *et al* (2007) states that risk placed with the wrong people inhibits innovation. An example given was placing the risk with a Sub-contractor who had no influence over the design. Innovation registers can be used to record and review ideas (Ansell *et al*, 2009).

#### **2.4.3.7 Quality**

The measure of quality is whether the end product meets or exceeds the expectations of the Client (Walker and Keniger, 2002). The reasons provided for poor quality include a lack of information, poor workmanship, poor communication and a lack of site supervision (Abdel-Razek, 1998). Therefore leadership style, enthusiasm,

participation and feedback are important. Successful projects rely on the Client leading the quality management according to Ahmed *et al* (2005). The testing and inspection regime should be decided before construction starts (Arditi and Gunaydin, 1997).

#### **2.4.3.8 Motivation**

Alpander and Carter (1991) define work motivation as “a series of energising forces that originate from both within and beyond the individual’s self”. Managers are important to motivation by using a person’s strengths and rewarding or punishing as necessary. There are three motives relevant to work and they are:- self-actualisation, affiliation and power (Alpander and Carter, 1991). Empowerment can lead to improved motivation (Dainty *et al*, 2002). Job diversity can be used to help keep people motivated (Appelbaum and Kamal, 2000).

Bresnen and Marshall (2000c) describe how companies will try to adapt partnering to suit their requirements which can result in a rather disjointed adoption of partnering. This results in very different experiences from partnering with the companies using certain aspects only (Bresnen and Marshall 2000c).

## **2.5 THE BRITISH STANDARD**

BS11000 (*British Standards Institution*, 2010a) provides “a strategic framework to establish and improve collaborative relationships in organisations of all sizes”. BS11000 provides a framework for a broad range of practitioners to incorporate their best practice approaches into. The framework therefore is, by necessity, very general. The summary of the framework is shown in Figure 4.

BS 11000 identifies a number of themes important to successful projects. These themes are:-

- Alignment of objectives
- Alignment of common operations and activities
- The creation of value and mutual benefits
- And Risk management

All these should be recorded in a relationship management plan.

By its very nature, as described previously the British Standard (*British Standards Institution, 2010a*) is very general. As its target audience is British businesses of all sizes the guidance has to be very general.

<b>Strategic</b>	<b>Awareness (Clause 3)</b>	Establish executive responsible and organizational policy	Identify business objectives and value proposition	Identify and prioritize relationships	Establish resources, competencies and behaviours	Undertake initial risk assessment
	<b>Knowledge (Clause 4)</b>	Develop specific business strategy	Establish knowledge management process	Establish objectives, strategy, business case and identify potential collaborative organizations	Establish initial exit strategy	Incorporate relationship management with risk management processes
	<b>Internal assessment (Clause 5)</b>	Undertake self assessment	Establish collaborative profile	Establish collaborative leadership	Establish partner selection criteria	Establish and implement action plan
<b>Engagement</b>	<b>Partner selection (Clause 6)</b>	Nominate potential partners	Evaluate potential partners	Establish partner selection plans	Create joint objectives and negotiation strategy	Select partner
	<b>Working together (Clause 7)</b>	Establish governance, joint objectives and leadership	Establish organizational structure, roles, responsibilities and processes	Establish performance measurement	Establish joint risk management and exit strategy	Establish contract arrangements
	<b>Value creation (Clause 8)</b>	Establish value creation programme	Define value drivers	Establish improvement team	Establish learning from experience	Implement innovation process
<b>Management</b>	<b>Staying together (Clause 9)</b>	Ongoing management, monitor and measure the relationship	Continual innovation	Maintain behaviours and trust	Manage delivery and performance	Manage issue resolution and monitor joint exit strategy
	<b>Exit strategy (Clause 10)</b>	Develop and maintain joint exit strategy	Establish boundaries for the relationship	Monitor and evaluate changes	Manage business continuity and transition	Evaluate future opportunities
<b>Relationship Management Plan</b>						

Figure 4. Overview of the principal components of successful collaborative business relationships (Taken from *British Standards Institution, 2010a*).

This means there is no timeframe that could be applied to a construction project. The people that should be involved in the process are not specific to the professionals found

in the construction industry and it does not detail how things like assessments could be made within construction projects.

The model presented within this thesis is specific to the construction industry. This British Standard will be compared to the model presented in this thesis in Chapter Nine (section 9.8).

There however is clearly a link between the British Standard (*British Standards Institution*, 2010a) and the literature as objectives (section 2.4.2.8), value (section 2.4.2.3), Mutual benefits (incentives, section 2.4.2.4 or win/win section 2.4.2.5) and risk (section 2.4.3.2) are discussed and are also found in the literature on partnering/collaboration.

## **2.6 OTHER FACTORS AND ASPECTS**

Most of the literature discusses factors/aspects of collaboration. A number of authors only discuss the various factors/aspects within a single paper. The authors are:-

Aarseth *et al* (2012); Akintoye and Main (2007); Barlow *et al* (1997); Bayliss *et al* (2004); Beach *et al* (2005); Bemelmans *et al* (2012); Black *et al* (2000); Bresnen (2007); Bresnen and Marshall (2002); Burnes and Coram (1999); Chan *et al* (2006); Chen and Chen (2007); Cheng and Li (2002); Cheung *et al* (2003); Cox and Townsend (1997); Eriksson *et al* (2008); Espling and Olsson (2004); Himes (1995); Ingirige and Sexton (2006); Koutsikouri *et al* (2008); Loraine (1994); Muir and Rance (1995); Prior and Nowak (2005); Ronoco (1998); Rich (2008); Samuelsson-Brown (2002); Shelbourn *et al* (2007); Stiles (1995); Todeva and Knoke (2005).

Bresnen and Marshall (2000b) describe how the literature consists of 'lists of systems' designed to improve collaboration.

These authors, taken together, produced a list of factors/aspects to collaboration but one area missing from the literature was the relative importance of these aspects/factors to each other. The literature search also had to be widened to include general construction management theory to identify both the hard and the soft aspects.

In 2002 Bresnen and Marshall described how there was no template for partnering and that defining project success is difficult. They go on to discuss how the informal

mechanisms are as important as the formal mechanisms to partnering. They highlight the importance of Contractor involvement (Bresnen and Marshall, 2002).

There are a few authors who have published papers on frameworks for partnering. Bresnen and Marshall (2000c) and Bresnen (2010) describes how it may not be possible to produce a standardised model for partnering. Bresnen (2009) described how partnering is embedded in local practices. Olsson and Espling (2004) looked at partnering for infrastructure maintenance. They describe how “goodwill trust” is the most important factor and that partnering is a tool that potentially could create success. The Author agrees that a single model would not be suitable for both an infrastructure and school project. However the model presented within this Thesis is adaptable to different scenarios. The model is design for larger project however it can be scaled down for smaller projects. The model also highlights elements which are not applicable for example involvement of the end user at handover of a highway project.

Bresnen (2007) described how partnering research is dominated by research into prescriptive approaches and the problems and limitations. His approach was to identify the seven deadly sins of partnering: strategy, membership, equity, integration, benchmarks, processes and feedback.

These seven pillars to partnering need to be controlled so as not to give rise to the “seven deadly sins” (Bresnen, 2007). In contrast the Author’s research/model is a practical guide that informs the user what to do and when.

Shelbourn *et al* (2007) discusses the work of Planning and Implementation of Effective Collaboration in Construction (PIECC) at Loughborough University. PIECC was working on a prototype framework for the planning and implementation of effective collaboration. The aim of their research was to produce a decision-making methodology/framework to aid in the development of strategies for business, technology and people. The Author has been unable to find further publications on this work however.

## **2.7 MODELS FROM THE LITERATURE**

Anvuur and Kumaraswamy (2007) proposed a model for partnering.

Anvuur and Kumaraswamy’s model (2007) is described as conceptual and is based upon information gathered from the published literature on partnering - unlike the

practical model proposed within this thesis. The model presented by Avuur and Kumaraswamy (2007) presents some strategies and factors but insufficient information on how these were arrived at. The literature provides a long list of factors that could be involved, as shown in the literature review and summarised below. No details of who should be involved/responsible or when these things should be carried out are indicated within the model. The model presented in this Thesis aims to address this deficiency.

The literature contains a number of conceptual partnering models but only Aarseth *et al* (2012) claims to have produced a model to address this. Aarseth *et al* (2012) points out how the literature is not clear on how partnering is to be applied in projects.

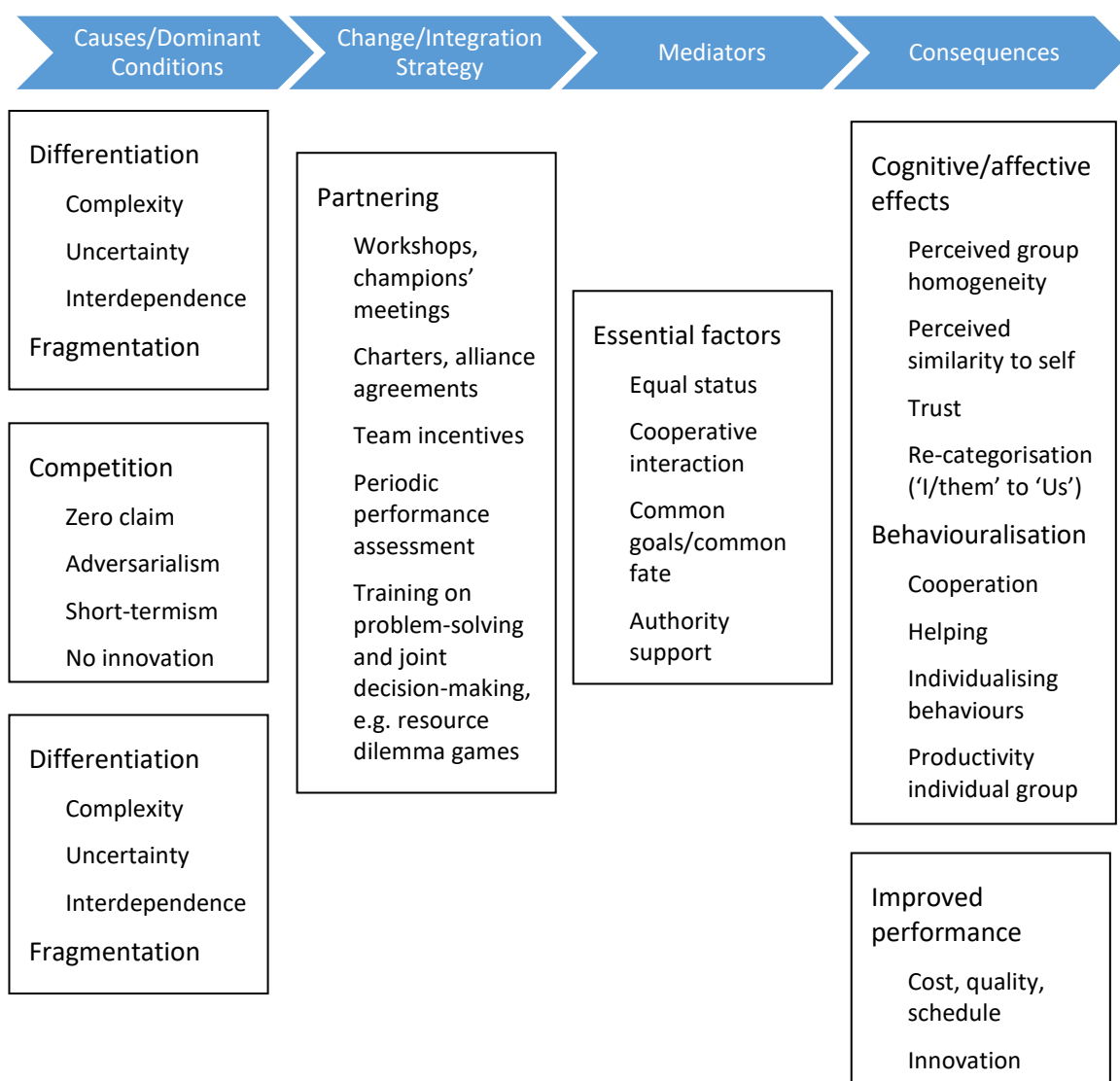


Figure 5. Conceptual model of partnering (Taken from Anvuur and Kumaraswamy, 2007).

The model they present has limitations because they only describe how the model looks at management and collaboration but ignores the legal/contractual side.

The Author's model includes management/collaboration and legal/contractual aspects.

Aarseth *et al* (2012) present an implicit model but failed to identify an explicit practical model.

The Author aims to present a practical model within this thesis.

Arseth *et al* (2012) examined five case studies (four from Norway and one from Canada) and used the difficulties encountered to produce a practical management / collaboration model.

They found that people did not have the same definition of 'partnering'. The model they produced is based on five areas:-

- Establishing a platform
- Starting the partnering process
- Executing the project
- Concluding the project
- An overarching "flower" of items – which alter in importance over the course of a project

The five areas are shown in Figure 6.

They describe how initially ground rules, project vision and management systems are important and how a workshop should be used to deal with these.

Aarseth *et al*'s (2012) model indicates a simple timeframe. However, it leaves many terms undefined such as 'start up' and 'conclude partnering process'.

The model contained within this thesis provides more clarity on timeframe.

Aarseth *et al* (2012) indicate nine factors/aspects to partnering. The literature within this chapter indicates a lot more aspects/factors, as summarised in the conclusion.

The model presented by Aarseth *et al* (2012) also indicates that the importance of the factors/aspects varies, but fails to fully explain the relative importance and how it varies with time. Their model does not indicate the personnel that should be taking part in the process.

The Author's model presented within this thesis identifies the personnel involved as well as the relative importance of the aspects unlike the model presented by Aarseth *et al* (2012).

This model will be compared to the model presented in this thesis in Chapter Nine (section 9.8).

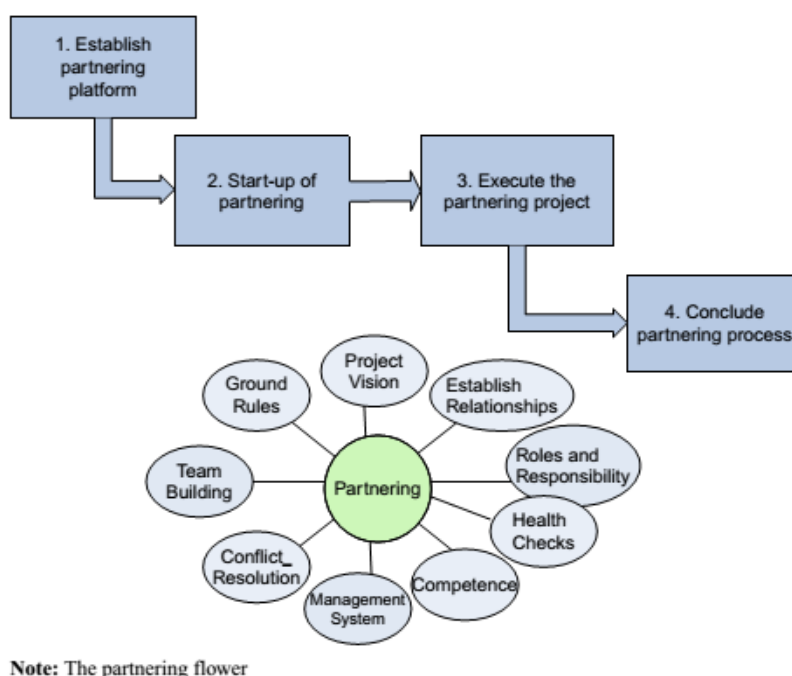


Figure 6. Model of partnering (Taken from Aarseth *et al*, 2012).

## 2.8 DISCUSSION OF THE LITERATURE REVIEW

This chapter initially examined the history of partnering from the Japanese concept of 'Kaizen' through to total quality management and how the US Army Corps of Engineers are seen as the first people to discuss partnering as a concept. This was then taken up in the UK with Latham's report in 1994 followed by Egan's report in 1998. This shows how partnering has evolved and in the Author's opinion is still evolving. Definitions were then examined for the various forms of collaboration. The most detailed definition for partnering was provided by Himes (1995) who stated that "a long-term commitment between two or more organisations for the purpose of achieving specific



business objectives by maximising the effectiveness of each participant’s resources. The relationship is based on trust, dedication to common goals and an understanding of each other’s individual expectations and values”.

This definition only identifies trust, common goals and understanding of expectations and values as important aspects. The literature however indicates a lot more aspects to collaboration. This definition takes the more relational viewpoint to collaboration. The literature review of definitions found that the definitions have either a relational or a tools and techniques worldview. The lack of a definition utilising both viewpoints that also represents the opinions of personnel in the industry was identified as possible gaps that required researching and filling by the Author in this work.

This chapter has examined and summarised the literature and provided an extensive list of aspects collated from sources on the various forms of ‘collaboration’. For clarification the aspects identified are shown in the table below. There is a total of 71 aspects.

Competitive advantage by the pooling together of resources	Torn loyalties to the organisation and to the partnership
Adequate resources required	Improvement of communication
Monthly review meetings	Maintain the continuity of the relationship
Social events	Newsletters
Workshops	Effect on contract elements
Mutual trust	Sub-supplier involvement in specification
Alternative Dispute resolution process	Focus on projects instead of processes
Keep costs low / financial savings	Labour unions
Cooperation from management down	Procurement procedures
Effective open communication	Laws and regulations
Effective coordination	Relationship management
Use of project partnering tools and procedures	Personal differences need to be put to one side
Increased Client base/ market share	A feeling of membership
Reduction in risk and a shared risk register	Alignment of common operations and activities
Higher productivity	The creation of value and mutual benefits
Increased profits	Timely responsiveness
Opportunity for innovation	Implementation
Chance for exploitation	Group working
Targets set for health and safety	Problem solving
Clearly defined roles	Understanding of partner’s needs

Performance measurement and benchmarks	Win-win philosophy
Target cost set and open book accounting	Mutual goals and objectives
Sharing of efficiency gains	Produce a better working environment
Clear design quality targets set	Complete the project within time
Partnering experience	A way to avoid litigation
New competences are required/ training	Equity
Top management support	Make sure decisions are made as a group
A learning culture	Commitment from everyone
Make promises only on what can be delivered	Non-adversarial attitudes
Everyone should be treated with respect	Champions of the partnership
Incentivisation	Inclusion of appropriate parties
Empowerment of stakeholders	Motivation
Supply chain involvement	Leadership
Understanding of other people's culture	Team spirit
Willingness to accept mistakes	Continuous joint evaluation
Partnering Charter	

Table 2. Aspects identified from the literature

As Bresnen and Marshall (2002) describe, a higher percentage of the aspects found within the literature are 'hard' aspects. Of the 71 aspects, 50 would be considered to be 'hard' aspects with only 21 of the aspects being considered as 'soft'. To identify how to approach the 'soft' aspects the more general construction management theory was examined. This was seen by the Author as important to produce a more rounded picture that was relevant to the industry. The list below was a result of the review of the literature on partnering/collaboration.

The hard aspects include:-

- Higher productivity
- Increased profits
- Clearly defined roles
- Target cost set and open book accounting
- Supply chain involvement
- Complete the project within time
- Laws and regulations
- Problem solving

- Win-win philosophy
- Mutual goals and objectives

While the soft aspects include:-

- Mutual trust
- Effective open communication
- Team spirit
- Leadership
- Motivation

The division of the aspects into 'hard' and 'soft' is relevant to this thesis as the 'hard' and 'soft' aspects will have to be handled separately within the model. Hard aspects are objective in nature, while soft aspects are subjective. This affects how they can be measured.

This general picture gained from the secondary sources of evidence was used to inform the primary research objectives. This literature review has shown that the majority of the published literature on partnering/collaboration is positive towards the concept (Ngowi 2001). The literature can seem to focus on how partnering/collaboration can improve a project (Akintoye and Main, 2007; Ng *et al*, 2002 and Bayliss *et al*, 2004). In the Author's opinion there is a lot of positives to collaboration but the industry does not always implement it correctly which can lead to dissatisfaction with the process.

Green (1998) questions the positive acceptance of the literature and especially Latham's (1994) assertions about collaboration.

The government has encouraged the use of partnering since Latham's (1994) and Egan's (1998) reports. The industry has been encouraged to use partnering by incorporating it in public sector tenders.

The Author's MSc research discovered that the industry did not just accept the way they were told to carry out partnering but were making it fit the industry.

The first stage of the research discussed in Chapter Three aims to identify which aspects the industry is using and which aspects they have discarded.

Little research has been carried out on the relative importance of each aspect and this is a gap the Author has addressed within this thesis in Chapter 5.

Akintoye *et al* (2000) produced a rank ordered list of factors important to the supply chain within a partnership; the list however is limited. There is a lack of research into identifying all aspects currently important to collaboration and their relative importance. This again is a gap in the extant body of research which provided a catalyst for the Author's research and importantly will feed into the model.

So, in summary, from the literature it is quite clear that no comprehensive, effective model exists which integrates what are generally held to be the crucial factors required for successful collaboration and any measure of their relative importance. The models examined also omit which stakeholders have specific roles to play within aspects of collaboration or when these aspects come into play. As will be seen later such a model was developed through the research presented in this thesis and forms the original contribution to knowledge.

Chapter Three sets out the methodology behind how the aims and objectives will be achieved. The chapter shows how the Author's own primary research will identify which of the factors/aspects identified in this chapter are still considered important, through a programme of interviews to identify aspects to current collaboration. The aspects from the literature review given in this chapter were then used as a comparison to those from the interviews to see if or how collaboration currently differs from the previous research into partnering, alliancing and joint ventures in the fourth chapter.

### **Summary of Chapter Two**

**1. Review the different forms of collaboration.**

**Partnering, alliancing and joint ventures are presented and compared and contrasted.**

**2. Define the various forms of collaboration.**

**Definitions of partnering, alliancing and joint ventures provided.**

**3. Identify the aspects of collaboration from the literature.**

**A total of 71 aspects to collaboration were identified within the literature.**

**4. Identify any existing models in the literature.**

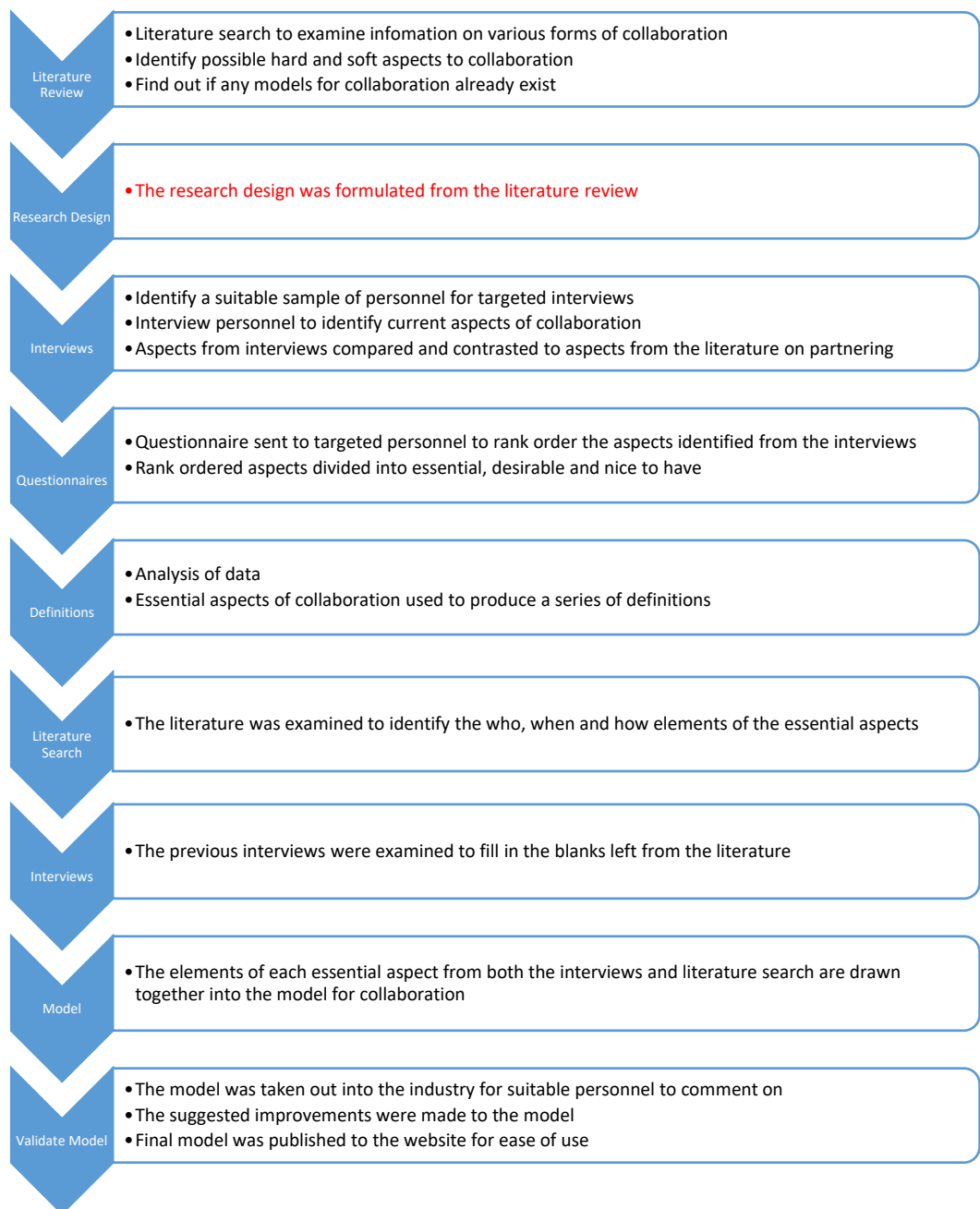
**Three important models have been discovered in the literature and Chapter Nine will examine how the model presented within this Thesis is different.**

## *Chapter Three*

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# Methodology

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# Chapter Three

## Methodology

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### **Chapter Three Aims**

- 1. Review of philosophical worldview and justify choices taken.**
- 2. Presentation and justification of the research strategy adopted in the study.**
- 3. Presentation and justification of the research methods utilised in the study.**
- 4. Contribution to knowledge.**

### **3.1 INTRODUCTION**

In the previous chapter the literature identified 71 aspects linked to collaboration. However, the literature failed to indicate the relative importance of the aspects to each other. The literature did not reveal detailed definitions and only provided a few conceptual models and no practical models for use by industry stakeholders. Having identified how a contribution to knowledge can be made, the aim of this chapter is to describe the possible research designs available to the Author.

The purpose has been to base the research on a very thorough methodology. After a review of methodological principles and alternative approaches the methodology presented here proceeds through six distinct phases:-

Phase One - Identification of aspects of collaboration from the literature.

Phase Two - Identification of the current collaborative aspects.

Phase Three - Rank ordering of collaborative aspects.

Phase Four - Essential aspects and production of the definitions.

Phase Five - Generation of a model for collaboration.

Phase Six - Validating collaborative model.



The chosen research design and the methodology used in this research is presented and justified in this chapter. The research is then described step by step from the identification of aspects to the validation of the model.

### 3.2 RESEARCH METHODOLOGY

Creswell (2009) describes the three possible research designs as quantitative, qualitative and mixed methods. Quantitative research can be used to test objective theories or to examine the relationships between variables (Creswell, 2009). Qualitative research is a way of exploring and understanding the views and behaviour of individuals or groups. Mixed methods is where both qualitative and quantitative research is used, which is considered stronger by many leading Researchers such as Bryman and Bell (2007).

Creswell (2009) describes how there are three factors to consider when designing research projects, these are:-

- Philosophical Worldview / Ontology and Epistemology
- Strategies of inquiry
- Specific methods of data collection

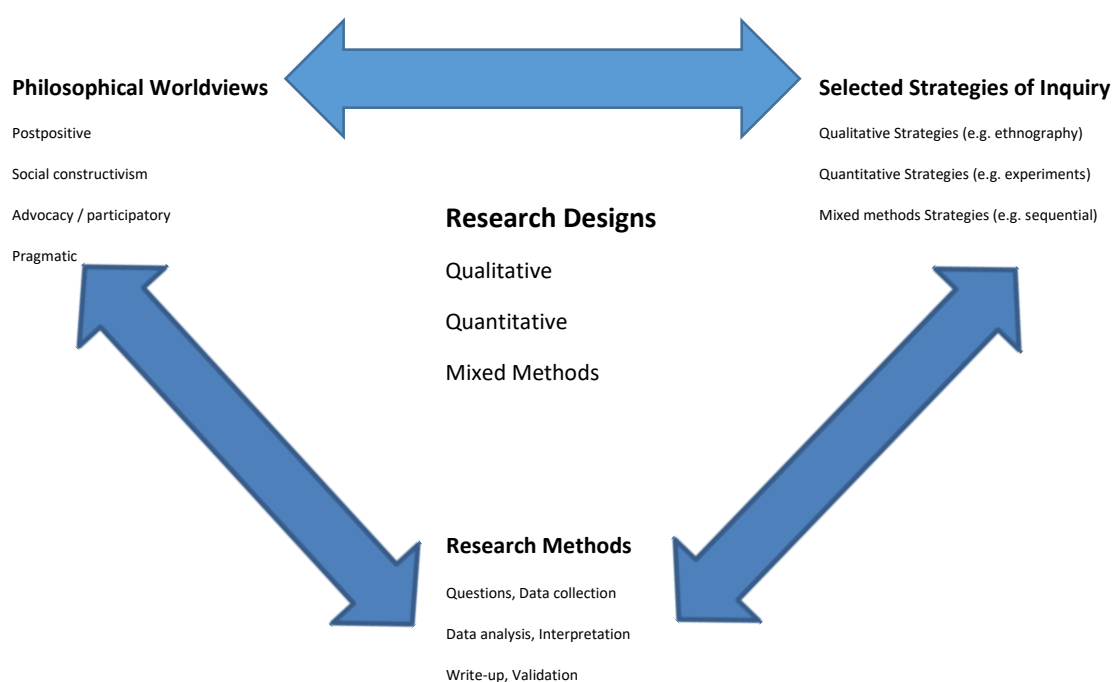


Figure 7. Research design (Taken from Creswell, 2009)

### **3.2.1 Philosophical Worldview**

Philosophical worldview has been described as the “general orientation about the world and the nature of research that a Researcher holds” (Creswell, 2009). Bryman and Bell (2007) describe the four common world views of postpositivism, constructivism, advocacy and pragmatism.

#### **3.2.1.1 Post positivism**

Post positivism is considered as the traditional form of research and involved the formation of a theory on which data were collected to either support or refute the theory. It is a form of research that aims to develop true statements that explain the relationship between two variables and is linked to quantitative research methods (Hart, 2005). Post positivism was not adopted for this thesis as the Author felt it is not possible to reduce the data to produce a single theory. Post positivism could identify if the 71 possible aspects are still perceived as important to collaboration but this approach would not allow the production of a model.

#### **3.2.1.2 Social constructivism**

The social constructivism worldview is linked to qualitative research methods. Broad questions are asked so that the participants are allowed to construct the meaning of the situation. This method is often used to examine processes of interaction (Creswell, 2009). Constructivism was considered for this thesis as it seeks to make sense of the meanings of others but was finally excluded as not all the aims could be achieved in this manner. This worldview is conducive to the production of a model but would not identify the relative importance of each of the aspects to each other. This is of importance in the formulation of a definition. It would also not allow a model to be produced that focussed on those aspects that can potentially provide the greatest success.

#### **3.2.1.3 Advocacy and participatory**

The advocacy and participatory worldview is linked to quantitative research and is entwined with politics and a political agenda and addresses important social issues (Hart, 2005). The philosophical worldview advocacy was excluded as this research is not political in nature. While the UK Government have promoted the use of collaboration through various mechanisms the aim of this research is to improve the

success of projects for the personnel managing the project. These personnel are not politically minded and therefore whilst acknowledging that the forces behind collaboration may be political, the day to day running of a collaborative project is not. From the point of view of the Contractor it is an avenue to get work. They have had no choice and are not there due to politics.

#### **3.2.1.4 Pragmatic**

Pragmatism is concerned with applications and finding solutions to problems and does not see the world as an absolute unity (Bryman and Bell, 2007). The philosophical worldview that best fits the Author's outlook is pragmatism. Pragmatism focuses on what works and finding solutions to problems and draws from both qualitative and quantitative assumptions (Creswell, 2009). Pragmatism, it was felt, was the most appropriate as it fits in best with the aims and objectives of the research in this thesis. An initial objective for the research was to identify what aspects are currently considered to be part of a successful collaborative project. This required a qualitative approach. The aspects then needed to be rank ordered which required a quantitative approach. Finally information about who should be responsible for these aspects, at what point in the project they become important and how should they be implemented required a qualitative approach. The mixed method approach therefore was important in obtaining the breadth and depth of information required to complete all the aims and objectives.

#### **3.2.2 Strategies of Inquiry**

Having chosen the most appropriate philosophical worldview the strategy of inquiry was examined. Strategies of inquiry are models that use quantitative, qualitative or mixed method designs to provide specific direction for the procedures in the research design (Hart, 2005).

##### **3.2.2.1 Quantitative strategies**

Examples of quantitative strategies include experimental research. Experimental research consists of changing or influencing one variable to see how it affects the outcome of another variable (Creswell, 2009). This method does not suit the aims and objectives of the Author's research.

Survey research is another strategy. Survey research provides a picture of trends using numerical data by using questionnaires or structured interviews (Hart, 2005). Surveys allow inferences to be made from a sample of people to the population. Surveys are useful as data can be collected quite quickly (Creswell, 2009). The quantitative strategy would only suit part of the research that involved putting the data into priority order but would not be suitable for gaining people's opinions on collaboration.

### **3.2.2.2 Qualitative strategies**

There are many examples of qualitative strategies. Ethnography involves the Researcher studying an intact cultural group in their natural environment (Creswell, 2009). Grounded Theory uses the views and opinions of participants using multiple stages of data collection to form a general abstract theory of a process (Dainty *et al*, 2000). Case Studies are an in depth study of an event, activity or process using a variety of data collection procedures over a prolonged period (Creswell, 2009). Phenomenological research is a prolonged study of people's experiences to understand the meaning of the process (Bryman and Bell, 2007). Narrative research is where individuals are asked to provide stories about their lives and they are compiled together (Creswell, 2009). A qualitative strategy would be more suitable for collecting data on the opinion of people involved in collaboration but would miss data on the importance of aspects.

### **3.2.2.3 Mixed methods strategies**

Sequential mixed methods is where the Researcher uses another method of data collection to elaborate on the data found using the first method (Hart, 2005). Concurrent mixed methods involves the Researcher merging both quantitative and qualitative data collection (Bryman and Bell, 2007). Transformative mixed methods uses a theoretical lens throughout the design and then uses either sequential or concurrent mixed methods (Creswell, 2009). Creswell (2009, pp 62) states that a theoretical lens provides an "*overall orientating lens*". The theoretical lens guides the questions asked and dictates how the data were to be collected and analysed (Creswell, 2009). A mixed method strategy was found to be the most suitable strategy for the Author's research. Qualitative data would allow the insight into how people view collaboration while the quantitative data would allow this data to be rank ordered to facilitate the drawing of the data into a model. Of the mixed method strategies available

a concurrent mixed method was not suitable for the research due to the complexity of collaboration. A sequential mixed method discussed by Hart (2005) was utilised which allowed the qualitative data to be collected and then rank ordered using quantitative data, although some concurrent mixed method was also utilised within the questionnaire. Then additional qualitative data were collected and analysed to help inform the model. The Author's aim is to compare the data collected to the existing theory but not to use the literature to guide the research design.

Mixed methods can be used to both corroborate and also expand one's knowledge (Johnson and Onwuegbuzie, 2004).

Johnson and Onwuegbuzie (2004) describe that mixed methods research can be mixed model or mixed method. Mixed model mixes qualitative and quantitative approaches within or across stages. Mixed method includes a quantitative phase and a qualitative phase. The Author's approach uses both mixed methods and mixed model as described in figure 8.

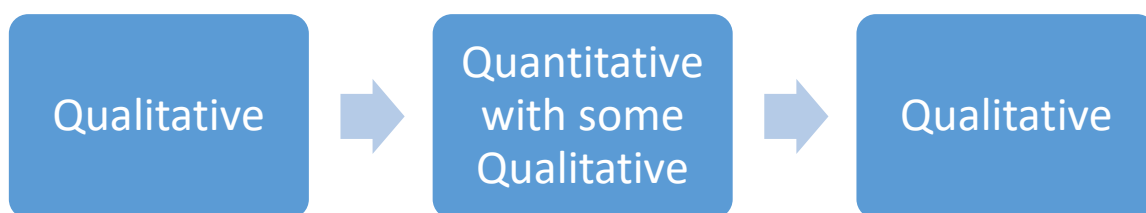


Figure 8. Mixed methods approach

### 3.2.3 Research Methods

Once the strategy had been chosen the specific methods could be examined. Having chosen a mixed methods strategy, the specific methods of data collection can draw from both qualitative and quantitative methods as best determined by the aims and objectives of the research. Specific research methods encompass data collection, analysis and interpretation. The type of methods used depends upon the data required (Bryman and Bell, 2007).

#### 3.2.3.1 Quantitative methods

Quantitative methods should use predetermined methods with closed ended questions. The sort of data that should be collected is performance, attitude,

observational and census data. The analysis and interpretation should be statistical. The methods that could be used included questionnaires, observational and comparative analysis (Hart, 2005).

The data collection method the Author thought best fit the aims and objectives is self-administered questionnaires. According to Creswell (2009) a random sample provides the best data. A random sample was not possible for this research as the Respondents need to understand collaboration within the UK construction industry. Therefore to improve the validity initial Respondents (clustering) were approached via Constructing Excellence Wales but were asked to send on the questionnaire to their acquaintances. This is snowball sampling and is discussed in 3.5.1 (Bryman, 2008). This reduced the targeting and increased randomisation to improve the ability to generalise to the population.

### *3.2.3.2 Qualitative methods*

Qualitative methods should use emerging methods (adapting to the situation) with open ended interviews. The sort of data that should be collected is interview, observational, document and audio visual data. The analysis should be of text and images and the interpretation of themes and patterns (Creswell, 2009). The methods that could be used included interviews, life history, case study and concept mapping (Bryman and Bell, 2007).

Observations are useful for Researchers to gain first-hand experience but it can take time to build up enough of a rapport so the Researcher is not seen as intrusive (Creswell, 2009). The Author did not have the necessary time scale for this procedure.

Documents are useful as they can be accessed at convenient times but not all documents may be accessible to the public (Creswell, 2009). The Author felt that this procedure was not suitable for the research design as some of the documents would be commercially sensitive and therefore the Author would be unable to access sufficient information.

Interviews provide control over the line of questioning, however the information is the opinions of the Interviewees and therefore filtered by their views. Not all people are articulate and perceptive (Creswell, 2009). In the Author's opinion interviews are the most appropriate procedure as they provide the most control. To mitigate against the

limitations of the procedure more people from various backgrounds were interviewed. These Interviewees included both civil engineering works and building projects and representatives of both the Contractor and the Client. In case the Interviewees were not very articulate several non-leading supplementary questions were prepared to help draw them out. It was suggested that they could email information to the Author following the interview.

### **3.2.3.3 Mixed methods**

Mixed methods can utilise both predetermined and emerging methods with both open and close ended questions. Open ended questions allow Interviewees to explain their interpretation. Closed ended questions allow Respondents to select from a range of options. Closed ended questions are a good method of collecting data that can be analysed quickly statistically (May, 2011). Multiple data forms can be collected. The analysis can be both statistical as well as text or image and the interpretation of multi databases (Creswell, 2009). The possible methods in a mixed method approach could have involved any techniques from qualitative and quantitative methods such as nominal group (a group identifying issues), case study, comparative analysis (comparison of two or more cases), interviews and questionnaires (Hart, 2005).

The mixed methods approach aims to collect multiple data using different approaches so that the resulting data utilizes the strengths of both qualitative and quantitative research while minimizing the weaknesses (Johnson and Onwuegbuzie, 2004).

The Author's design includes both interviews and questionnaires. The qualitative interviews were a good method to tap into Interviewee's perspectives on what they perceive as collaboration. They also indicated that some aspects were more important than others. These interviews would not produce valid data on the relative importance of each aspect. Therefore, quantitative questionnaires were used to measure the importance of each aspect so that they could be analysed statistically.

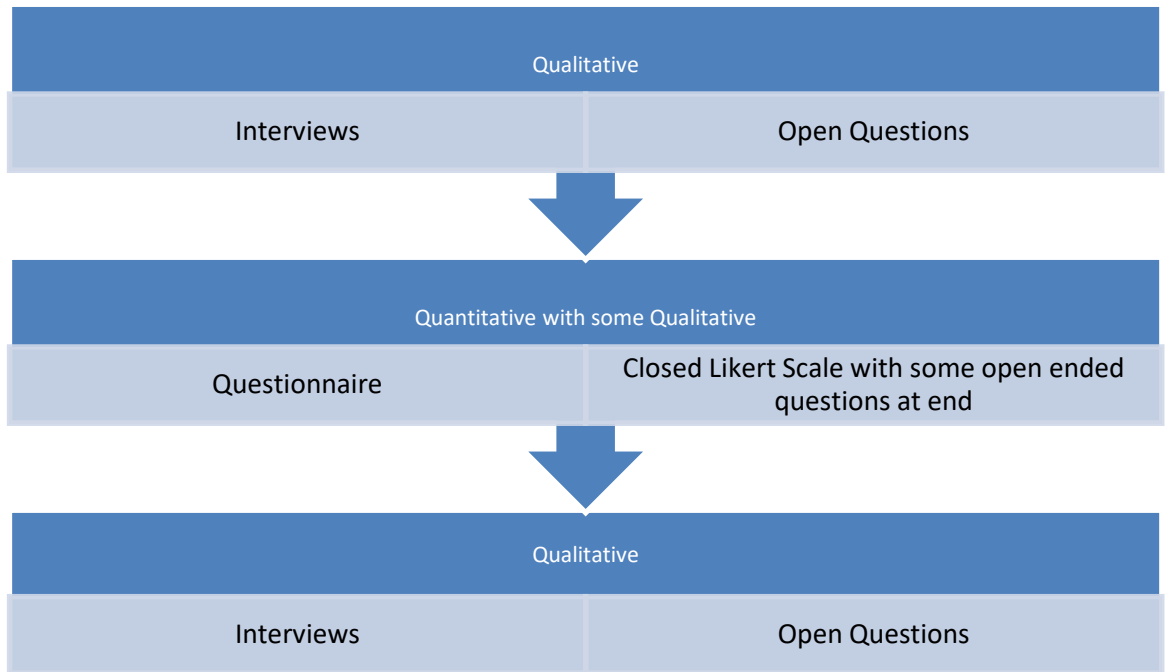


Figure 9. Data collection flow chart

The open ended questions at the end of the questionnaire gave the Respondents an opportunity to disagree or add more aspects. This, according to Johnson and Omwuegbuzie (2004), helps improve generalisability.

### 3.2.4 Summary of the Methodological Approach Used in this Thesis

The research design consisted of a pragmatic approach with a mixed methods strategy. The research design utilised both qualitative open ended interviews and quantitative questionnaires as research methods. The research design was then used to inform the methodological approach This incorporated specific data collection methods and how the data would be analysed and interpreted.

The flow chart in Figure 10 provides a methodological thesis roadmap as an aid in following the logic of this research.



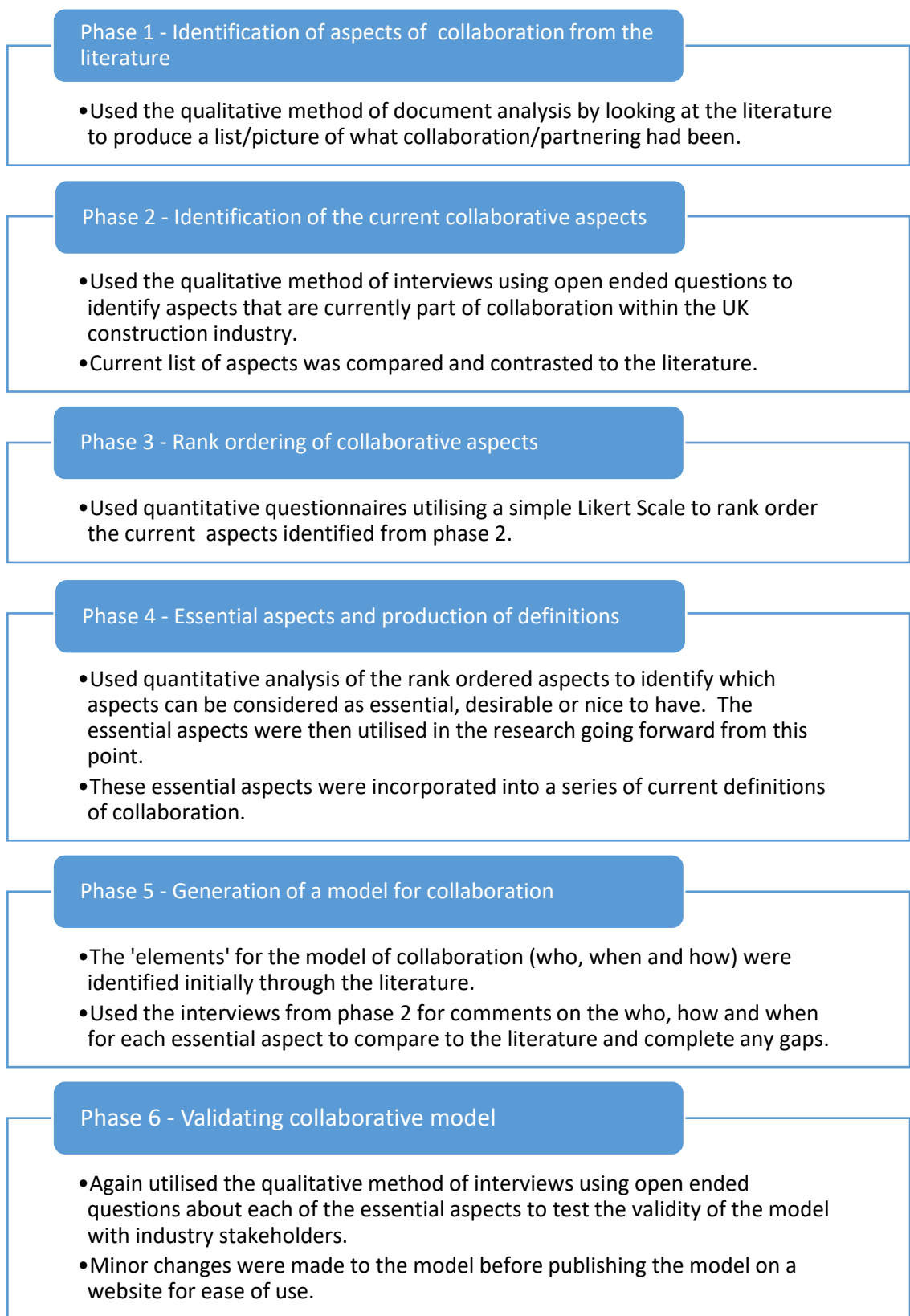


Figure 10. Flow chart providing the methodological roadmap

### **3.3 IDENTIFICATION OF ASPECTS OF COLLABORATION FROM LITERATURE**

The preliminary research found that incentivisation on its own would not ensure a successful collaborative project. Therefore, when the research progressed to the PhD objectives, secondary sources were examined to identify possible aspects that were important within collaborative projects.

#### **3.3.1 Sources of Data for Initial Literature and Information Search**

Secondary data were obtained from construction and business journal papers to identify potential aspects within collaborative projects (see list in Appendix 11). These are presented in Chapter Two.

#### **3.3.2 The Classification of Information from the Initial Literature Review**

The secondary data obtained from the journal papers identified information relating to aspects that may be involved in producing successful collaborative projects. These were further divided into soft aspects and hard aspects.

The initial research into secondary sources on collaboration revealed that secondary sources (see Chapter Two, section 2.8) were primarily written by academics. The majority of papers used were about partnering. Seventy one aspects to collaboration were identified from the literature but the Author had anecdotal evidence from her MSc research that partnering was evolving and that not all aspects were still considered useful to a successful project. To balance this the research needed to gather the opinions of people involved in the collaborative process.

Having identified the possible aspects from the secondary sources the research then moved on to collect primary data. This list of aspects identified from secondary sources was compared and contrasted to the first batch of primary data collected to identify if and how the concept of partnering was evolving into this new collaboration.

### **3.4 IDENTIFICATION OF THE CURRENT COLLABORATIVE ASPECTS**

Interviews were used to gather data on the aspects of collaboration from construction professionals experienced in collaborative projects on how they viewed collaboration. The data from the interviews were analysed and a list of aspects for collaboration was

produced. These were compared to the literature review to see if there were new aspects or any not discussed. This was to examine if the industry has adapted partnering to fit the industry.

### **3.4.1 Interviewee Selection Strategy**

To produce a list of aspects for successful collaboration it was important to target the right audience. Therefore, selective sampling was carried out. Rather than relying on random selection the sample was selected as the Interviewees had to understand and have experience of collaboration within the UK construction industry. Using contacts from Constructing Excellence Wales possible Interviewees were identified from recent collaborative projects. Constructing Excellence Wales was selected as the Author, being self-funding, had no resources for travelling so therefore needed local contacts. However, Constructing Excellence Wales, as a national organisation, has access to relevant people appropriate for the Author's data collection. Also, Constructing Excellence Wales is a part of Constructing Excellence in the UK which helps to broaden the relevance of the data.

With regards to the number of interviewees required Creswell (2009), Bryman (2008) and Knight and Ruddock (2008) discuss how sample sizes can be smaller in qualitative research designs. They do not give details of how to calculate them. Cohen *et al* (2011) suggest a minimum of 15 interviews. However, Mason (2010) and Dworkin (2012) discuss saturation based on the point of diminishing returns. They describe how more data does not necessarily lead to more information as qualitative research is looking for meanings.

### **3.4.2 Willingness and Availability to be Interviewed**

The Author approached Constructing Excellence Wales and they agreed to be interviewed but also to put the Author in contact with other suitable people within the industry and a sample of individuals as possible Interviewees was created.

Ten people were initially approached as a starting point for their availability to be interviewed. As expected some of the people approached were not available for interview within a reasonable period of time due to holidays and leave. Using diminishing returns seven people were interviewed: three Client representatives,

three Contractor representatives and one Interviewee who was an Advisor and whose views did not come from either perspective.

### 3.4.3 Criteria for Selection

Contract Managers, Cost Managers, Clients and Project Managers with sufficient experience to make judgments on aspects of collaboration were targeted for interviewing.

The personnel interviewed all worked in large organisations across the UK within the construction industry, from a cross section of project types including major construction projects with associated infrastructure works, civil engineering works and smaller building projects. The Interviewees had a minimum of ten years' experience of working within a collaborative environment with four of them having worked for over 15 years on collaborative projects. It was decided that sufficient interviews had been carried out as the number of new aspects reduced with each interview and no new aspects were obtained from the final interview as shown in Figure 11.

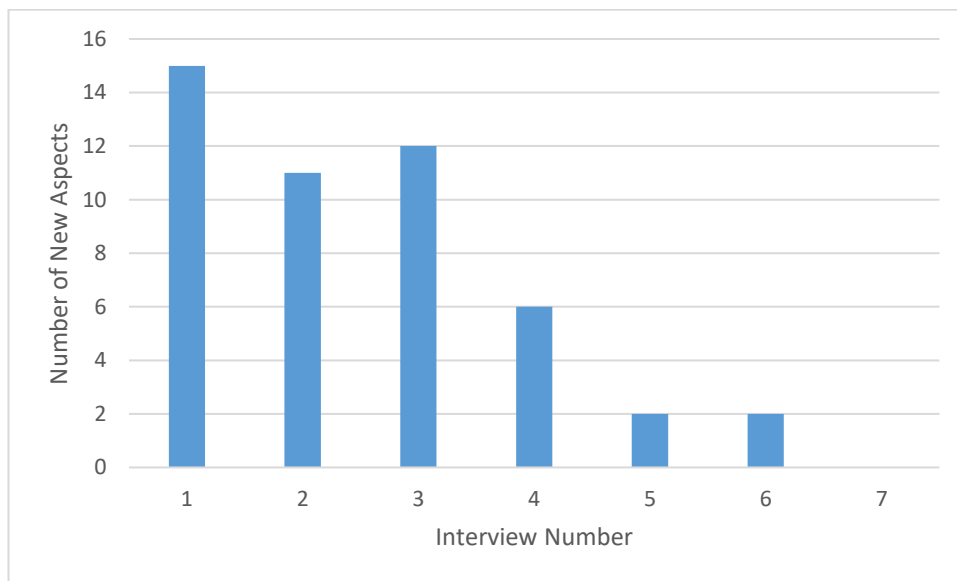


Figure 11. Graph showing the number of new aspects identified in subsequent interviews

### 3.4.4 Interview Questions and Format

Interviews were used to explore the Interviewees' understanding of the term collaboration. For the full set of questions please see Appendix 12.

The Interviewees were asked some general questions about their experience to confirm their suitability and also for possible analysis of the data later.

The interview was a semi-structured, open ended interview which included five questions covering why both Contractors and Clients enter into collaborative arrangements and the benefits they get from collaboration. They were also asked their opinion on the difference between collaboration and partnering. The questions were kept general to bring in as much data as possible so it could be compared and contrasted to the secondary data from Chapter Two. The interview was piloted and worked well and so the only changes made were to draw out individuals on points made for clarity.

The Interviewees were thanked for their participation and asked to contact the Researcher by email should anything else relevant be subsequently identified.

#### **3.4.5 Interview Analysis**

These interviews took about 30 minutes and were all transcribed. The transcribed interviews were then examined to identify all aspects mentioned. The flow diagram in Figure 12 describes how the data were analysed.

From the Interview process with a selected sample a total of 48 aspects were identified.

The list of 48 aspects gathered as primary data from these interviews were compared to the 71 aspects identified from secondary sources reviewed in the Author's initial literature review which was undertaken to compare and contrast partnering to collaboration. The interviews' purpose was to identify the current interpretation of collaboration in the industry. Some aspects were mentioned more frequently than others in the interviews but quantitative data were required in order to rank order the aspects. The list of aspects (described in Chapter Four, section 4.4.3) was then used to produce the questionnaires to answer the question of relative importance of each aspect to each other.

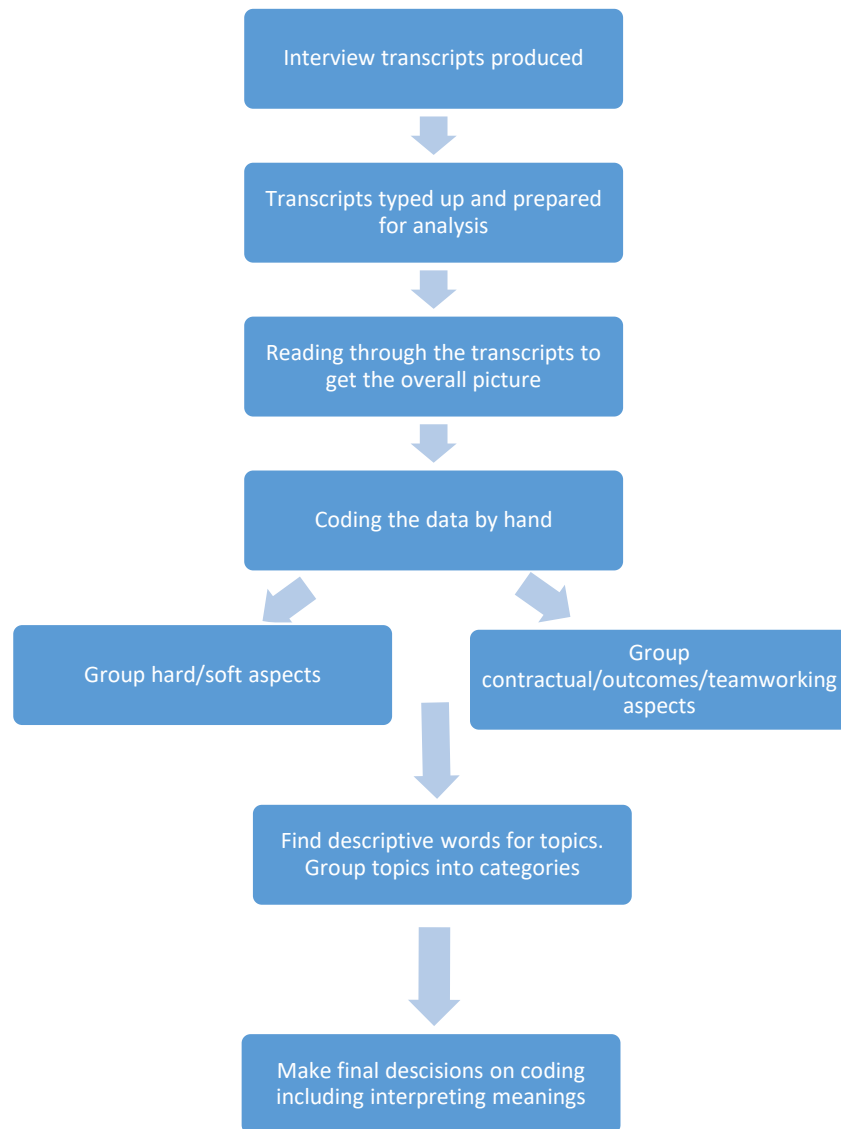


Figure 12. Flow diagram of interview analysis (adapted from Creswell 2009)

From a methodological perspective it was decided that it would more consistent to use the 48 aspects identified from the interviews to take forward to the next stage of the research. This maintains the integrity of the data as it is the product of direct contemporaneous primary research. The 71 aspects identified from the literature represent what partnering was or has been over the past 20 plus years. The aim of this research is to define what collaboration is currently seen as within the industry and produce a model that the industry can identify with therefore it is only the 48 aspects from the interviews which were taken forward to Chapter Five. Thirty one of these 48 aspects were noted in the literature review but 17 of the 48 aspects were not identified in the literature.

For the next two phases of the research only the aspects identified from the interviews were used so that the definitions and model are relevant to the current industry.

### **3.5 RANK ORDERING OF COLLABORATIVE ASPECTS**

The list of aspects identified in the interviews was then used in a questionnaire utilising a Likert scale to rank order the aspects. The results obtained were used to produce a definition and inform the generation of the model.

#### **3.5.1 Population Sample**

Targeted sampling was carried out as the Respondents had to have an understanding of collaboration. As with the previous interviews, Constructing Excellence Wales provided the contacts to broaden the relevance of the data. The target sample was set at 50 but more importantly the sample had to achieve statistical reliability as described in Chapter Five (section 5.4.2).

Bryman (2008) described how it is not possible to set up a framework for certain populations. As personnel with experience in collaboration were required to collect relevant data a sampling framework was not an option. Snowball sampling is suggested by Bryman (2008) as an alternative. Snowball sampling is where an initial selected sample is sent the questionnaire but then the initial sample send the questionnaire on to all their acquaintances and then they in turn send it on further until no more questionnaires are returned. This has lower generalisability than probability sampling but is better than a selected sample (Bryman, 2008). Snowball sampling was therefore used to keep as much generalisation as possible.

#### **3.5.2 Sample Contact Method**

The pilot questionnaire was distributed by hand to people in the industry known by the Author. The main issue raised was about the structure of some of the aspects which was addressed by writing all the aspects as statements. Once the questionnaire had been improved a survey website was utilised to increase the coverage of the questionnaires. The link was sent to the contacts provided by Constructing Excellence Wales, who had agreed to distribute the questionnaire to other people they knew with suitable experience and also asked them to re-forward the email.

### **3.5.3 Respondent Selection Criteria**

A questionnaire was used as it allowed the Respondents to provide their opinion on the relative importance of the aspects of collaboration. This provided data that were easily analysed and was also a method suitable to collect the volume of results required for this research. In choosing a sample the relevant role (Client/Contractor), experience, type of project (Building or Civil Engineering projects) and geography (experience within the UK) were considered important. Therefore, selective sampling was again carried out to ensure that the Respondents had the level of understanding to make informed choices. To produce a set of relevant data it was important that the sample had experience of collaboration. Contract Managers, Cost Managers, Clients, Quantity Surveyors and Project Managers were targeted. They were chosen for their understanding of contracts, management and the day to day running of the site enabling them to make judgments on the importance of aspects of collaboration. It was decided to send the questionnaire to people working in both civil engineering and building sector projects and from various sized projects to get a broad cross section of the UK construction industry. The Respondents were required to indicate the number of years they had been involved in collaborative projects. Any results from people with less than one years' experience of collaborative projects were discarded. Table 17 shows the divide of experience (see Chapter Six, section 6.2.2).

### **3.5.4 Preliminary Questionnaire Design**

An initial questionnaire was sent out to a small sample of six people to complete and provide feedback on the 'functionality' of the questionnaire.

The questionnaire was quite long. This was due to the fact that it was necessary to identify the relative importance of the 48 aspects derived from the interviews. Therefore, the rest of the questionnaire was kept to the bare minimum so that people would complete the questionnaire and not just give up. The Author was keenly aware of the need to provide a valid completion rate.

The aspects derived from the interviews were not always clearly understandable and the aspects were expressed in a variety of different forms which was confusing. Therefore, the results of the interviews were converted into standardised statements and a pilot study carried out.



### **3.5.5 Pilot Study of Questionnaire**

As described the trial questionnaire was sent out to six people (see Appendix 13). The feedback that was received was incorporated by altering the wording of some of the statements and the delivery of the questionnaire was reconsidered.

### **3.5.6 Distribution of Questionnaire**

Initially 20 questionnaires were distributed and 13 of the questionnaires were returned which gave a 65% return rate. Using snowball sampling the initial respondents were asked to pass on the questionnaires to their acquaintances via the internet to people with a knowledge of collaboration. A total of 52 responses was obtained. The pilot study questionnaire was originally written in Excel and they had to mark the correct box. When the final questionnaire was designed a survey website was used which made the process quicker. Respondents had to tick the box of choice. The programme also indicated how many more questions they would be asked to complete. This questionnaire was distributed via email to people known to have worked on collaborative projects and they then sent the email on to their contacts. The questionnaire contained questions to check their suitability as a Respondent. Any questionnaires in which the Respondent had a lack of experience or had not answered all the questions were discarded.

### **3.5.7 Final Questionnaire**

The interviews resulted in a list of 48 aspects which Respondents in the questionnaire exercise were asked to rank. An example of how the questionnaire was set out is shown in Figure 13.

The questionnaire used a three point Likert Scale and asked the participants to decide if each individual aspect was either essential to collaboration, desirable, or nice to have but not necessary (see Appendix 14). This was a closed form of questioning. The Likert Scale was chosen for the questionnaire as analysis was made easier if the Respondents were not answering freely and their opinions could be directly compared. At the end of the questionnaire there was an opportunity to offer more possible aspects. The data once collected were then analysed by scoring each answer so that a rank order of the aspects could be produced.

<b>5. The client takes the lead in the project.</b>		
<input type="radio"/> Essential to collaboration	<input type="radio"/> Desirable for collaboration	<input type="radio"/> Nice to have but not necessary in a collaborative project
<b>6. The contract supports collaboration.</b>		
<input type="radio"/> Essential to collaboration	<input type="radio"/> Desirable for collaboration	<input type="radio"/> Nice to have but not necessary in a collaborative project
<b>7. Accounts are accessible to both the contractor and the client.</b>		
<input type="radio"/> Essential to collaboration	<input type="radio"/> Desirable for collaboration	<input type="radio"/> Nice to have but not necessary in a collaborative project

Figure 13. Example of questionnaire

### 3.6 ESSENTIAL ASPECTS AND PRODUCTION OF DEFINITIONS

The questionnaire scores were tested statistically to make a judgement on whether the scores could be used to determine whether the aspect is essential or not. The data were analysed using Spearman's Rho to check the validity of the results. Spearman's Rho tests the extent to which pairs of related data change together (Coolican, 2009). The data were also checked using Cronbach's Alpha to check the internal validity of the data. Cronbach's Alpha tests reliability by examining how much people vary on individual items (Coolican, 2009).

#### 3.6.1 Essential Aspects

Having proved the validity of the data the scores were used to identify if the aspect was essential, desirable, or nice to have. For the next stage of the research only the essential aspects were examined. This was to keep the model manageable as a practical model.

#### 3.6.2 Patterns in the Data

Pearson's correlation was carried out on the data to examine if there were patterns in the data. Pearson's correlation is a measure of co-variation. If variation exists in the data it can be positive (as one value increases so does the other) or negative (as one value increases the other decreases). Both these patterns were identified in the data and are examined in Chapter Six. These patterns were examined to aid in completing the model. The essential aspects were also divided into 'hard' and 'soft'. 'Hard' and 'soft' aspects would need to be handled differently within the model.

Further statistical analysis was carried out with ANOVA tests to identify any statistical differences in the means. Differences in the means between different groups of Respondents would indicate that these groups interpret collaboration differently. Analysis examined corporate affinity, years' experience and role. This analysis identified if different groups of people have a different interpretation of collaboration.

### 3.6.3 Definitions

The essential aspects were examined according to corporate affinity, experience and role to produce definitions relevant to the particular group but also an overall definition for collaboration was produced using the essential aspects. This was because no contemporary relevant definitions was identified by the Author in the literature.

## 3.7 GENERATION OF A MODEL FOR COLLABORATION

Once the list of 18 essential aspects had been derived the focus of the research proceeded to order them into a usable model. In order to produce the model, the Author needed to identify 'elements' that make up each of the essential aspects, the 'elements' being the 'who', 'when' and 'how'. As shown below in Figure 14.

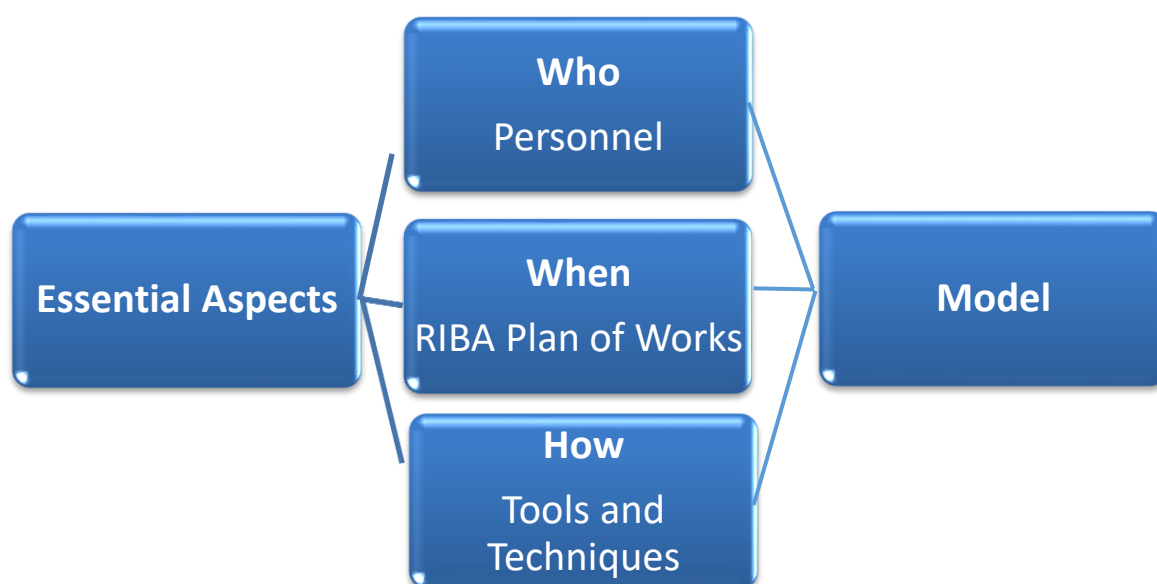


Figure 14. 'Elements' for model of collaboration

### **3.7.1 Writing the Model for Collaboration**

The generation of the model focussed on three elements:

- Time – When – At what point in the project should the ‘aspect’ or ‘element’ be considered.
- People – Who – should be involved or control the ‘aspect’ or ‘element’.
- Tools / Techniques – How – What tools and techniques should be utilised to achieve each ‘aspect’.

The Author felt that these three pieces of information were required for Personnel to fully understand what is required of them to improve collaboration.

#### **3.7.1.1 Timeframe**

The RIBA Plan of Work (*RIBA, 2013*) was used as the time framework for the model. Although it was considered more relevant to building projects than civil engineering projects the process is generally understood by everyone in the construction industry. When personnel/tools and techniques should be involved was not always very clear in the literature and so the Author had to interpret this at times.

#### **3.7.1.2 Personnel involvement**

Which personnel should be involved was not always very clear in the literature and so the Author had to interpret this at times. The interpretation was then tested during the validation of the Author’s initial draft model.

#### **3.7.1.3 Tools and techniques**

The tools and techniques identified from the literature should be able to promote, support, underpin and/or maintain the particular aspect of collaboration during the project process.

### **3.7.2 Identification of the ‘Elements’ for Incorporation in the ‘Model for Collaboration’**

The 18 essential aspects of collaboration were used to create the model.

The Author chose to use as much information published by the industry as possible. This would produce a model that the industry could identify with. Secondary sources were used to identify who should be involved with each aspect as well as the tools and techniques that may aid or improve each aspect of collaboration. The aspects were then related to the phase of the RIBA Plan of Work 2013 to provide the order of when they should be carried out. Each aspect was dealt with individually to ensure that data, if present in the literature, were incorporated into the model. Chapter Seven (section 7.3) shows the results of the information taken from the literature and used to inform the model.

#### ***3.7.2.1 Sources of data for literature and information searches***

Initially the Author went back to the journal papers and searched for research papers on the essential aspects. A web based literature search was carried out using the e-library databases. Databases like Emerald were searched using specific terms from the eighteen essential aspects. However, Emerald did not yield the required information from the construction and business journal papers. The strategy was therefore reviewed and instead the Construction Information Service used for government publications and similar documents specifically on the application of collaboration. These searches yielded more practical information relevant to producing the model.

#### ***3.7.2.2 The classification of information from the literature review***

The literature review described in Chapter Two reviews ‘what’ collaboration is and ‘why’ it is important. The data required from the literature for the model was the ‘who’, ‘when’ and ‘how’ for each of the 18 essential aspects. ‘Where’ is addressed through the type of project. These data could then be used to inform the model.

#### ***3.7.3 Filling in the Literature Gaps***

The literature did not contain all the information required to complete a model as described in Chapters Seven and Eight (sections 7.3 and 8.2.1). The initial interviews (phase one) had yielded a lot of information useful to the model. The transcripts were re-examined specifically for the time, personnel, and tools and techniques required for the model. This information, in conjunction with the literature, provided sufficient information to produce the model.

### **3.7.4 Assumptions Made Within the Model for Collaboration**

While defining the model certain assumptions had to be made. One assumption was the type of project that the model was written for. The model could not be designed to cover every situation and so the Author designed the model for large complex projects involving a large team with early involvement of Contractor, Subcontractors and Suppliers. This early involvement can potentially bring about savings by the Contractor as well as the main Subcontractors and Suppliers. In smaller less complex projects bringing the supply chain on board may not make enough savings to warrant the outlay and therefore should be dealt with later in the collaborative project. Once written the model was distributed for validation. The Author had recognised from an earlier stage the need for validation of the initial draft of the collaborative model by key industry stakeholders.

## **3.8 VALIDATING THE COLLABORATIVE MODEL**

With an initial model prepared it needed to be validated by suitably qualified people.

### **3.8.1 The Interviewee Sample Selection**

The model needed to be validated by people with sufficient knowledge of the subject to make informed judgements. The model was designed for larger more complex projects and so the Interviewees needed to have worked on these types of projects. The model was written to apply to both building and civil engineering projects and so Interviewees from both sectors were interviewed. Targeted sampling from larger projects therefore took place to get the experienced Respondents that were required. Again, Constructing Excellence Wales provided contacts that had broad experience on collaboration around the UK. These people were a different sample to the sample used to help inform the model. The projects they were involved with were also different projects to the sample. This increased the sample and gave Interviewees a chance to disagree. This design was chosen to improve the replicability or generalisability of the results. The Interviewees that inputted into the model agreed closely with the Interviewees that were judging the model. This indicated the reliability of the model produced.

It was initially decided to interview five personnel that had worked on large complex collaboration projects, two from civil engineering and two from building. The fifth

Interviewee was to be as neutral as possible in that they did not work for the Client or Contractor but in an advisory role. To get a broad spectrum of responses as well, of the two Civil Engineer Respondents' one represented the Client while the other represented the Contractor. This approach was the same for the building sector Interviewees. If the sort of comments these Interviewees made were similar then no further Interviewees would be sought. The experience of the Interviewees needed to be sufficient to make the required judgements and so Interviewees were sought via Constructing Excellence Wales from award winning demonstration collaboration projects.

### **3.8.2 Willingness and Availability to be Interviewed**

Due to the fact that the Interviewees were involved in the Constructing Excellence Wales demonstration projects they were approachable and willing to be interviewed.

The Interviewees were busy people but by the Author agreeing to interview them at their place of work at a time to suit them meant that it was possible to achieve the required interviews. It did however take a period of two months to complete the required interviews.

### **3.8.3 Interview Questions**

The interview structure was quite open. They were asked to focus however on the time, techniques and personnel within the model.

The Interviewees were asked about their experience to confirm their suitability. They were then asked general questions about the model with regards to the time frame, personnel and readability.

A few general open ended questions were used with the Interviewees. The questions were:-

- Do you feel the correct personnel are involved?
- Do you feel the correct tools are being used or can you suggest others?
- Is the timing of the personnel and tools correct?
- The Interviewees were asked, subject to the changes being made, if they felt that the model was of use to the industry.

### **3.8.4 Interview Structure**

The Interviewees were given the freedom to talk about the model as they wished to. They were prompted if they had not commented on the three main questions for each of the aspects. Otherwise they were allowed to guide the interview with prompting questions utilised if they strayed too far from the general topic. All the interviews were recorded and transcribed later.

### **3.8.5 Accessibility of the Model for Collaboration**

The model was initially scripted to be read aspect by aspect which was how it was viewed by the Interviewees for validation. After the Author's validation exercise the model was also presented from two other perspectives, first by the RIBA phases and second by role, for ease of use by people in the industry.

For ease of access the model was published on a website so that people could access the information they required in the format that suited them.

## **3.9 VALIDITY**

Validity for quantitative research is well established. The quantitative data collected for this research were analysed with Cronbach's Alpha. Cronbach's Alpha is the most widely used reliability coefficient (Knight and Ruddock 2008). The test examines how much people vary on individual items (Coolican, 2009).

Qualitative research validity is not established. Cohen *et al* (2011) describes the five kinds of qualitative validity:

- descriptive validity
- interpretive validity
- theoretical validity
- generalisability
- evaluative validity

Descriptive validity is the factual accuracy of the research (Cohen *et al*, 2011). The interview transcripts are provided as an audit trail in the Appendices (15 and 32) to support the descriptive validity.



Interpretive validity is catching the correct meanings (Cohen *et al*, 2011). The interviews were transcribed then checked for accuracy. The transcribed interviews were then coded. As part of the coding process previous codes were checked to ensure codes are not repeated. The coding was also checked at the end to make sure everything was coded correctly.

Theoretical validity is the theoretical constructions brought to the research by the Researcher (Cohen *et al*, 2011). The research was examined and then the data compared and contrasted to the theory. Having examined the theory first it forms a framework for the researcher's views.

Generalisability is a measure of how applicable the research is to similar situations (Cohen *et al*, 2011). Generalisability has been an important focus during the research and several strategies have been utilized to improve it. Constructing Excellence Wales was approached for selective sampling which reduces generalizability. However through snowball sampling generalisability was improved. Triangulation was utilised by testing the results from interviews about collaboration through the use of the questionnaire. Finally, through each phase of the research, different Interviewees/Respondents were used to increase input into the final model.

Evaluative validity is the taking of a judgmental stance towards research (Cohen *et al*, 2011). The process of writing the thesis has been important as it allows the Author to stand back and evaluate the research and the research methodology. The Author has also published two conference papers and one journal paper on this research which supports the external validity of the research.

### **3.10 CONTRIBUTION TO KNOWLEDGE**

The aim was to contribute to knowledge by producing a list of aspects that are perceived by the industry as important within current collaborative construction projects. By rank ordering these aspects it was possible to identify the essential aspects to collaboration. These essential aspects were used to define what collaboration is within the UK construction industry and also to produce a model to aid the process of collaboration. This model aims to be a practical model to improve the success of collaborative projects within the UK construction industry.

### 3.11 SUMMARY

This chapter has initially examined the theory of research methodology in order to set out alternative research approaches. Utilising this information the research design was chosen. The design utilised a mixed methods approach coming from a pragmatic ontology with a sequential mixed methods strategy of inquiry. The Author used open ended interviews and closed ended questions within the questionnaire as the research methods.

The chapter described how the research design allowed the aims and objectives to be achieved through primary research to gather qualitative data through the use of interviews. This allowed exploration of the meaning of the term 'collaboration'. The list of aspects produced could be rank ordered. A closed ended questionnaire asked personnel to rank order the aspects using a Likert Scale so that the aspects could be compared to each other.

The 'elements' of which personnel (who), what tools and techniques (what) and at what point in the project personnel should be involved (when) were identified for the 18 essential aspects. The literature was utilised to identify 'elements' that the industry are using to promote/control the 'essential' aspects. The essential aspects were then used to produce a model that could be used to achieve successful collaborative construction projects. The model was trialled with people from the industry to test its validity. Finally the model would be published on a website to improve usability through different search methods.

The chapter concludes by examining the contribution to knowledge which is discussed further in Chapter Ten, section 10.15. The next chapter sets out the primary data collected on the aspects to collaboration from a series of interviews. The results of the interviews are then compared to the literature. This identifies how the current interpretation of collaboration in the industry differs from the term "partnering" in the literature.

### **Summary of Chapter Three**

**1. Review of philosophical worldview and justification of choices taken.**

- The post-positivism, social-constructivism, advocacy and pragmatic research philosophies has been reviewed. A pragmatic approach has been adopted and the reasoning for this presented.

**2. Presentation of the research strategy followed in the study.**

- A mixed methods design has been presented and justified. The validity and generalisability techniques such as triangulation and statistical analysis has been explained and justified.

**3. Presentation and justification of the research methods utilised in the study.**

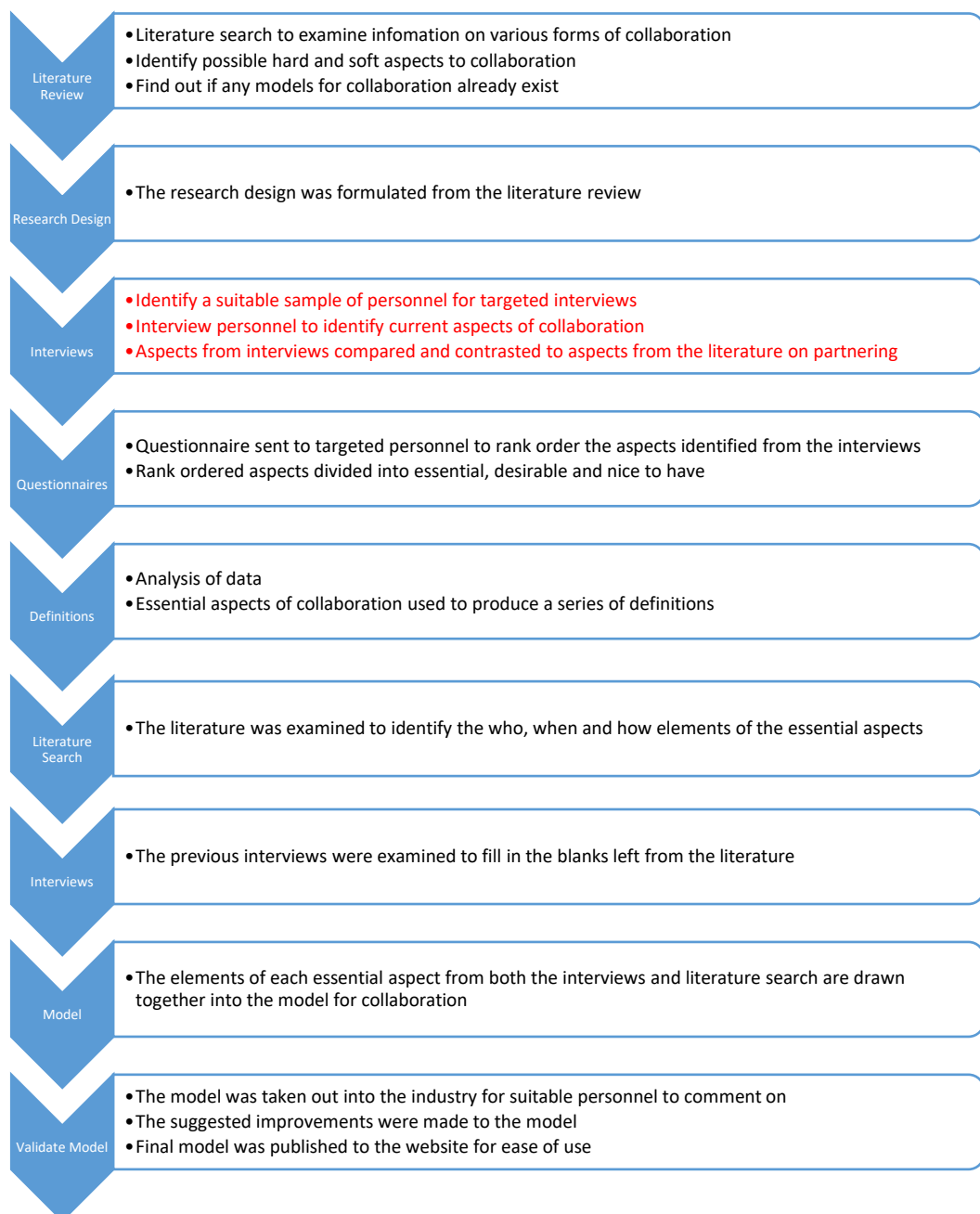
- Interviews and questionnaires have been discussed including strengths and weaknesses of these techniques. The reasoning behind the production of the model has been presented.

## *Chapter Four*

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# Results and Analysis of First Stage Interviews on Collaborative Aspects

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# Chapter Four

## Results and Analysis of First Stage Interviews on Collaborative Aspects

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### **Chapter Four Aims**

- 1. Formulation of interviews**
- 2. Aspects of collaboration identified by Interviewees**
- 3. Initial rank order**
- 4. Compare and contrast aspects from literature on partnering and 'collaboration' has evolved**

#### **4.1 INTRODUCTION**

Chapter Two summarised the aspects that are historically identified with partnering. This chapter sets out the formulation of the interviews and provides the results of the interviews to identify aspects of collaboration. The chapter then describes the analysis of these data to discover what collaboration currently means to personnel in the construction industry. Interviews were carried out to identify aspects that are involved in making collaboration successful. The Interviewees seemed to place varying importance on these aspects and so an initial rank order is produced. This established the current situation with collaboration. Finally, the chapter compares and contrasts the list from the literature review in Chapter Two with the current opinion on collaboration from the interviews. This chapter aims to examine the evolution of collaboration and how collaboration has evolved from 'partnering' described within the literature into 'collaboration' as it is within the industry currently.

#### **4.2 INTERVIEW DETAILS**

In order to get expert opinion to obtain a list of aspects to produce a definition of collaboration, targeted interviews were carried out.

#### 4.2.1 Number of Interviewees

Initially it was estimated that five to ten interviews would be required. Diminishing returns were used to identify when sufficient interviews had been carried out. It was decided that sufficient interviews had been carried out when each successive interview yielded fewer and fewer new aspects and then the final interview (seventh) did not yield any new aspects/data.

#### 4.2.2 Suitability of Interviewees

The research required the interviewing of people who are 'expert' in collaboration. Targeted selection was therefore made of Interviewees. Constructing Excellence Wales provided links to possible interviewees from companies with national experience. In order to assess the suitability of possible Interviewees a few questions were asked. These were asked via email prior to the interview but also reiterated at the beginning of the interviews to confirm. They were asked how many years' experience they had within collaborative projects. They were expected to have a minimum of ten years' experience within collaboration. So that a broad sample was interviewed, they were also asked whether they represented the Contractor or the Client and was their background within the building sector or civil engineering.

##### 4.2.2.1 Number of years' experience

All Interviewees were experienced in collaboration as shown in Table 3.

Interviewee	Role	Years' experience
2111	Neutral – Consultant	20 Years
2112	Contractor – Contracts Manager	16 Years
2113	Contractor – Project Manager	10 Years
2114	Sub-Contractor – Operational Manager	14 Years
2115	Client – Project Manager	15 Years
2116	Client - Advisor	15 Years
2117	Client	15 Years

Table 3. Interviewees' experience

As can be seen from the table all Interviewees had a minimum of ten years' experience, with 71% of the Interviewees having had 15 or more years' experience in collaboration.

#### 4.2.2.2 Range of experience and type

All Interviewees had a range of experience in collaboration as shown in Table 4.

Interviewee	Role	Type of Experience
2111	Neutral – Consultant	Building and Civils
2112	Contractor – Contracts Manager	Civils
2113	Contractor – Project Manager	Building
2114	Sub-Contractor – Operational Manager	Building
2115	Client – Project Manager	Civils and Building
2116	Client - Advisor	Civils
2117	Client	Building

Table 4. Interviewees' type of experience

Interviewees were selected so that they had experience between them from both civil engineering and the building sector. The table above shows that 57% of the Interviewees had experience in civil engineering and 71% of the Interviewees had experience in the building sector.

#### 4.2.2.3 Roles

Seven people were interviewed - three people that represented the Client, three that represented the Contractor and one neutral Interviewee. The reasoning behind this was to get a balanced opinion from the perspective of Client and the Contractor. One Sub-contractor agreed to be interviewed introducing another part of the supply chain into the research.

### 4.3 INTERVIEW QUESTIONS

The interviewees were asked the following questions:

- Why do you feel Clients enter into collaborative projects?
- Why do you feel Contractors enter into collaborative projects?
- Partnering has become unpopular since the credit crunch. How would you distinguish between the terms partnering and collaboration?
- What do you perceive as the benefits of collaborative working?
- What do you perceive as the disadvantages of collaborative working?



At the end of the interview they were asked if they could email any further ideas that they had about collaboration to the Author. These five questions were chosen for the pilot run interviews as very open questions to just get the Interviewees to discuss collaboration. The Author at the 1<sup>st</sup> stage of the research wanted to get a picture of collaboration within the industry. These questions elicited such an extensive and useful set of responses however that the questions were not altered in the further interviews to more direct questions.

#### **4.4 INTERVIEW TRANSCRIPTS**

The interviews were transcribed. The interview transcripts are provided in Appendix 15. The questions, as described in Chapter Three, are provided in Appendix 12.

##### **4.4.1 Some Key Aspects Derived from Interviews**

Some of the comments are provided below from the Interviewees to give a flavour of their opinions on collaboration.

###### Interviewee 2111 - Independent

*“Being part of a team is a better way of working for some people.”*

*“I think a collaborative process is better than a partnered process.”*

*“If it’s open book approach then you have also got the opportunity to monitor costs all that way through the project.”*

*“There is an opportunity to share in any gain; it is of course pain gain.”*

*“Risks being allocated properly, sometimes Contractors are expected to carry a risk that they have no control over, it should be a Client risk.”*

*“There needs to be some equality in the relationship.”*

###### Interviewee 2112 - Contractor

*“When we enter into collaborative projects, because you tend to have early Contractor involvement you can sit with the designer and try to give your solutions to his design problems.”*

*"That is again surety of ongoing works, income and building a relationship with Clients."*

Interviewee 2113 - Contractor

*"I think it is good in terms of funding, in terms of securing bids."*

*"I think likewise with Contractors, for us to enter into a collaborative project and have historical data that is very good for repeat business."*

*"Everything is rather open book."*

*"We are using the NEC 3 contract here; it is quite bureaucratic in terms of how it is managed, but it definitely forces the issue of collaboration because you have to have risk review meetings."*

*"They could say 'you are the builder, we are the school, can you knock the door and tell us you are finished and we will come and move in' but it was not like that because they gelled in and came into the team."*

Interviewee 2114 - Contractor

*"Well there are quite a few reasons for collaboration, really. I suppose in terms of sharing of information to find solutions to needs that are probably the most cost effective routes."*

*"I think probably partnering went out of fashion because it sounded too cosy and there was some criticism of these long term relationships that they were not being challenged. Whereas collaborative working implies separate entities coming together for a specific purpose."*

*"Unless you are involved in a true collaborative team environment, where the relationships get you into the job early, even at the cost planning stage and reengineering the cost base, the solutions we can offer are sometimes dictated by what has gone before."*

*"The biggest factor is the feeling of trust between the parties, I think, and knowing that you are not getting ripped off."*

*"I think that as a partnered and collaborative process some administration could be eliminated and probably it would save an enormous amount of man hours."*

Interviewee 2115 - Client

*"It has got to be led by the Client."*

*"Collaboration is more, you know, a state of mind."*

*"You have got to trust the people you are working with and that comes from being open, honest and transparent and that doesn't come from a term in a contract, it comes back to the relationship."*

Interviewee 2116 - Client

*"Better value in terms of the hard things, better value for the Client and potentially more profit for the Contractor."*

*"Before the credit crunch I have always been one of these people who has loathed the word partnering. I think it is harder to abuse the word collaboration. I mean most people understand what the word collaborating means."*

*"I think also if you, get into a truly collaborative arrangement it creates opportunities for people to look at different career paths or to go onto secondment."*

*"You don't have to use the NEC contract for collaborative work but it is a good enabler."*

*"Okay, the workshops are going to cost a few thousand every time you do one, but actually payback is many, many times more."*

Interviewee 2117 - Client

*"My view always was there are not winners and losers in the contracts there is either two winners or two losers and I embraced that."*

*"You have got to work as a team."*

*"We found that on projects where the principal Subcontractors were involved right at the outset we were able to develop the design that a) got rid of the snags, the problems but also made the thing more deliverable and more cost effective to deliver."*

*"You need some strong leadership and you need to set that right tone at the very outset as part of the tender interview."*

The above comments give an indication of the aspects found within collaboration.

#### 4.4.2 Analysis of the Interview Transcripts

The interviews were transcribed and typed up. In typing the interviews some corrections were made to the transcripts to make them more readable. The transcripts were then read to allow the Author to get a picture of the Interviewees' opinions. The comments were coded by hand and arranged as 'hard' or 'soft' aspects and also tender/contract, procedures/management or outcomes (see Chapter Three, section 3.4.5 for details of coding). As described in Chapter Two (section 2.8) 'hard' aspects are objective while 'soft' aspects are subjective in nature and therefore will require different handling within the model.

With each new interview the statements were examined. Any statements that meant the same thing were recoded. The interviews continued until no new statements were obtained from the final interview. The coding was given one final check before the research proceeded to the next stage.

#### 4.4.3 Aspects of Collaboration

The coded list consisted of a mixture of inputs, outputs and tenses and was difficult to read. Therefore the list of aspects were rewritten. This list rationalised the wording to try to make the aspects more of a neutral statement. The interviews once analysed in this way produced a total of 48 aspects, described by some or all of the Interviewees.

List of Aspects produced from interviews:-

- **A common aim for all contributors**
- **Aim for a win / win outcome**
- **All team members contribute**
- **A problem solving environment**
- **Client leads project**
- **Close supervision of Contractor and Subcontractor**
- **Continuity of work for the supply chain**
- **Contract supporting collaboration**
- **Early involvement of key members of the supply chain**
- **Early warning systems to identify any problems**

- **Effective information sharing**
- **Efficiency in design produced**
- **Environment of mutual trust**
- **Everyone achieves a reasonable profit margin**
- **Few to zero claims**
- **Formal quality control assurance mechanism utilised**
- **Health and safety improved from benchmark**
- **Holistic view of parties' positions**
- **Innovation encouraged**
- **Low turnover of personnel**
- **Long term relationships develop**
- **Non - adversarial environment**
- **Open book environment**
- **Open dialogue environment**
- **Opportunities for further funding**
- **Pain share gain share mechanism fair to both the Client and the Contractor**
- **Performance is measured using KPI's**
- **Projects are brought in on time**
- **Projects brought in on initial budget**
- **Projects delivered in less time than a traditional procurement approach**
- **Projects similar in nature**
- **Rates renegotiable over time**
- **Regular meetings between the parties (Client and Supply chain)**
- **Regular workshops held**
- **Relationships between the parties are managed**
- **Repeat business encouraged**
- **Respect for input of the other team members**
- **Risks allocated fairly**
- **Streamlining of common administrative processes**
- **Subcontractor involved in core team**
- **Supply chain involved**
- **Sustainability improved from benchmark**
- **Team members allowed to develop skills and extend traditional role input**

- **Team members have a record in collaboration**
- **Team spirit between all personnel**
- **Understanding the other team members' roles and responsibilities**
- **Value engineering utilised**
- **Waste reduced**

This list represents the 48 aspects taken from the interviews. These aspects were the aspects used for the next phase of the research. This list represents the aspects currently seen as relevant to collaboration by the Interviewees.

#### **4.5 ROUGH RANK ORDER OF COLLABORATIVE ASPECTS**

This list has been put in alphabetical order for convenience but the Interviewees seemed to place more importance on some of them during the interviews. Team spirit and the ethos seemed to be very important to the Interviewees. Some initial analysis of the data was carried out on ordering, including rank ordering, for the model.

Some aspects were mentioned by more than one Interviewee and so a tally was kept of the Interviewees that mentioned the same aspect to provide an initial indication of which aspects are the most important to collaboration. The aspects could also be subdivided according to the nature of them as discussed in 4.5.2.

The tally chart showing the number of times the aspect was mentioned by different Interviewees is provided in Appendix 16.

##### **4.5.1 Initial Rank Order of Collaborative Aspects**

The results divided by the number of Interviewees that mentioned that aspect are shown below:-

<b>All Seven Interviewees mentioned</b>
Non – adversarial environment
Team spirit between all personnel
<b>Five Interviewees mentioned</b>
Aim for a win / win outcome
Risks allocated fairly
A problem-solving environment
Open book environment
<b>Four Interviewees mentioned</b>

Long term relationships develop
Repeat business encouraged
Value engineering utilised
Innovation encouraged
<b>Three Interviewees mentioned</b>
A common aim for all contributors
Understanding the other team members' roles and responsibilities
Early involvement of key members of the supply chain
Pain share gain share mechanism fair to both the Client and the Contractor
Environment of mutual trust
Streamlining of common administrative processes
Client leads project
Early warning systems to identify any problems
<b>Two Interviewees mentioned</b>
Open dialogue environment
Projects are brought in on time
Few to zero claims
Contract supporting collaboration
Projects brought in on initial budget
Performance is measured using KPI's
Subcontractor involved in core team
<b>One Interviewee mentioned</b>
Low turnover of personnel
Projects similar in nature
Everyone achieves a reasonable profit margin
Respect for input of the other team members
Team members have a record in collaboration
Opportunities for further funding
Team members allowed to develop skills and extend traditional role input
Supply chain involved
Regular workshops held
Close supervision of Contractor and Subcontractor
Rates renegotiable over time
Holistic view of parties' positions
Regular meetings between the parties (Client and supply chain)
All team members contribute
Relationships between the parties are managed
Formal quality control assurance mechanism utilised
Effective information sharing
Continuity of work for the supply chain
Projects delivered in less time than a traditional procurement approach
Waste reduced

Efficiency in design produced
Health and safety improved from benchmark
Sustainability improved from benchmark

Table 5. Number of Interviewees mentioning specific aspects

From these initial data, it would appear that team spirit and a non-adversarial environment are very important in collaboration. Also it would appear that everybody benefiting, risk being fairly allocated, solving problems together and open book accounting are important within collaboration. These results provided an initial indication of which aspects were important in collaboration but to start to form a definition, quantitative data from the subsequent questionnaires was necessary. The questionnaires were necessary to rank order the aspects.

#### 4.5.2 Subdivision of Collaborative Aspects According to their Nature

The aspects could be subdivided according to the nature of the aspect. Some of the aspects can be put into the tender document or contract. Some of the other aspects are more to do with the procedures and management of the project. The final sub division are soft aspects and are more about outcomes. The table below shows the aspects divided in this way:-

<b><u>Tender / Contract</u></b>
Client leads project
Close supervision of Contractor and Subcontractor
Contract supporting collaboration
Early involvement of key members of the supply chain
Early warning systems to identify any problems
Effective information sharing
Formal quality control assurance mechanism utilised
Non – adversarial environment
Open book environment
Pain share gain share mechanism fair to both the Client and the Contractor
Everyone achieves a reasonable profit margin
Performance is measured using KPI's
Projects are brought in on time
Projects similar in nature
Rates renegotiable over time



Regular meetings between the parties (Client and Supply chain)
Relationships between the parties are managed
Risks allocated fairly
Subcontractor involved in core team
Supply chain involved
Value engineering utilised
<b><u>Procedures / Management</u></b>
A common aim for all contributors
All team members contribute
A problem-solving environment
Environment of mutual trust
Open dialogue environment
Projects brought in on initial budget
Regular workshops held
Respect for input of the other team members
Understanding the other team members' roles and responsibilities
<b><u>Outcomes</u></b>
Aim for a win / win outcome
Continuity of work for the supply chain
Efficiency in design produced
Few to zero claims
Health and safety improved from benchmark
Holistic view of parties' positions
Innovation encouraged
Low turnover of personnel
Long term relationships develop
Opportunities for further funding
Projects delivered in less time than a traditional procurement approach
Repeat business encouraged
Streamlining of common administrative processes
Sustainability improved from benchmark
Team members allowed to develop skills and extend traditional role input
Team members have a record in collaboration
Team spirit between all personnel
Waste reduced

Table 6. Aspects to collaboration ordered by their nature

These different sorts of categories of aspects would have to be handled differently in the final model.

#### 4.6 COMPARISON OF ASPECTS TO LITERATURE REVIEW

As described in Chapter Two (section 2.8) the examination of the literature elicited 71 aspects to partnering/collaboration. The interviews have identified 48 aspects to collaboration currently within the industry. The aspects identified from the literature can be 20 plus years old and so the current aspects from the interviews were then compared to the list of aspects identified from the literature to identify how the industry has adapted the historic concept of partnering into what the industry is currently calling collaboration. Some of the terminology was different but on analysis there were 31 aspects common to both the literature and the interviews. This leaves 40 aspects unique to the literature and 17 aspects unique to the interviews. This can be visualised in a Venn diagram as shown in Figure 15.

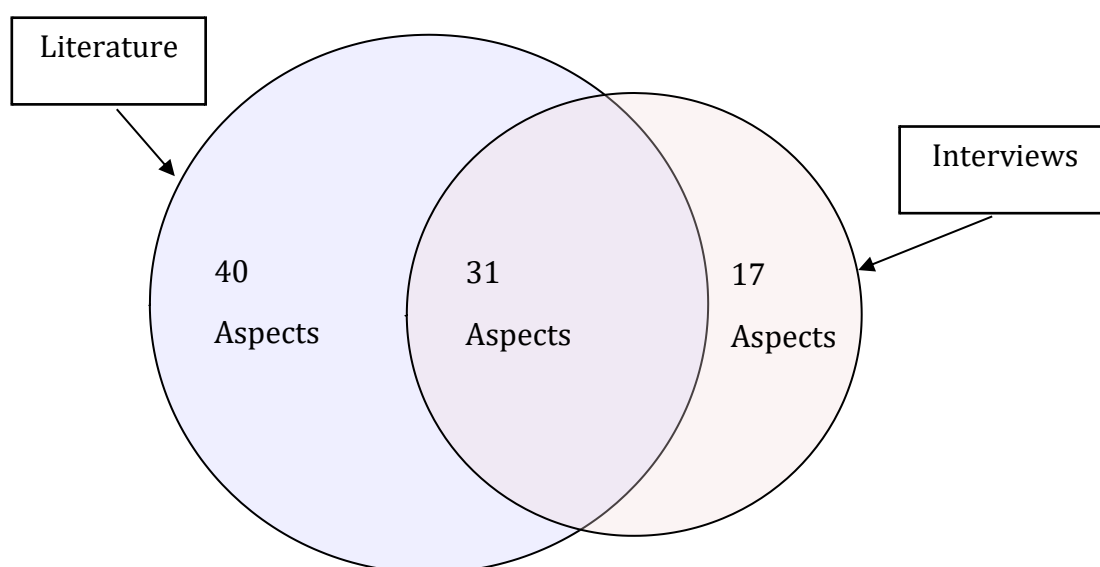


Figure 15. Venn diagram representing the aspects from the literature and interviews

Table 7 below shows the 71 aspects identified from the literature. The cells highlighted in blue are the 40 aspects that were elicited from the literature but did not appear in the interviews.

Competitive advantage by the pooling together of resources	Torn loyalties to the organisation and to the partnership
Adequate resources required	Partnering Charter
Continuous joint evaluation	Willingness to accept mistakes
Social events	Newsletters

Understanding of other people's culture	Motivation
Make promises only on what can be delivered	Sub-supplier involvement in specification
Alternative Dispute resolution process	Focus on projects instead of processes
Keep costs low / financial savings	Labour unions
Cooperation from management down	Procurement procedures
Empowerment of stakeholders	Laws and regulations
Effective coordination	A way to avoid litigation
Use of project partnering tools and procedures	Personal differences need to be put to one side
Increased Client base/ market share	A feeling of membership
Champions of the partnership	Commitment from everyone
Higher productivity	Equity
Chance for exploitation	Timely responsiveness
Make sure decisions are made as a group	New competences are required/ training
Top management support	Group working
Implementation	Produce a better working environment
Sharing of efficiency gains	Clear design quality targets set
Mutual goals and objectives	Performance measurement and benchmarks
Win-win philosophy	Monthly review meetings
Problem solving	Workshops
Leadership	Relationship management
Effect on contract elements	Everyone should be treated with respect
Inclusion of appropriate parties	Reduction in risk and a shared risk register
Effective open communication	Alignment of common operations and activities
Mutual trust	Supply chain involvement
Increased profits	A learning culture
Targets set for health and safety	Team spirit
Opportunity for innovation	Clearly defined roles
Maintain the continuity of the relationship	Partnering experience
Non-adversarial attitudes	Complete the project within time
Target cost set and open book accounting	Understanding of partner's needs
Improvement of communication	The creation of value and mutual benefits
Incentivisation	

Table 7. Seventy one aspects identified from the literature

There are therefore 31 aspects which are not highlighted which were identified within the literature and the interviews. The 48 aspects identified from the interviews are shown below:-

- A common aim for all contributors
- Aim for a win / win outcome
- A problem solving environment
- Client leads project
- Contract supporting collaboration
- Early involvement of key members of the supply chain
- Effective information sharing
- Environment of mutual trust
- Everyone achieves a reasonable profit margin
- Health and safety improved from benchmark
- Holistic view of parties' positions
- Innovation encouraged
- Long term relationships develop
- Non – adversarial environment
- Open book environment
- Open dialogue environment
- Pain share gain share mechanism fair to both the Client and the Contractor
- Performance is measured using KPI's
- Projects are brought in on time
- Regular meetings between the parties (Client and Supply chain)
- Regular workshops held
- Relationships between the parties are managed
- Respect for input of the other team members
- Risks allocated fairly
- Streamlining of common administrative processes
- Supply chain involved
- Team members allowed to develop skills and extend traditional role input
- Team members have a record in collaboration
- Team spirit between all personnel
- Understanding the other team members' roles and responsibilities
- Value engineering utilised
- All team members contribute
- Close supervision of Contractor and Subcontractor

- Continuity of work for the supply chain
- Early warning systems to identify any problems
- Efficiency in design produced
- Few to zero claims
- Formal quality control assurance mechanism utilised
- Low turnover of personnel
- Opportunities for further funding
- Projects brought in on initial budget
- Projects delivered in less time than a traditional procurement approach
- Projects similar in nature
- Rates renegotiable over time
- Repeat business encouraged
- Subcontractor involved in core team
- Sustainability improved from benchmark
- Waste reduced

Given that there were 31 aspects common to both the literature and the interviews there were 17 aspects which came out of the interviews which had not been identified in the literature review. These are highlighted in grey.

Table 8 shows the 31 aspects taken from the literature alongside the 31 aspects from the interviews.

<b>Literature</b>	<b>Interviews</b>
Mutual goals and objectives	A common aim for all contributors
Win-win philosophy	Aim of a win/win outcome
Problem solving	A problem-solving environment
Leadership	Client leads project
Effect on contract elements	Contract supporting collaboration
Inclusion of appropriate parties	Early involvement of key members of the supply chain
Effective open communication	Effective information sharing
Mutual trust	Environment of mutual trust
Increased profits	Everyone achieves a reasonable profit margin
Targets set for health and safety	Health and safety improved from benchmark
Understanding of partner's needs	Holistic view of parties' positions
Opportunity for innovation	Innovation encouraged

Maintain the continuity of the relationship	Long term relationships develop
Non-adversarial attitudes	Non-adversarial environment
Target cost set and open book accounting	Open book environment
Improvement of communication	Open dialogue environment
Incentivisation	Pain share gain share mechanism fair to both the Client and the Contractor
Performance measurement and benchmarks	Performance is measured using KPI's
Complete the project within time	Projects are brought in on time
Monthly review meetings	Regular meetings between the parties (Client and Supply chain)
Workshops	Regular workshops held
Relationship management	Relationships between the parties are managed
Everyone should be treated with respect	Respect for the input of the other team members
Reduction in risk and a shared risk register	Risks allocated fairly
Alignment of common operations and activities	Streamlining of common administrative processes
Supply chain involvement	Supply chain involved
A learning culture	Team members allowed to develop skills and extend traditional role input
Partnering experience	Team members have a record in collaboration
Team spirit	Team spirit between all personnel
Clearly defined roles	Understanding the other team members' roles and responsibilities
The creation of value and mutual benefits	Value engineering utilised

Table 8. Thirty one aspects identified in literature and in interviews

Some terms may be on both lists but are expressed in different ways. However there were noticeable differences. The Author had some evidence from her MSc that some tools and techniques had been rejected by the industry as window dressing and not useful to the collaborative process. This was substantiated in the interview results as neither newsletters nor partnering charters made the list. The aspects seem less idealistic and more down to earth. There has been some rationalisation of aspects within the industry with regards to procurement and contracts. The focus now appears to be on the correct contract and not on the correct procurement route and laws and regulations. Now there seems to be more importance placed on work / job security with low turnover of personnel and continuity of work.

A lot of the aspects are similar but seem to show a slight shift in foci. The foci of collaboration would seem to be on the iron triangle of time, cost and quality, which is similar to the literature but the focus is more on measurement with quality assurance and initial budgets. There appears to be a more commercial emphasis with aspects such as repeat business, zero claims, projects brought in on initial budget, funding, rates renegotiable, continuity of work for supply chain and waste reduced. Another focus seems to be on efficiency through early warning, reducing project time and building in efficient design.

The industry realises the importance of the Subcontractor involvement, but is struggling to make this work as described by Dainty *et al* (2001). The Interviewees therefore did not mention looking further down the supply chain.

There seems to be a more positive outlook as alternative dispute resolution, labour unions and a way to avoid litigation were not mentioned but early warnings and zero claims were discussed instead.

A negative mentioned in the literature by Cheung *et al* (2003) is that partnering is a chance for exploitation. The Author had some evidence from her MSc research that this was a problem. The industry's answer appears to be to increase the amount of supervision of the Contractor and Sub-contractor. The literature also discusses torn loyalties but the industry does not seem to have a problem with this, but encourages people from different organisations to work in the same office.

The Author did not get the impression that mistakes would be tolerated as suggested in the literature by Ng *et al* (2002). However, the industry seems to understand the importance of early warnings to reduce the effects of mistakes.

This indicates an evolution of the collaborative process where emphasis is placed on different aspects with a more commercial and efficient focus from all sides. This could be due to Green's (1998) idea that partnering was imposed on the industry and so the industry is adapting it to suits its needs. It suggests that the industry has identified aspects that are important and are concentrating on them. The literature list however contains some techniques such as social events which could be useful to achieving other aspects within the model. As described previously the focus of the research will be to maintain the integrity of the data and utilise the 48 aspects for the next stage of the research.

## 4.7 SUMMARY

From this initial research the frequency of reference to specific aspects (see Table 4, section 4.5.1) indicates that some aspects are considered more important than others. From the answers received people in the industry seem to favour the collaborating concept over that of partnering. There would appear to be differences between the old 'partnering' and the new 'collaboration'. Collaboration would appear to be less formal than partnering and be more of an attitude of mind. No Respondent mentioned the need for a partnering agreement during the interviews, just a supportive contract. The overall impression is that the industry is now more focused on commercialism and efficiency within collaboration. The list of aspects identified through the interviews represents those currently seen as relevant to personnel working in the industry. This initial list of 48 aspects was used to inform the next stage of the research (shown in section 4.4.3). Specifically the total list of essential aspects were used to inform the model of collaboration which is discussed further in Chapter Seven, Eight and Nine. The aim of this research is to 'produce a model which guides the practitioner in improving collaboration'. Therefore, only the 48 aspects, from the interviews, which are currently identified by the industry will be utilised in the research. The next chapter establishes the rank order of the 48 aspects using questionnaires. These were then used to produce a definition for collaboration and to identify aspects important in formulating the model.



### **Summary of Chapter Four**

**1. Formulation of interviews**

**Open ended questions, interviews carried out until no new aspects emerged**

**2. Aspects of collaboration identified**

**Interviews transcribed and hand coded to produce list of aspects**

**3. Initial rank order**

**Initial rank order produced that indicates a hierarchical structure to the aspects**

**4. Compare and contrast aspects from literature on partnering and how industry sees 'collaboration'**

**40 aspects in the literature were not mentioned by interviewees and 17 mentioned by interviewees not found in literature**

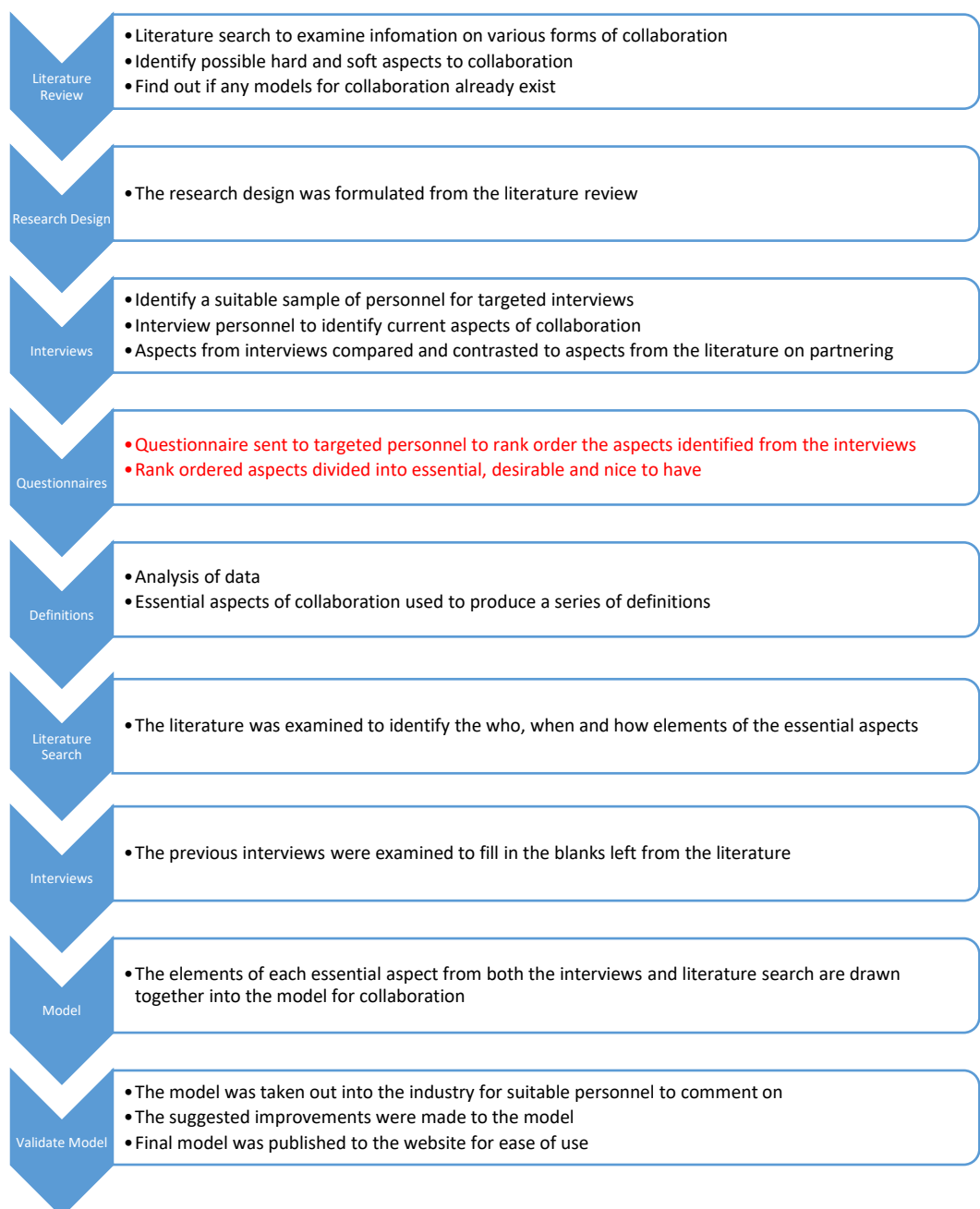
**A more commercial and efficiency focussed set of 48 aspects arose from the interviews. Upon which the next stage of the research is based.**

## *Chapter Five*

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# Results and Initial Analysis of Rank Order Questionnaires

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# Chapter Five

## Results and Initial Analysis of Rank Order Questionnaires

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### Chapter Five Aims

1. Rank order aspects
2. Confirm 'essential', 'desirable' and 'nice to have' aspects
3. Develop definition of collaboration
4. Correlation analysis to examine relationships between the 48 aspects
5. Aspects categorised as hard or soft

### 5.1 INTRODUCTION

The previous chapter set out the 48 aspects that currently make up collaboration. This chapter sets out the results of the rank order questionnaires analysing the data (48 aspects) into 'essential', 'desirable' and 'nice to have' aspects (aspects described as present in an ideal situation). The rank order of aspects is then compared using statistical tools to establish how these data feeds into the next stage of the research to produce the model. The data identifying the relative importance of each aspect were used to produce a definition of collaboration. Finally the 'essential' aspects are categorised into hard and soft to better establish the tools and techniques to incorporate them into the model.

### 5.2 ASPECTS QUESTIONNAIRE

The list of aspects from Chapter Four (section 4.4.3) were put into a questionnaire to rank order the aspects. A simple Likert scale was used with the Respondents able to choose from 'essential', 'desirable' or 'nice to have'. A small pilot study was carried out by producing the questionnaire in Excel. This was distributed to six people to check for clarity and usability. The pilot questionnaire is provided in Appendix 13. A few changes were made to make the statements clearer following this process and the questionnaire placed on line. Constructing Excellence Wales provided the initial

contact with suitable Respondents. These Respondents were emailed a link to an internet based electronic survey service which they forwarded to suitable acquaintances who were further asked to pass it on. This snowball sampling decreased selection to improve validity but meant that the response rate is unknown. The Author kept the survey open until no new results had been obtained for over two weeks. The total number of questionnaires was 52. The questionnaire is provided in Appendix 14.

### **5.3 RESPONDENTS' DETAILS**

As described in Chapter Three (section 3.5.1) Constructing Excellence Wales was approached to identify suitable Respondents. These were required to have sufficient knowledge of collaboration within the UK construction industry to give informed answers to the questionnaire. As part of the questionnaire the Respondents were asked where they mostly worked. All Respondents answered "Britain" and so the results have to be restricted to the UK construction industry.

The Respondents were not only asked how long they had been involved in collaboration but also other questions which may affect their opinions eg "do you work for Contractor, Client or Independent" and also "what is your role" eg Quantity Surveyor, Project Manager? These answers were collected to help analyse the data and distinguish any variations between employers and role. These will be discussed further in Chapter Six.

### **5.4 ASPECT QUESTIONNAIRE**

Once the data were collected the 52 questionnaires were analysed and the results of the questionnaires were scored as three for 'essential' (E), two for 'desirable' (D), one for 'nice to have' (N). The full results are shown in Appendix 17.

#### **5.4.1 Rank Ordered List of Aspects**

As described in Chapter Three (section 3.5.7) the questionnaire listed the 48 aspects with a simple Likert scale. The Respondents were asked to select 'essential', 'desirable' or 'nice to have'. They were also asked open questions at the end as to whether they would add any other aspects to the list or have any other comments. The total scores were then used to provide an overall rank order for the aspects. The higher the score the more important the aspect is to collaboration. The list then needed to be divided into the three categories.

## 5.4.2 Subdivision of Aspects

The total scores provide a quick method of identifying the approximate boundary between 'essential' and 'desirable' and also 'desirable' and 'nice to have'. This method reduced the workload as only the boundaries needed to be checked. The full list showing the total scores are in Appendix 17.

To identify if it was possible to use the total scores to rank order the aspects the results were checked statistically. To check the validity of the results Spearman's Rho analysis was carried out on the numbers of Es (essential) obtained with regards to the total score (see Chapter Three, section 3.6 for details). Spearman's Correlation assesses the monotonic relationship between the rank values of two variables (the total score and the number of 3s). Spearman's Correlation assesses if as one value increases so does the other or if as one increases the other decreases. Spearman's Correlation was used as it does not rely on a linear relationship (Coolican, 2009). The null hypothesis is that there is no correlation between the score and the number of Es. The  $p$ -value obtained was 0.978968 while the critical value was 0.366. Therefore, as the  $p$ -value is significantly greater than the critical value the null hypothesis can be rejected and therefore there is a strong positive correlation between the number of Es and the total score. Given this positive result the total score can be used to judge the number of 3s. This allowed the total scores to be used to rank order the aspects.

The ranges allocated were:-

- 'essential' 130-156
- 'desirable' 78-129
- 'nice to have' 52-77

From the total scores alone it was difficult to know where to place the boundary lines for which aspects were 'essential', 'desirable' or 'nice to have'. The individual scores as well as the total score were used as a guide, to inform the ranges for 'essential', 'desirable' and 'nice to have'. The ranges were based on a minimum of 50% of the Respondents having believed the aspect fitted in that category. This would indicate that the majority believed that it fitted into this range. These ranges were then tested statistically. Cronbach's Alpha Test provides a measure of the internal consistency of a test and therefore validity and reliability. The value is measured between zero and

one. A value of zero indicates no internal consistency while one indicates total internal consistency (Tavakol and Dennick, 2011). Cronbach's Alpha Test was carried out to check the internal reliability and the results were a mean of 105.226415 with a standard deviation of 18.798476, so equalled 0.96482217 which is an excellent result. This result indicates very good internal consistency and therefore reliability. Using the 50% rule with the total score it was possible to categorise the aspects.

#### 5.4.2.1 'Essential' aspects

The survey therefore identified the 16 'essential' aspects to collaboration from the score with a further two being included as they had over 50 percent of the personnel choosing 'essential' for the aspect (Table 9).

Aspect	Total Score	'Essential' Percentage	'Desirable' Percentage	'Nice to have' Percentage
Open dialogue environment	149	88.46%	9.62%	1.92%
A common aim for all contributors	144	80.77%	15.38%	3.85%
Early warning systems to identify any problems	143	76.92%	21.15%	1.92%
A problem-solving environment	142	76.92%	19.23%	3.85%
Environment of mutual trust	142	75.00%	23.08%	1.92%
All team members contribute	141	73.08%	25.00%	1.92%
Team spirit between all personnel	140	73.08%	23.08%	3.85%
Understanding the other team member's roles and responsibilities	139	69.23%	28.85%	1.92%
Contract supporting collaboration	138	71.15%	23.08%	5.77%
Non-adversarial environment	137	69.23%	25.00%	5.77%
Regular meetings between the parties (Client and Supply chain)	137	71.15%	21.15%	7.69%
Effective information sharing	136	63.46%	34.62%	1.92%
Risks allocated fairly	136	63.46%	34.62%	1.92%
Pain share gain share mechanism fair to both the Client and the Contractor	134	65.38%	26.92%	7.69%
Relationships between the parties are managed	134	63.46%	30.77%	5.77%
Respect for the input of the other team members	131	59.62%	32.69%	7.69%

Early involvement of key members of the Supply chain	129	53.85%	40.38%	5.77%
Aim for a win/win outcome	126	50.00%	42.31%	7.69%

Table 9. Eighteen ‘essential’ aspects of collaboration

Out of the 18 ‘essential’ aspects open dialogue would appear to be the most important; 16 of the 18 aspects scored above 130 and the score was made up of over 50% Es. ‘Early involvement of key members of the supply chain’ and ‘win/win outcome’ scored below 130 but were made up of at least 50% Es and therefore included in the ‘essential’ category. Most of these aspects have been linked in the literature to forms of collaborative working. Two aspects ‘all team members contribute’ and ‘early warning systems to identify problems’ were not found in the literature review which the Respondents had identified as ‘essential’ to collaboration. All the ‘essential’ aspects would have to be present within a project for the project to be ‘collaborative’. These rank ordered ‘essential’ aspects were then used to produce the definition described later in this chapter (section 5.6.1).

#### 5.4.2.2 ‘Desirable’ aspects

There are then 27 ‘desirable’ aspects to collaboration (Table 10).

Aspects	Total Score	‘Essential’ Percentage	‘Desirable’ Percentage	‘Nice to have’ Percentage
Long term relationships develop	123	44.23%	48.08%	7.69%
Participants achieve a reasonable profit margin	122	46.15%	42.31%	11.54%
Regular workshops held	118	44.23%	38.46%	17.31%
Open book environment	117	48.08%	28.85%	23.08%
Subcontractors involved in core team	117	36.54%	51.92%	11.54%
Few to zero claims	116	34.62%	53.85%	11.54%
Client leads project	114	38.46%	42.31%	19.23%
Value engineering utilised	114	36.54%	46.15%	17.31%
Team members are allowed to develop skills and extend traditional role input	112	28.85%	57.69%	13.46%
Performance is measured using KPI's	111	30.77%	51.92%	17.31%
Projects are brought in on time	111	32.69%	48.08%	19.23%



Formal quality control assurance mechanism utilised	109	25.00%	59.62%	15.38%
Repeat business encouraged	109	30.77%	48.08%	21.15%
Supply chain more closely involved	108	25.00%	57.69%	17.31%
Holistic view of party's positions	107	26.92%	51.92%	21.15%
Innovation encouraged	107	23.08%	59.62%	17.31%
Efficiency in design produced	104	21.15%	57.69%	21.15%
Continuity of work for the supply chain	103	23.08%	51.92%	25.00%
Projects brought in on initial budget	103	23.08%	51.92%	25.00%
Close supervision of the Contractor and Subcontractor	100	26.92%	38.46%	34.62%
Streamlining of common administrative processes	97	13.46%	59.62%	26.92%
The projects delivered in less time than a traditional procurement approach	96	17.31%	50.00%	32.69%
Health and safety improved from benchmark	93	23.08%	32.69%	44.23%
Low turnover of personnel	91	19.23%	36.54%	44.23%
Waste reduced	90	11.54%	50.00%	38.46%
Sustainability improved from benchmark	88	9.62%	50.00%	40.38%
Team members have a record in collaboration	88	7.69%	53.85%	38.46%

Table 10. Twenty seven 'desirable' aspects of collaboration

The most important of the 'desirable' aspects would seem to be that collaboration encourages long-term relationships, with the least important being team members demonstrating a record of working on collaborative projects. There are 27 'desirable' aspects which represents 56% out of the 48 aspects considered.

#### 5.4.2.3 'Nice to have' aspects

There are then three aspects which would be 'nice to have' in a collaborative project, based on the percentage of personnel choosing 'nice to have' as well as the overall score. These aspects can be seen in Table 11.

Aspects	Total Score	'Essential' Percentage	'Desirable' Percentage	'Nice to have' Percentage
---------	-------------	------------------------	------------------------	---------------------------

Opportunities for further funding	84	11.54%	38.46%	50.00%
The rates renegotiable over time	84	9.62%	42.31%	48.08%
Projects similar in nature	63	0.00%	21.15%	78.85%

Table 11. Three aspects that would be ‘nice to have’ in collaboration

Based on the score only ‘projects similar in nature’ should be ‘nice to have’. Although a score of 84 indicates ‘desirable’ the Author made the choice to place ‘opportunities for further funding’ and ‘the rates renegotiable over time’ into ‘nice to have’ based on the number of 1s. These three aspects all had their highest percentage as ‘nice to have’ and therefore do not appear to be that important to the collaborative process but may be present occasionally. The Respondents did not seem to think that the projects need to be similar in nature as they rated this the lowest.

#### 5.4.2.4 Free answers from questionnaire

Within the questionnaire people were given the opportunity to provide new aspects they felt important to collaboration. Appendix 18 shows these results in full. Table 12 shows a flavor of the comments.

No new aspects were identified so did not add to what was already listed from the interviews or literature review. Some of the answers however did help the Author improve the coding. The procurement approach was mentioned as well as the suitability of current standard contracts. The Respondents also discussed how collaboration required more effort but was more enjoyable.

Respondent ID No	Respondent details	In your opinion what are the important aspects of collaboration?	Are there any aspects to collaboration not mentioned in the questionnaire?
996158	Designer 1-3 Client	Trust	Effects of procurement/contracts on collaboration
102407	Engineer 4-6 Subcontractor	Trust, commitment, balance of power, fairness, transparency, sharing of risk, sharing of reward (pain/gain), common goals	Risk
754749	Other 11-15 Contractor	Mutual trust and a desire for mutual success	The role of a Consultant/Advisor to facilitate partnering or

			collaboration at team formation.
201007	QS 11-15 Contractor	Understanding that 'win win' emphasis is adhered to. All parties need to share rewards and are treated as such.	Yes, aim to eradicate any ambiguities upfront before works start.
207849	QS 7-10 Client	Mutual trust, openness & honesty	Collaboration takes "a lot" more effort than the traditional approach. The right commercial model is fundamental to collaboration working properly
433663	Solicitor 15+ Independent	All parties understanding their rights and obligations and that being contractual does not mean being adversarial.	Should contracts (Standard Forms) be amended?
398309	QS 1-3 Client	Fair Pain Share % splits; supply chain management (incl. ECI); communication, leadership by Client (s rep's); open book audit procedures	More attention to risk allocation could prove useful
376091	Other 11-15 Contractor	Understanding each parties key drivers and an honest approach to profit	Procurement methods are mentioned briefly but considered 'essential' to supporting collaborative projects
374796	Designer 7-10 Client	Greater understanding of the construction partners and the project	persons/ companies different agenda
363038	Project Manager 7-10 Client	Trust, respect, open and honest dialogue	The projects are more enjoyable to work on
988573	Other 1-3 Client	Efficient delivery, within budget and safely	Not aware
398805	Project Manager 15+ Contractor	Decision making based on what is best for the project, not what is best for the individual party.	Question 42 Collaboration results in a smaller number of claims. This suggests that claims are bad practice, collaborative contracts encourage parties to identify entitlements to claim for the effects of change early (Early Warnings). This question needs rewording to produce a balanced response.

Table 12. Examples of the free answers from the questionnaire

## 5.5 STATISTICAL ANALYSIS OF ASPECTS

The data were then analysed statistically to check for any statistically significant differences.

### 5.5.3 Correlations Between Aspects

The total scores for the aspects were used to carry out a Pearson's Correlation Analysis to identify if there are any correlations between the 48 aspects. A correlation is a statistical test that indicates if two or more variables fluctuate together, and the strength of their relationship (Coolican, 2009). The relationship can be positive (as one variable increases the other variable also increases). This means that if the Respondents consider one aspect as important they will also consider the other to be important. This test was carried out to try to identify relationships between the aspects that could be used within the model, using one aspect to support or influence another. Further details are provided in 5.6.2.

The relationship can also be negative (as one variable increases the other variable decreases). This means that if a Respondent considers one aspect important then they will consider the other as unimportant and vice versa (Coolican, 2009).

<b>R value =</b>	<b>Interpretation</b>
+0.70 or higher	Very strong positive relationship (V+)
+0.40 to +0.69	Strong positive relationship (S+)
+0.30 to +0.39	Moderate positive relationship (M+)
+0.20 to +0.29	Weak positive relationship (W+)
+0.01 to +0.19	No or negligible relationship
0	No relationship
-0.01 to -0.19	No or negative relationship
-0.20 to -0.29	Weak negative relationship (W-)
-0.30 to -0.39	Moderate negative relationship (M-)
-0.40 to -0.69	Strong negative relationship (S-)

-0.70 or higher	Very strong negative relationship (V-)
-----------------	--

Table 13. Critical values for r; taken from Quinnipiac University (2014).

The test was carried out using Statistical Package for the Social Sciences (SPSS). The tables showing the results of the statistical analysis are provided in Appendix 19. A set of r values was obtained. There are statistical tables that provide mathematical significance values. However this research is dealing with the opinions of people and the Political Science Department at Quinnipiac University (*Quinnipiac University 2014*) have provided a table for estimating the critical values of r. The interpretation showing the strength of the relationship based on the r value is provided in Table 13.

Using this table there was a total of 394 statistically significant correlations between the 48 aspects. The list of correlations is provided in Appendix 20.

The majority of the correlations, ie 379 were positive, (which is 96.19%) with only 15 of the correlations being negative. Therefore 96.19% of the correlations showed that if the one aspect was ranked highly then the other aspect was also ranked highly. This would indicate that the aspects could be quite dependent upon each other. This in turn could be important within the model.

### 5.5.3.1 *Negative correlations*

Fifteen of the correlations though were negative and these are shown in the table below (for interpretation see Table 13 above):-

Aspect 1	Correlation	Interpretation	Aspect 2
All team members contribute	-0.324	M-	Client leads project
Open dialogue environment	-0.276	W-	Health and safety improved from benchmark
Regular meetings between the parties (Client and Supply chain)	-0.267	W-	Client leads project
Relationships between the parties is managed	-0.259	W-	Open book environment
A common aim for all contributors	-0.257	W-	Opportunities for further funding
Risks allocated fairly	-0.249	W-	Projects similar in nature
Understanding the other team members' roles and responsibilities	-0.244	W-	Client leads project

Regular meetings between the parties (Client and Supply chain)	-0.240	W-	Open book environment
Environment of mutual trust	-0.239	W-	The projects delivered in less time than a traditional procurement approach
Team spirit between all personnel	-0.239	W-	Client leads project
Open book environment	-0.232	W-	Continuity of work for the Supply chain
Client leads project	-0.229	W-	Team members are allowed to develop skills and extend traditional role input
Risks allocated fairly	-0.217	W-	The projects delivered in less time than a traditional procurement approach
Regular workshops held	-0.211	W-	Open book environment
Early warning systems to identify any problems	-0.209	W-	Participants achieve a reasonable profit margin

Table 14. Negative correlations

If the Respondents scored Aspect one high they scored Aspect two low and vice versa. Five of the 15 negative correlations involve ‘the Client leads project’. Four of the negative correlations involve ‘open book environment’. These negative correlations are mostly ‘weak’ with one ‘moderate’ relationship. In the Author’s opinion, to have an impact on the model, only the ‘strong’ and ‘very strong’ correlations should be considered. Therefore the negative correlations were not included in the model development.

### 5.5.3.2 ‘Essential’ aspect correlations

If just the ‘essential’ aspect correlations are examined on their own the following list is obtained (for interpretation see Table 13 above):-

Aspect 1	Correlation	Interpretation	Aspect 2
Effective information sharing	0.201	W+	Aim for a win/win outcome
Risks allocated fairly	0.201	W+	Aim for a win/win outcome
Environment of mutual trust	0.203	W+	Relationships between the parties is managed
Team spirit between all personnel	0.213	W+	Aim for a win/win outcome
Relationships between the parties is managed	0.219	W+	Aim for a win/win outcome

Relationships between the parties is managed	0.223	W+	Respects for the input of the other team members
Understanding the other team members' roles and responsibilities	0.228	W+	Respects for the input of the other team members
A common aim for all contributors	0.237	W+	Pain share gain share mechanism fair to both the Client and the Contractor
All team members contribute	0.237	W+	Understanding the other team members' roles and responsibilities
A problem-solving environment	0.238	W+	Pain share gain share mechanism fair to both the Client and the Contractor
Environment of mutual trust	0.238	W+	All team members contribute
Team spirit between all personnel	0.239	W+	Regular meetings between the parties (Client and Supply chain)
All team members contribute	0.240	W+	Effective information sharing
Team spirit between all personnel	0.242	W+	Respects for the input of the other team members
Environment of mutual trust	0.245	W+	Early involvement of key members of the Supply chain
A common aim for all contributors	0.246	W+	Aim for a win/win outcome
A common aim for all contributors	0.249	W+	Relationships between the parties is managed
Understanding the other team members' roles and responsibilities	0.250	W+	Effective information sharing
Respects for the input of the other team members	0.252	W+	Early involvement of key members of the Supply chain
Team spirit between all personnel	0.252	W+	Relationships between the parties is managed
All team members contribute	0.254	W+	Contract supporting collaboration
Regular meetings between the parties (Client and Supply chain)	0.256	W+	Relationships between the parties is managed
Non adversarial environment	0.257	W+	Pain share gain share mechanism fair to both the Client and the Contractor
Team spirit between all personnel	0.262	W+	Risks allocated fairly
Regular meetings between the parties (Client and Supply chain)	0.263	W+	Early involvement of key members of the Supply chain
Team spirit between all personnel	0.265	W+	Understanding the other team members' roles and responsibilities
Early warning systems to identify any problems	0.266	W+	All team members contribute

Early warning systems to identify any problems	0.271	W+	A problem-solving environment
Environment of mutual trust	0.273	W+	Risks allocated fairly
Regular meetings between the parties (Client and Supply chain)	0.286	W+	Respect for the input of the other team members
Open dialogue environment	0.295	W+	All team members contribute
A problem-solving environment	0.305	M+	Respect for the input of the other team members
Open dialogue environment	0.308	M+	Effective information sharing
Open dialogue environment	0.308	M+	Risks allocated fairly
Early warning systems to identify any problems	0.309	M+	Effective information sharing
Environment of mutual trust	0.309	M+	Aim for a win/win outcome
Effective information sharing	0.322	M+	Pain share gain share mechanism fair to both the Client and the Contractor
A problem-solving environment	0.323	M+	Effective information sharing
A problem-solving environment	0.323	M+	Risks allocated fairly
Environment of mutual trust	0.329	M+	Respects for the input of the other team members
Team spirit between all personnel	0.330	M+	Effective information sharing
Contract supporting collaboration	0.340	M+	Regular meetings between the parties (Client and Supply chain)
Environment of mutual trust	0.346	M+	Team spirit between all personnel
Open dialogue environment	0.349	M+	Team spirit between all personnel
Pain share gain share mechanism fair to both the Client and the Contractor	0.353	M+	Aim for a win/win outcome
Open dialogue environment	0.356	M+	Respects for the input of the other team members
Non adversarial environment	0.364	M+	Aim for a win/win outcome
All team members contribute	0.390	M+	Team spirit between all personnel
Open dialogue environment	0.390	M+	Pain share gain share mechanism fair to both the Client and the Contractor
Environment of mutual trust	0.396	M+	Non adversarial environment
Open dialogue environment	0.415	S+	Environment of mutual trust
Non adversarial environment	0.416	S+	Effective information sharing
Non adversarial environment	0.416	S+	Risks allocated fairly
Risks allocated fairly	0.438	S+	Pain share gain share mechanism fair to both the Client and the Contractor
Environment of mutual trust	0.445	S+	Pain share gain share mechanism fair to both the Client and the Contractor
Effective information sharing	0.511	S+	Risks allocated fairly



A problem-solving environment	0.548	S+	Environment of mutual trust
A problem-solving environment	0.554	S+	Non adversarial environment

Table 15. 'Essential' aspects correlations

There are 58 statistically significant correlations between the 'essential' aspects. However, as described previously, only the eight 'strong' and 'very strong' relationship results (as highlighted S+) were considered in the next section.

## 5.6 INITIAL CONCLUSIONS FROM THE QUESTIONNAIRE RESULTS

As discussed previously the results to the Spearman's Rho and Cronbach's Alpha statistical test were positive which allowed the aspects to be divided into 'essential', 'desirable' and 'nice to have' based on the total score and percentages. The 18 'essential' aspects (listed in section 5.4.2.1). Provide the essence of the process and can therefore be used in the Author's opinion to produce a definition of collaboration.

### 5.6.1 Definition of Collaboration

The Author reflected on the 'essential' aspects and articulated what she believes to be a justifiable definition of collaboration. This was created after various iterations and the Author believes it to be a fully justified definition based on her research.

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, problems can be solved together and everyone contributes towards a common aim motivated by a fair pain share gain share.**

### 5.6.2 Correlations and the Model

The correlations on their own cannot be used to produce a model for collaboration. These results would seem to help guide the model as they indicate links that can be utilized within the model such as 'mutual trust' and 'open dialogue' showing correlation.

The eight 'strong' correlations between seven of the 'essential' aspects are the most useful. The results would seem to indicate that 'mutual trust' is linked to 'open dialogue', 'pain share gain share mechanism' and 'a problem-solving environment'. A 'non-adversarial environment' is linked with 'effective information sharing', 'risks allocated fairly' and 'a problem-solving environment'. 'Risks allocated fairly' as well as being linked to a 'non-adversarial environment' is linked to 'pain share gain share mechanism' and 'effective information sharing'.

These relationships from the table were taken into consideration in designing the model for collaboration described in Chapter Eight (section 8.2.3). Figure 16 is a mind map showing the correlations between the 'essential' aspects.

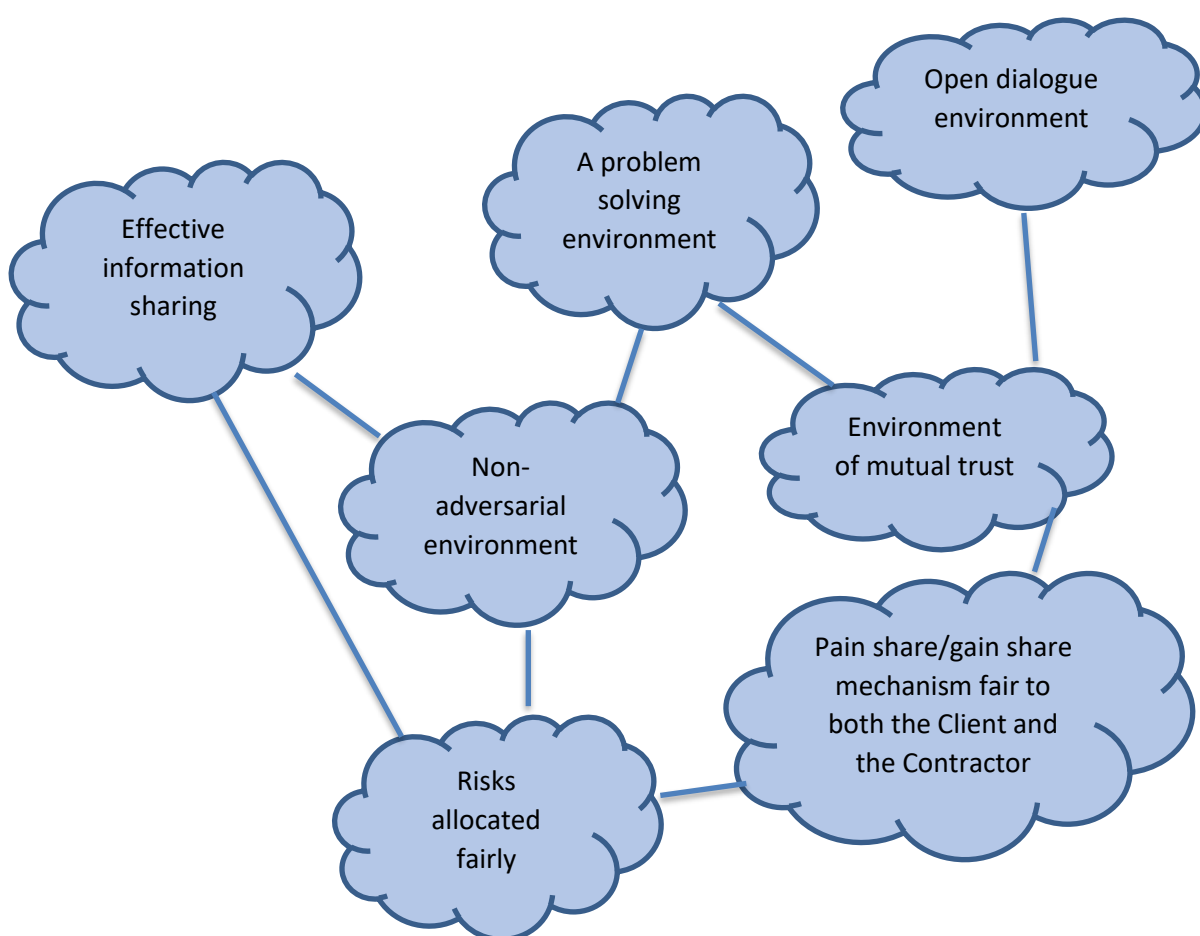


Figure 16. Mind map of correlation links

The positive correlation results show that if people rank one aspect high then they also rank the other high. By drawing the relationships out, as a mind map, a picture emerges as to possible interactions between these aspects. These interactions could be utilised within the model.

For example, a 'non-adversarial environment' is linked to a 'problem solving environment', 'effective information sharing' and 'risks allocated fairly'. In the Author's opinion it may be possible that the same tools and techniques such as sharing an office could have a positive effect on 'effective information sharing'. In turn this could have a positive effect on 'non-adversarial environment', 'risks allocated fairly' and 'a problem solving environment'.

By making sure the tools and techniques are in place for the 'Hard' Aspects (as described in 5.8) 'pain share/gain share mechanism', 'risk allocated fairly' and 'effective information sharing' then these same techniques may have an effect on the 'Soft' Aspects.

## **5.7 ORGANISATION OF THE COLLABORATIVE ASPECTS**

Only the 18 'essential' aspects were used for the model. This is more manageable than 48 but the 18 can be further subdivided. The division of the 'essential' aspects should indicate how the aspect is to be dealt with within the model. The aspects can be divided up in many ways. For the model the Author decided that sorting the aspects into hard and soft aspects would be useful in identifying the tools to be utilised.

## **5.8 HARD AND SOFT COLLABORATIVE ASPECTS**

The aspects have been divided into hard or soft. Hard aspects are objective while soft aspects are subjective and so are handled and measured differently. The hard and soft aspects are considered differently within the model as hard aspects are easier to measure while soft aspects are more about personal opinion. Figures 17 and 18 describe what the Author identified as the nine soft and the nine hard aspects.



Figure 17. Soft aspects (Some aspects such as information sharing could also be hard if you are considering the intranet etc.)



Figure 18. Hard aspects

## 5.9 SUMMARY

The result from the questionnaires has produced a rank ordered list of the 48 aspects of collaboration. The list of aspects produced has been divided into 'essential' aspects, 'desirable' aspects and aspects that would be 'nice to have'. Two aspects i.e. 'all team members contribute' and 'early warning systems to identify problems' were both new to collaboration and also 'essential'. The 18 'essential' aspects were used to produce a definition for collaboration articulated from the views of all parties. The data were analysed to identify correlations between the aspects that could impact on the model. It may be possible to have a positive effect on some 'Soft' Aspects by using tools and techniques to influence the 'Hard' aspects. For example, if you use techniques for information sharing such as placing people in the same office this may also be useful in producing a non-adversarial environment.

The 'essential' aspects with their correlations were used to inform the initial model of collaboration which is discussed further in Chapter Eight. The data collected in the questionnaires also asked for their corporate affinity, number of years experience and the Respondent's role within collaboration. The next chapter analyses the data further by examining if the Respondents' experience, role or corporate affinity affects their opinion on collaboration to see if these would impact on the model.

### **Summary of Chapter Five**

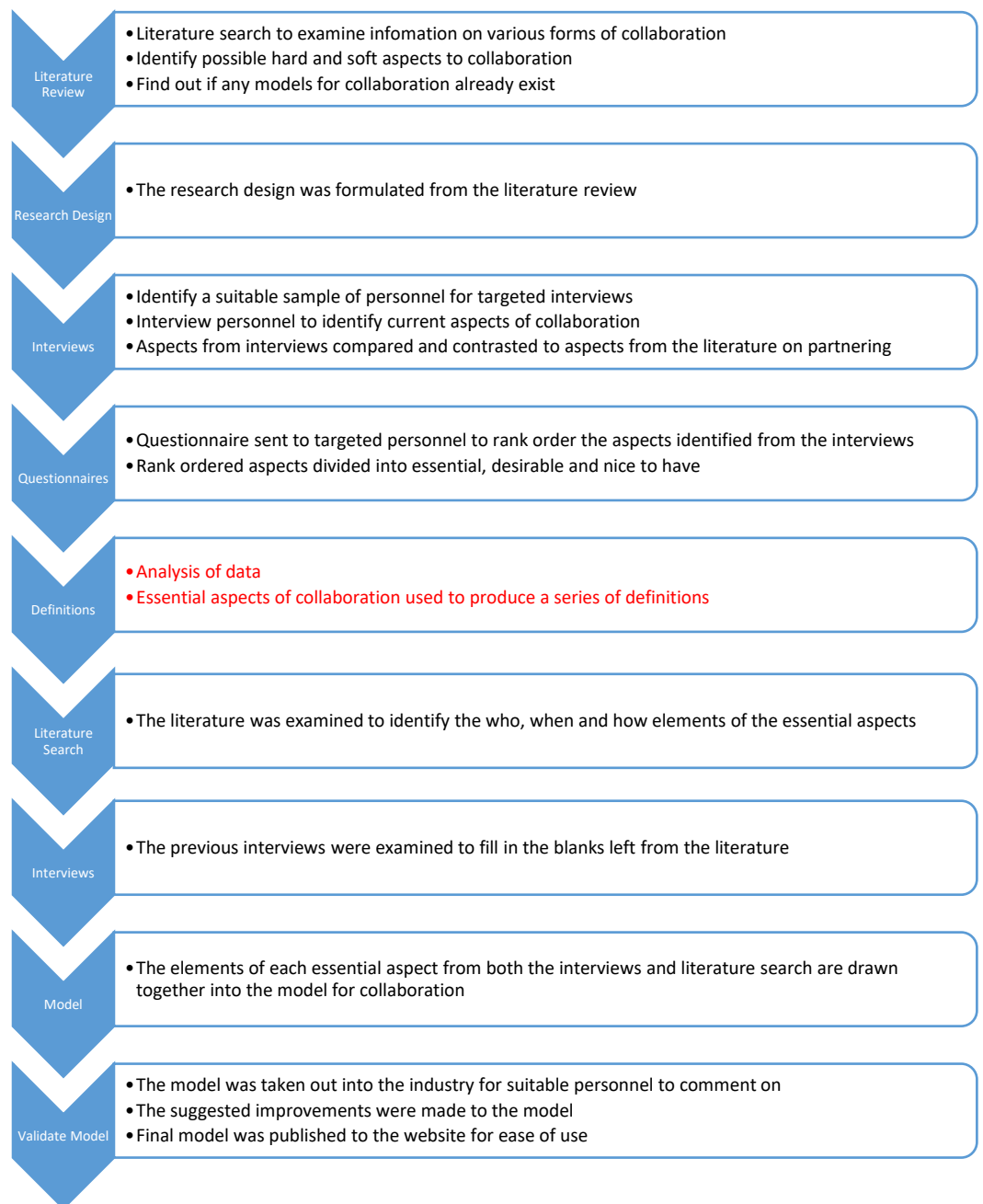
- 1. Rank order aspects**  
**The Respondents categorised each aspect as 'essential', 'desirable' and 'nice to have' which was given a score.**
- 2. Confirm 'essential', 'desirable' and 'nice to have' aspects**  
**The total score and percentages were used to identify the 'essential', 'desirable' and 'nice to have' aspects.**
- 3. Develop definition**  
**The 'essential' aspects were articulated into a definition.**
- 4. Correlation analysis to examine relationships**  
**Correlation analysis used to identify relationships between aspects which can be used within the model.**
- 5. Aspects categorised as hard or soft**  
**The hard aspects require management and contractual control while soft aspects require communication and relationship mechanisms.**

## *Chapter Six*

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# Analysis of the Effect of Perspective

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# Chapter Six

## Analysis of the Effect of Perspective

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### Chapter Six Aims

1. Analyse how corporate affinity affects the respondents' views of collaboration
2. Analyse how number of years' experience affects their view of collaboration
3. Analyse how role affects their view of collaboration
4. Discuss impact on model of collaboration

### 6.1 INTRODUCTION

The analysis of the data presented in the last chapter divided the data into the 'essential', 'desirable' and 'nice to have' aspects. This chapter sets out how the data were analysed to identify if the Respondents' perspectives would impact on their view of collaboration. The data were divided by role, experience and by corporate affinity (Contractor or Client) to see if there were any differences from the results obtained from the whole data set. This analysis led onto more definitions of collaboration and a discussion on the impact of perspective on the model of collaboration.

### 6.2 SUBDIVISION OF THE DATA

#### 6.2.1 Corporate Affinity

As described previously the Respondents were asked a series of questions about their background. The Respondents were asked who they represented within projects ie Client, Contractor, Subcontractor or Independent. Again, if they did not answer the question they were removed from the data set. The Respondents covered a range of experience as shown in Table 16.

Experience	Number of Respondents
Contractor	16
Sub-Contractor	2
Independent	8



Client	26
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Table 16. Type of experience of Respondents questioned

Eight of the questionnaires were completed by people working in an advisory capacity and therefore, in the Author’s opinion, had less bias towards the Client or Contractor perspective. Twenty six questionnaires were completed by people representing the Client while 18 people that completed questionnaires represented the Contractor. The Respondents therefore represented the range of corporate affinities within the industry. The Subcontractors’ results were placed with the Contractors as the small number of Subcontractors’ results would not allow any conclusions to be drawn.

### 6.2.2 Number of Years’ Experience

Respondents were also asked how long they had been involved in collaborative projects. The responses were grouped into none, 1-3, 4-6, 7-10, 11-15 and 15+ years. Any Respondents who had no experience were removed from the data set. The Respondents covered a range of number of years’ experience as shown in Table 17.

Number of Years’	Number of Respondents
1-3	9
4 - 6	7
7 - 10	15
11 - 15	11
15+	10

Table 17. Number of years’ experience of Respondents questioned

The personnel targeted had a role that made them directly involved in collaboration projects (Table 17). All of the participants had a minimum of one year involvement within collaborative projects and 71% of the participants had over seven years’ experience and therefore could be considered to be an experienced sample.

### 6.2.3 Roles

A range of people were targeted as shown in Table 18. The majority of responses though came from Quantity Surveyors and Project Managers directly involved in the collaborative projects.

<b>Role</b>	<b>Number of Respondents</b>
Clients	3
Designs	3
Engineers	4
Project Managers	10
Quantity Surveyors	20
Solicitors	1
Educationalists	2
Others	9

Table 18. Roles of Respondents questioned

The results for the Quantity Surveyors and the Project Managers may be reliable but the numbers of Clients and Designers etc are too few to draw valid conclusions.

### 6.3 ANALYSIS BY CORPORATE AFFINITY

#### 6.3.1 Rank Ordered Corporate Affinity Aspects

The data were sorted by corporate affinity. The results of the 48 aspects rank ordered for Client, Contractor and the Independent representative is provided in Appendix 21.

The rank ordered lists were then divided into 'essential', 'desirable' and 'nice to have' using the previously explained method. This is also shown highlighted in Appendix 21. The rank orders for the 'essential' aspects on their own are shown below for each corporate affinity.

##### 6.3.1.1 Client

Twenty six Clients responded, therefore the 'essential' score range was 65-78. As described in Chapter Five (section 5.4.2) the survey identified 16 but the list was also based upon a minimum of 50% of Respondents believe that the aspect fitted into the 'essential' category. On this basis a further two aspects were included. The 'essential' aspects for the Clients are shown in Table 19 below.

<b>Aspect</b>	<b>Total</b>	<b>Essential</b>	<b>Desirable</b>	<b>Nice to Have</b>
Open dialogue environment	74	84.62%	15.38%	0.00%
A common aim for all contributors	73	84.62%	11.54%	3.85%
A problem-solving environment	71	73.08%	26.92%	0.00%
Early warning systems to identify any problems	71	73.08%	26.92%	0.00%
Non-adversarial environment	70	76.92%	15.38%	7.69%

Environment of mutual trust	69	65.38%	34.62%	0.00%
All team members contribute	68	65.38%	30.77%	3.85%
Contract supporting collaboration	68	73.08%	15.38%	11.54%
Team spirit between all personnel	68	69.23%	23.08%	7.69%
Effective information sharing	67	61.54%	34.62%	3.85%
Risks allocated fairly	67	61.54%	34.62%	3.85%
Understanding the other team member's roles and responsibilities	67	61.54%	34.62%	3.85%
Relationships between the parties are managed	66	61.54%	30.77%	7.69%
Respect for the input of the other team members	66	57.69%	38.46%	3.85%
Open book environment	65	61.54%	26.92%	11.54%
Pain share gain share mechanism fair to both the Client and the Contractor	65	65.38%	19.23%	15.38%
Regular meetings between the parties (Client and Supply chain)	65	61.54%	26.92%	11.54%
Client leads project	64	53.85%	38.46%	7.69%
Early involvement of key members of the Supply chain	63	50.00%	42.31%	7.69%
Few to zero claims	62	50.00%	38.46%	11.54%
Aim for a win / win outcome	61	50.00%	34.62%	15.38%

Table 19. 'Essential' aspects for the Client

The Clients chose 21 aspects as 'essential'. Clients agreed with the 'essential' aspects from the complete data set but also felt that 'Client leads project', 'few to zero claims' and 'open book environment' as 'essential'.

### 6.3.1.2 Contractor

Eighteen Contractors responded, therefore their 'essential' score range was 45-54. The 'essential' aspects for the Contractor can be seen in Table 20 below.

Aspect	Total	Essential	Desirable	Nice to Have
Early warning systems to identify any problems	53	94.44%	5.56%	0.00%
Open dialogue environment	52	94.44%	0.00%	5.56%
Regular meetings between the parties (Client and Supply chain)	52	94.44%	0.00%	5.56%
A problem-solving environment	51	88.89%	5.56%	5.56%
All team members contribute	51	83.33%	16.67%	0.00%
Environment of mutual trust	51	88.89%	5.56%	5.56%
A common aim for all contributors	50	77.78%	22.22%	0.00%

Contract supporting collaboration	49	72.22%	27.78%	0.00%
Team spirit between all personnel	49	72.22%	27.78%	0.00%
Understanding the other team member's roles and responsibilities	49	72.22%	27.78%	0.00%
Effective information sharing	48	66.67%	33.33%	0.00%
Respect for the input of the other team members	48	72.22%	22.22%	5.56%
Early involvement of key members of the Supply chain	48	66.67%	33.33%	0.00%
Long term relationships develop	47	61.11%	38.89%	0.00%
Non-adversarial environment	47	61.11%	38.89%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	47	61.11%	38.89%	0.00%
Relationships between the parties are managed	47	66.67%	27.78%	5.56%
Risks allocated fairly	47	61.11%	38.89%	0.00%
Aim for a win / win outcome	46	55.56%	44.44%	0.00%
Value engineering utilised	45	61.11%	27.78%	11.11%

Table 20. 'Essential' aspects for the Contractor

The Contractors chose 20 aspects as 'essential'. The Contractors agreed with the 'essential' aspects from the complete data set but felt that 'value engineering' and 'long-term relationships develop' are also 'essential'.

### 6.3.1.3 Independent

Eight Independents responded, therefore their 'essential' score range was 20-24. One further aspect was added due to a minimum of 50% of the Respondents feeling it was 'essential'. The 'essential' aspects for the Independent Respondents are shown in Table 21 following:-

Aspect	Total	Essential	Desirable	Nice to Have
Open dialogue environment	23	87.50%	12.50%	0.00%
Team spirit between all personnel	23	87.50%	12.50%	0.00%
Understanding the other team member's roles and responsibilities	23	87.50%	12.50%	0.00%
All team members contribute	22	75.00%	25.00%	0.00%
Environment of mutual trust	22	75.00%	25.00%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	22	75.00%	25.00%	0.00%
Risks allocated fairly	22	75.00%	25.00%	0.00%
A common aim for all contributors	21	75.00%	12.50%	12.50%
Contract supporting collaboration	21	62.50%	37.50%	0.00%

Effective information sharing	21	62.50%	37.50%	0.00%
Everyone achieves a reasonable profit margin	21	75.00%	12.50%	12.50%
Relationships between the parties are managed	21	62.50%	37.50%	0.00%
A problem-solving environment	20	62.50%	25.00%	12.50%
Non-adversarial environment	20	62.50%	25.00%	12.50%
Regular meetings between the parties (Client and Supply chain)	20	50.00%	50.00%	0.00%
Early warning systems to identify any problems	19	50.00%	37.50%	12.50%

Table 21. Essential aspects for the Independent Respondents

The Independent personnel chose 16 ‘essential’ aspects as ‘essential’. The Independent personnel agreed with most of the ‘essential’ aspects from the complete data set, but excluded ‘respect input of other team members’ and ‘early involvement of key members of the Supply Chain’ and ‘aim for a win/win outcome’. They felt however that ‘participants achieving a reasonable profit margin’ was also ‘essential’.

### 6.3.2 Comparison of Analysis

These results may be clearer from Table 22 shown below which shows the ‘essential’ aspects for each group. A blank cell indicates that it is not an ‘essential’ aspect for them.

	Client	Contractor	Independent
Aspect	%	%	%
A common aim for all contributors	84.62	77.78	75.00
A problem-solving environment	73.08	88.89	62.50
All team members contribute	65.38	83.33	75.00
Contract supporting collaboration	73.08	72.22	62.50
Early involvement of key members of the Supply chain	50.00	66.67	50.00
Effective information sharing	61.54	66.67	62.50
Environment of mutual trust	65.38	88.89	75.00
Non-adversarial environment	76.92	61.11	62.50
Open dialogue environment	84.62	94.44	87.50
Pain share gain share mechanism fair to both the Client and the Contractor	65.38	61.11	75.00

Regular meetings between the parties (Client and Supply chain)	61.54	94.44	50.00
Relationships between the parties are managed	61.54	66.67	62.50
Risks allocated fairly	61.54	61.11	75.00
Team spirit between all personnel	69.23	72.22	87.50
Understanding the other team member's roles and responsibilities	61.54	72.22	87.50
Aim for a win / win outcome	50.00	55.56	
Early warning systems to identify any problems	73.08	94.44	
Respect for the input of the other team members	57.69	72.22	
Client leads project	53.85		
Few to zero claims	50.00		
Open book environment	61.54		
Value engineering utilised		61.11	
Long term relationships develop		61.11	
Everyone achieves a reasonable profit margin			75.00

Table 22. Comparison of the corporate affinity rank ordered results

The Contractor has a commercial focus and has included 'long term relationships develop', 'value engineering utilised' and 'aim for a win/win outcome'. The Contractors' focus appears to be about maintaining profitability and workload.

The Clients' focus on the other hand appears to be more about control. The Client has included 'Client leads project' and 'open book environment'.

The Independent Respondents were the only personnel to place 'everyone achieves a reasonable profit margin' as essential. This may be a result of their objectivity in viewing the collaborative projects from outside.

These results indicate that the different personnel see collaboration differently. Therefore they would each define the term collaboration differently.

### 6.3.3 ANOVA Test on Corporate Affinity

An ANOVA test was carried out on the data to ascertain if there are any statistically significant differences between the mean scores for the Client, Contractor and Independent. The difference between the means would indicate that Personnels' corporate affinity affects their view on collaboration. All 48 aspects were tested in this way. The full results obtained from SPSS are shown in Appendix 22. Table 23 shows

the results that were statistically significant at 0.05 (95% confidence level as explained in Chapter Three).

<b>Aspect</b>	<b>Corporate affinity</b>	<b>Role</b>	<b>Mean difference</b>
Efficiency in design produced	Contractor	Independent	0.722
Team members have a record in collaboration	Client	Independent	0.673
Low turnover of personnel	Client	Independent	0.885
Low turnover of personnel	Contractor	Independent	0.889
Formal quality control assurance mechanism utilised	Contractor	Client	0.521
Client leads project	Client	Contractor	0.684
Long term relationships develop	Contractor	Independent	0.736
Early warning systems to identify any problems	Contractor	Independent	0.569

Table 23. Statistically significant corporate affinity ANOVA results

These results show that there are some statistically significant differences between the means from Clients, Contractors and Independent personnel. The Contractors and Independent Personnel's opinions would appear to differ the most as they had statistically different means for:-

- 'Efficiency in design produced'
- 'Low turnover of personnel'
- 'Long term relationships develop'
- 'Early warning systems to identify any problems'

The Contractors rank 'early warning systems to identify any problems' as one of the most 'essential' aspects to collaboration at 1, while the Independent personnel ranked it 16<sup>th</sup>.

The Contractors ranked 'long term relationships develop' 14<sup>th</sup> while the Independent personnel ranked it 29<sup>th</sup>.

The Clients ranked 'Client leads project' 15<sup>th</sup> while the Contractors ranked it 41<sup>st</sup>.

The Contractors ranked 'formal quality control assurance mechanism utilised' 21<sup>st</sup> while Clients ranked it 37<sup>th</sup>.

The Clients ranked 'low turnover of personnel' 39<sup>th</sup> while the Independents ranked it 48<sup>th</sup> and the Contractors ranked it 38<sup>th</sup>.

The Clients ranked 'team members having a record in collaboration' 37<sup>th</sup> while Independents rank it 46<sup>th</sup>.

The Contractors ranked 'efficiency in design produced' 27<sup>th</sup> while Independents ranked it 42<sup>nd</sup>.

#### 6.3.4 Definitions by Corporate Affinity

The ANOVA Tests strengthens the argument that the Client, Contractor and Independent personnel view collaboration differently to each other. This may also impact on their opinion of the model for collaboration. Using the data the Author reflected on the 'essential' aspects to produce what she believes are three justifiable definitions for collaboration. These are shown below, the text in blue highlights the differences between the definitions:-

##### Client

**Collaboration with in the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their role and responsibilities. The team/project is led and managed by the Client and relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, open book accounting is used, problems can be solved together and everyone contributes towards a common aim motivated by a fair pain share gain share with few claims.**

##### Contractor

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract there is early involvement of key members and everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared,**



problems can be solved together and everyone contributes towards a common aim and **value engineering** can be used to ensure that everyone is a ‘winner’ motivated by a fair pain share gain share **within a long term relationship**.

## Independent

Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands others peoples’ role and responsibilities. The relationships are managed with the help of regular meetings, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, problems can be solved together and everyone contributes towards a common aim motivated by a fair pain share gain share so that **the Client and the Supply chain achieve a reasonable profit**.

## 6.4 ANALYSIS BY YEARS’ EXPERIENCE

### 6.4.1 Rank Ordered Years’ Experience Aspects

The data were then sorted by years’ experience in collaboration. The results of the 48 aspects rank ordered for each experience group is provided in Appendix 23.

The rank ordered lists were then divided into ‘essential’, ‘desirable’ and ‘nice to have’ using the previously explained method. This is also shown highlighted in Appendix 23. The rank orders for the ‘essential’ aspects on their own are shown below for each band of experience.

#### 6.4.1.1 1-3 years’ experience

Nine people with 1-3 years’ experience responded therefore the ‘essential’ score range was 23-27 with a further eight aspects included due to a minimum of 50% 3s (explained in Chapter Four).

Aspect	Total	Essential	Desirable	Nice to Have
A common aim for all contributors	26	88.89%	11.11%	0.00%
Early warning systems to identify any problems	26	88.89%	11.11%	0.00%
Contract supporting collaboration	25	77.78%	22.22%	0.00%

Regular meetings between the parties (Client and Supply chain)	25	77.78%	22.22%	0.00%
All team members contribute	24	66.67%	33.33%	0.00%
Effective information sharing	24	66.67%	33.33%	0.00%
Long term relationships develop	24	66.67%	33.33%	0.00%
Open dialogue environment	24	77.78%	11.11%	11.11%
Early involvement of key members of the Supply chain	24	66.67%	33.33%	0.00%
A problem-solving environment	23	66.67%	22.22%	11.11%
Close supervision of the Contractor and Subcontractor	23	66.67%	22.22%	11.11%
Non-adversarial environment	23	55.56%	44.44%	0.00%
Subcontractors involved in core team	23	55.56%	44.44%	0.00%
Understanding the other team member's roles and responsibilities	23	55.56%	44.44%	0.00%
Environment of mutual trust	22	55.56%	33.33%	11.11%
Formal quality control assurance mechanism utilised	22	55.56%	33.33%	11.11%
Open book environment	22	66.67%	11.11%	22.22%
Relationships between the parties are managed	22	55.56%	33.33%	11.11%
Risks allocated fairly	22	55.56%	33.33%	11.11%
Team spirit between all personnel	22	55.56%	33.33%	11.11%
Value engineering utilised	22	55.56%	33.33%	11.11%
Supply chain more closely involved	21	55.56%	22.22%	22.22%

Table 24. Rank order 'essential' aspects for personnel with 1-3 years' experience

Personnel that have only been involved with collaboration for 1 – 3 years decided that there were 22 'essential' aspects.

These Respondents agreed with most of the 'essential' aspects from the complete data set but excluded 'respect input of other team members', 'pain share gain share mechanism fair to both Client and the Contractor' and 'aim for a win/win outcome'. They felt however that 'long term relationships develop', 'close supervision of the Contractor and Subcontractor', 'Subcontractors involved in core team', 'formal quality control assurance mechanism utilised', 'open book environment', 'value engineering utilised' and 'Supply chain involved' were also 'essential'.

#### 6.4.1.2 4-6 years' experience

Seven people with 4-6 years' experience responded, therefore the 'essential' range was 18-21 with a further three aspects included due to a minimum of 50% 3s.

Aspect	Total	Essential	Desirable	Nice to Have
Early warning systems to identify any problems	20	85.71%	14.29%	0.00%
A common aim for all contributors	19	71.43%	28.57%	0.00%
A problem-solving environment	19	71.43%	28.57%	0.00%
Contract supporting collaboration	19	71.43%	28.57%	0.00%
Open dialogue environment	19	71.43%	28.57%	0.00%
Relationships between the parties are managed	19	71.43%	28.57%	0.00%
Aim for a win / win outcome	18	71.43%	14.29%	14.29%
Environment of mutual trust	18	57.14%	42.86%	0.00%
Regular meetings between the parties (Client and Supply chain)	18	71.43%	14.29%	14.29%
Respect for the input of the other team members	18	71.43%	14.29%	14.29%
Team spirit between all personnel	18	71.43%	14.29%	14.29%
Understanding the other team member's roles and responsibilities	18	57.14%	42.86%	0.00%
All team members contribute	17	57.14%	28.57%	14.29%
Non-adversarial environment	16	57.14%	14.29%	28.57%
Pain share gain share mechanism fair to both the Client and the Contractor	16	57.14%	14.29%	28.57%

Table 25. Rank order 'essential' aspects for personnel with 4-6 years' experience

Personnel that have been involved with collaboration for 4–6 years thought that 15 of the aspects were 'essential'. The 4-6 years Respondents agreed with most of the 'essential' aspects from the complete data set but excluded – 'early involvement of key members of the Supply chain', 'effective information sharing' and 'risks allocated fairly'.

#### 6.4.1.3 7-10 years' experience

Fifteen people with 7-10 years' experience responded therefore the 'essential' score range was 38-45 with a further seven aspects included due to a minimum of 50% 3s.

Aspect	Total	Essential	Desirable	Nice to Have
Open dialogue environment	44	93.33%	6.67%	0.00%
A problem-solving environment.	43	86.67%	13.33%	0.00%
Non-adversarial environment	43	86.67%	13.33%	0.00%
A common aim for all contributors	42	80.00%	20.00%	0.00%
All team members contribute	42	80.00%	20.00%	0.00%
Contract supporting collaboration.	42	86.67%	6.67%	7.14%
Environment of mutual trust	42	80.00%	20.00%	0.00%
Team spirit between all personnel	41	73.33%	26.67%	0.00%

Early warning systems to identify any problems	40	66.67%	33.33%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	40	66.67%	33.33%	0.00%
Regular meetings between the parties (Client and Supply chain)	40	66.67%	33.33%	0.00%
Relationships between the parties are managed	40	66.67%	33.33%	0.00%
Risks allocated fairly	40	66.67%	33.33%	0.00%
Understanding the other team member's roles and responsibilities	40	73.33%	20.00%	7.14%
Effective information sharing	39	60.00%	40.00%	0.00%
Few to zero claims	38	60.00%	33.33%	7.14%
Respect for the input of the other team members	37	53.33%	40.00%	7.14%
Subcontractors involved in core team	37	53.33%	40.00%	7.14%
Aim for a win / win outcome	36	53.33%	33.33%	14.29%
Participants achieve a reasonable profit margin	36	53.33%	33.33%	14.29%
Regular workshops held	36	53.33%	33.33%	14.29%
Early involvement of key members of the Supply chain	36	53.33%	33.33%	14.29%
Open book environment	35	53.33%	26.67%	21.43%

Table 26. Rank order 'essential' aspects for personnel with 7-10 years' experience

Personnel that had been involved in collaborative projects for 7 – 10 years thought 23 of the aspects were 'essential'.

The 7-10 years Respondents agreed with all of the 'essential' aspects from the complete data set. They felt however that 'few to zero claims', 'participants achieve a reasonable profit margin', 'Subcontractors involved in core team', 'regular workshops held' and 'open book environment' were also 'essential'.

#### 6.4.1.4 11-15 years' experience

Eleven people with 11-15 years' experience responded, therefore the 'essential' score range was 28-33 with a further one aspect included due to a minimum of 50% 3s.

Aspect	Total	Essential	Desirable	Nice to Have
Open dialogue environment	33	100.00%	0.00%	0.00%
A common aim for all contributors	32	90.91%	9.09%	0.00%
Environment of mutual trust	32	90.91%	9.09%	0.00%

Respect for the input of the other team members	31	81.82%	18.18%	0.00%
Understanding the other team member's roles and responsibilities	31	81.82%	18.18%	0.00%
A problem-solving environment	30	72.73%	27.27%	0.00%
All team members contribute	30	72.73%	27.27%	0.00%
Early warning systems to identify any problems	30	72.73%	27.27%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	30	72.73%	27.27%	0.00%
Regular meetings between the parties (Client and Supply chain)	30	81.82%	9.09%	9.09%
Team spirit between all personnel	30	72.73%	27.27%	0.00%
Contract supporting collaboration	29	63.64%	36.36%	0.00%
Effective information sharing	29	63.64%	36.36%	0.00%
Non-adversarial environment	29	63.64%	36.36%	0.00%
Risks allocated fairly	29	63.64%	36.36%	0.00%
Regular workshops held	28	54.55%	45.45%	0.00%
Relationships between the parties are managed	28	63.64%	27.27%	9.09%
Early involvement of key members of the Supply chain	28	54.55%	45.45%	0.00%
Long term relationships develop	27	54.55%	36.36%	9.09%

Table 27. Rank order 'essential' aspects for personnel with 11-15 years' experience

Personnel involved with collaboration for 11 – 15 years found that 19 of the aspects were 'essential'.

The 11-15 years Respondents agreed with most of the 'essential' aspects from the complete data set but excluded 'aim for a win/win outcome'. They felt however that 'long term relationships develop' and 'regular workshops held' were also 'essential'.

#### 6.4.1.5 15+ years' experience

Ten people with 15+ years' experience responded, therefore the 'essential' score range was 25-30 with a further five aspects included due to a minimum of 50% 3s.

Aspect	Total	Essential	Desirable	Nice to Have
Effective information sharing	29	90.00%	10.00%	0.00%
Open dialogue environment	29	90.00%	10.00%	0.00%
Risks allocated fairly	29	90.00%	10.00%	0.00%
Team spirit between all personnel	29	90.00%	10.00%	0.00%
All team members contribute	28	80.00%	20.00%	0.00%
Environment of mutual trust	28	80.00%	20.00%	0.00%

A problem-solving environment	27	80.00%	10.00%	10.00%
Early warning systems to identify any problems	27	80.00%	10.00%	10.00%
Pain share gain share mechanism fair to both the Client and the Contractor	27	80.00%	10.00%	10.00%
Understanding the other team member's roles and responsibilities	27	70.00%	30.00%	0.00%
Client leads project	26	60.00%	40.00%	0.00%
Non-adversarial environment	26	70.00%	20.00%	10.00%
Everyone achieves a reasonable profit margin	26	70.00%	20.00%	10.00%
A common aim for all contributors	25	70.00%	10.00%	20.00%
Aim for a win/win outcome	25	60.00%	30.00%	10.00%
Relationships between the parties are managed	25	60.00%	30.00%	10.00%
Early involvement of key members of the Supply chain	25	60.00%	30.00%	10.00%
Regular meetings between the parties (Client and Supply chain)	24	60.00%	20.00%	20.00%
Respect for the input of the other team members	24	60.00%	20.00%	20.00%
Contract supporting collaboration	23	50.00%	30.00%	20.00%
Long term relationships develop	23	50.00%	30.00%	20.00%
Open book environment	23	50.00%	30.00%	20.00%

Table 28. Rank order 'essential' aspects for personnel with 15+ years' experience

Personnel who have been involved in collaboration for over 15 years thought that 22 of the aspects were 'essential'.

The 15+ years Respondents agreed with all of the 'essential' aspects from the complete data set. They felt however that 'long term relationships develop', 'open book environment', 'Client leads project' and 'participants achieve a reasonable profit margin' were also 'essential'.

#### 6.4.2 Comparison of Analysis

If the experience bands are then compared the following results are obtained. All personnel agree on 12 of the 'essential' aspects no matter how long they have been involved in collaboration. These are shown highlighted in the table below in blue:-

	1-3 Years	4-6 Years	7-10 Years	11-15 Years	15+ Years
15+ Years	%	%	%	%	%
A common aim for all contributors	88.89	71.43	80.00	90.91	70.00
A problem-solving environment	66.67	71.43	86.67	72.73	80.00
All team members contribute	66.67	57.14	80.00	72.73	80.00
Contract supporting collaboration	77.78	71.43	86.67	63.64	50.00
Early warning systems to identify any problems	88.89	85.71	66.67	72.73	80.00
Non-adversarial environment	55.56	57.14	86.67	63.64	70.00
Environment of mutual trust	55.56	57.14	80.00	90.91	80.00
Regular meetings between the parties (Client and Supply chain)	77.78	71.43	66.67	81.82	60.00
Relationships between the parties are managed	55.56	71.43	66.67	63.64	60.00
Team spirit between all personnel	55.56	71.43	73.33	72.73	90.00
Understanding the other team member's roles and responsibilities	55.56	57.14	73.33	81.82	70.00
Open dialogue environment	77.78	71.43	93.33	100.00	90.00
Early involvement of key members of the Supply chain	66.67		53.33	54.55	60.00
Effective information sharing	66.67		60.00	63.64	90.00
Open book environment	66.67		53.33	100.00	50.00
Risks allocated fairly	55.56		66.67	63.64	90.00
Respect for the input of the other team members		71.43	53.33	81.82	60.00
Pain share gain share mechanism fair to both the Client and the Contractor		57.14	66.67	72.73	80.00
Aim for a win / win outcome		71.43	53.33		60.00
Long term relationships develop	66.67			54.55	50.00
Regular workshops held			53.33	54.55	
Participants achieve a reasonable profit margin			53.33		70.00
Subcontractors involved in core team	55.56		53.33		

Close supervision of the Contractor and Subcontractor	66.67				
Formal quality control assurance mechanism utilised	55.56				
Supply chain more closely involved	55.56				
Value engineering utilised	55.56				
Few to zero claims			60.00		
Client leads project					60.00

Table 29 'Essential' aspects by years' experience

There is one aspect only chosen by the most experienced as 'essential' and that is:

- 'Client leads the project'

There are four highlighted in green which only the less experienced personnel chose as 'essential', which are:-

- 'Value engineering utilised'
- 'Formal quality control assurance mechanism utilised'
- 'Supply chain more closely involved'
- 'Close supervision of the Contractor and Subcontractor'

These aspects involve the extended team being involved early on and also control with supervision and quality control assurance. With more experience the Respondents stop choosing early involvement of the extended team. The Respondents also chose less control mechanisms as they increased their experience. However 'open book environment' remained important as experience increased.

#### 6.4.3 ANOVA for Years' Experience

The results were statistically analysed using SPSS and running an ANOVA test. This tested for statistically different means in the results between the different years' experience. The results are shown in Appendix 24. No statistically significant results were obtained. This is probably due to the numbers within each sample.

#### 6.4.4 Definitions by Years' Experience

Although not statistically significant it would appear that the number of years' experience alters personnel's view of collaboration. Using this data the Author



reflected on the “essential” aspects to produce what she believes are five justifiable definitions for collaboration. These are shown below, the differences highlighted in blue:-

### **1 – 3 Years**

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their role and responsibilities. It also involves close supervision of the Contractor and Subcontractor. The relationships are managed with the help of regular meetings, early warning systems, open dialogue, involvement of the Supply chain including early involvement of key members, a formal quality control mechanism, value engineering and risk sharing to produce an atmosphere of mutual trust where information is shared, open book accounting is used, problems can be solved together and everyone contributes towards a common aim motivated by a long term relationships developing.**

### **4 – 6 Years**

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings, early warning systems and open dialogue to produce an atmosphere of mutual trust where problems can be solved together and everyone contributes towards a common aim to ensure that everyone is a ‘winner’ motivated by a fair pain share gain share mechanism.**

### **7-10 Years**

**Collaboration within the UK construction industry is a non-adversarial team based environment where through the use of the correct contract, Subcontractors are involved in the core team, the key members of the Supply chain are more closely involved and everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings and workshops, early warning**

systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, open book accounting is used, problems can be solved together, **there are few to zero claims** and everyone contributes towards a common aim to ensure that everyone is a 'winner' and receives a reasonable profit motivated by a fair pain share gain share.

### **11-15 Years**

Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, key members of the Supply chain are involved and everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings and workshops, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, problems can be solved together and everyone contributes towards a common aim motivated by a fair pain share gain share within a long term relationship.

### **15+ Years**

Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, key members of the Supply chain are more closely involved and everyone understands and respects the input of others and their roles and responsibilities. **The team/project is led and managed by the Client** with the help of regular meetings, early warning systems, open dialogue, open book accounting and risk sharing. This produces an atmosphere of mutual trust where information is shared, problems can be solved together and there is a common aim to ensure that everyone is a 'winner'. Motivation is improved through a fair pain share gain share and a reasonable profit margin within a long term relationship.

## 6.5 ANALYSIS BY ROLE

### 6.5.1 Rank Ordered Role Aspects

Finally the data were sorted by the Respondent's role. The results of the 48 aspects were rank ordered according to the Respondent's role in construction. The full results of this are provided in Appendix 25.

The rank ordered lists were divided into 'essential', 'desirable' and 'nice to have' using the previously explained method. The resulting Table is also provided highlighted in Appendix 25. The 'essential' aspects list is shown below for each role:-

#### 6.5.1.1 Quantity Surveyors

Twenty Quantity Surveyors responded therefore the 'essential' score range was 50-60 with a further one aspect included due to a minimum of 50% 3s.

Aspect	Total Score	Essential	Desirable	Nice to Have
A common aim for all contributors	59	95.00%	5.00%	0.00%
Open dialogue environment	58	90.00%	10.00%	0.00%
Contract supporting collaboration	56	80.00%	20.00%	0.00%
Early warning systems to identify any problems	56	80.00%	20.00%	0.00%
All team members contribute	54	75.00%	20.00%	5.00%
A problem-solving environment	53	70.00%	25.00%	5.00%
Non-adversarial environment	53	70.00%	25.00%	5.00%
Pain share gain share mechanism fair to both the Client and the Contractor	52	65.00%	30.00%	5.00%
Regular meetings between the parties (Client and Supply chain)	52	65.00%	30.00%	5.00%
Risks allocated fairly	52	60.00%	40.00%	0.00%
Understanding the other team member's roles and responsibilities	52	65.00%	30.00%	5.00%
Environment of mutual trust	51	60.00%	35.00%	5.00%
Relationships between the parties are managed	50	60.00%	30.00%	10.00%
Team spirit between all personnel	50	60.00%	30.00%	10.00%
Aim for a win/win outcome	49	55.00%	35.00%	10.00%

Table 30. 'Essential' aspects for Quantity Surveyors

Quantity Surveyors chose 15 aspects as 'essential'. Quantity Surveyors ranked 'a common aim for all contributors' as the most important aspect. The Quantity Surveyors agreed with most of the 'essential' aspects from the complete data set but excluded:-

- 'Respecting input of other team members'
- 'Effective information sharing'
- 'Early involvement of key members of the supply chain'

Contracts and finance are higher on the list of essential aspects which understandable given their role within the team.

#### 6.5.1.2 *Project Managers*

Ten Project Managers responded therefore the 'essential' score range was 25-30 with a further one aspect included due to a minimum of 50% 3s.

<b>Aspect</b>	<b>Total Score</b>	<b>Essential</b>	<b>Desirable</b>	<b>Nice to Have</b>
A problem-solving environment	30	100.00%	0.00%	0.00%
Open dialogue environment	30	100.00%	0.00%	0.00%
All team members contribute	29	90.00%	10.00%	0.00%
Early warning systems to identify any problems	29	90.00%	10.00%	0.00%
Effective information sharing	29	90.00%	10.00%	0.00%
Environment of mutual trust	29	90.00%	10.00%	0.00%
Non-adversarial environment	29	90.00%	10.00%	0.00%
Risks allocated fairly	28	80.00%	20.00%	0.00%
Team spirit between all personnel	28	80.00%	20.00%	0.00%
Understanding the other team member's roles and responsibilities	28	80.00%	20.00%	0.00%
A common aim for all contributors	27	80.00%	10.00%	10.00%
Relationships between the parties are managed	27	80.00%	10.00%	10.00%
Respect for the input of the other team members	27	80.00%	10.00%	10.00%
Pain share gain share mechanism fair to both the Client and the Contractor	26	70.00%	20.00%	10.00%

Regular meetings between the parties (Client and Supply chain)	25	70.00%	10.00%	20.00%
Contract supporting collaboration	24	60.00%	20.00%	20.00%

Table 31. 'Essential' aspects for Project Mangers

Project Managers chose 16 aspects as 'essential'. Project Managers ranked 'a problem-solving environment' and 'open dialogue environment' as the most important aspects.

The Project Managers agreed with most of the 'essential' aspects from the complete data set but excluded:-

- 'early involvement of key members of the Supply chain'
- 'aiming for a win/win outcome'

Given their role ranking problem solving first is not a surprise and communication is an important part of their role. Their exclusion of a win/win outcome however is interesting and may warrant further research in the future.

### 6.5.1.3 Others

Nine 'Others' responded, therefore the 'essential' score range was 23-27 with a further two aspects included due to a minimum of 50% 3s.

Aspect	Total Score	Essential	Desirable	Nice to Have
Environment of mutual trust	27	100.00%	0.00%	0.00%
Team spirit between all personnel	27	100.00%	0.00%	0.00%
Understanding the other team member's roles and responsibilities	27	100.00%	0.00%	0.00%
Non-adversarial environment	26	88.89%	11.11%	0.00%
Open dialogue environment	26	88.89%	11.11%	0.00%
Early involvement of key members of the Supply chain	26	88.89%	11.11%	0.00%
A problem-solving environment	25	77.78%	22.22%	0.00%
Regular meetings between the parties (Client and Supply chain)	25	77.78%	22.22%	0.00%
Contract supporting collaboration	24	66.67%	33.33%	0.00%
Effective information sharing	24	66.67%	33.33%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	24	66.67%	33.33%	0.00%

Relationships between the parties are managed	24	66.67%	33.33%	0.00%
Risks allocated fairly	24	66.67%	33.33%	0.00%
A common aim for all contributors	23	66.67%	22.22%	11.11%
All team members contribute	23	55.56%	44.44%	0.00%
Early warning systems to identify any problems	22	55.56%	33.33%	11.11%
Respect for the input of the other team members	22	55.56%	33.33%	11.11%

Table 32. 'Essential' aspects for Others

'Others' chose 17 aspects as 'essential'. 'Others' also ranked the following as important aspects:-

- 'Environment of mutual trust'
- 'Team spirit between all personnel'
- 'Understanding other team members' roles and responsibilities'

The 'Others' agreed with most of the 'essential' aspects from the complete data set but excluded 'aim for a win/win outcome'.

#### 6.5.1.4 Engineers

Four Engineers responded therefore the 'essential' score range was 10-12 with a further six aspects included due to a minimum of 50% 3s.

Aspect	Total Score	Essential	Desirable	Nice to Have
A common aim for all contributors	12	100.00%	0.00%	0.00%
Environment of mutual trust	12	100.00%	0.00%	0.00%
Open dialogue environment	12	100.00%	0.00%	0.00%
Regular meetings between the parties (Client and Supply chain)	12	100.00%	0.00%	0.00%
A problem-solving environment	11	75.00%	25.00%	0.00%
Aim for a win/win outcome	11	75.00%	25.00%	0.00%
All team members contribute	11	75.00%	25.00%	0.00%
Early warning systems to identify any problems	11	75.00%	25.00%	0.00%
Everyone achieves a reasonable profit margin	11	75.00%	25.00%	0.00%
Long term relationships develop	11	75.00%	25.00%	0.00%

Pain share gain share mechanism fair to both the Client and the Contractor	11	75.00%	25.00%	0.00%
Relationships between the parties are managed	11	75.00%	25.00%	0.00%
Repeat business encouraged	11	75.00%	25.00%	0.00%
Respect for the input of the other team members	11	75.00%	25.00%	0.00%
Risks allocated fairly	11	75.00%	25.00%	0.00%
Early involvement of key members of the Supply chain	11	75.00%	25.00%	0.00%
Team spirit between all personnel	11	75.00%	25.00%	0.00%
Value engineering utilised	11	75.00%	25.00%	0.00%
Continuity of work for the Supply chain	10	50.00%	50.00%	0.00%
Contract supporting collaboration	10	50.00%	50.00%	0.00%
Effective information sharing	10	50.00%	50.00%	0.00%
Few to zero claims	10	50.00%	50.00%	0.00%
Non-adversarial environment	10	50.00%	50.00%	0.00%
Regular workshops held	10	50.00%	50.00%	0.00%
Subcontractors involved in core team	10	50.00%	50.00%	0.00%
Client leads project	9	50.00%	25.00%	25.00%
Supply chain more closely involved	9	50.00%	25.00%	25.00%
Efficiency in design produced	9	50.00%	25.00%	25.00%
Innovation encouraged	9	50.00%	25.00%	25.00%
Performance is measured using KPI's	9	50.00%	25.00%	25.00%
Team members are allowed to develop skills and extend traditional role input	9	50.00%	25.00%	25.00%

Table 33. 'Essential' aspects for Engineers

Engineers chose 31 aspects as 'essential'. Engineers ranked a 'common aim for all contributors', 'environment of mutual trust', 'open dialogue environment' and 'regular meetings between the parties (Client and Supply chain)' as the most important aspects.

The Engineers agreed with most of the 'essential' aspects from the complete data set but excluded 'understanding the other team member's roles and responsibilities'. They felt however that the following aspects were also 'essential':-

- 'Long term relationships develop'
- 'Everyone achieves a reasonable profit margin'
- 'Repeat business encouraged'
- 'Subcontractors involved in core team'
- 'Value engineering utilised'
- 'Continuity of work for the Supply chain'

- 'Few to zero claims'
- 'Regular workshops held'
- 'Client leads project'
- 'Efficiency in design produced'
- 'Innovation encouraged'
- 'Performance is measured using KPI's'
- 'Team members are allowed to develop skills and extend traditional role input'
- 'Supply chain more closely involved'

The Engineers have included the most aspects as essential. They represent both the Client and the Contractor which may explain why they have included so many aspects.

#### 6.5.1.5 Designers

Three Designers responded therefore the 'essential' score range was 8-9.

Aspect	Total Score	Essential	Desirable	Nice to Have
Contract supporting collaboration	9	100.00%	0.00%	0.00%
Few to zero claims	9	100.00%	0.00%	0.00%
Regular meetings between the parties (Client and Supply chain)	9	100.00%	0.00%	0.00%
A problem-solving environment	8	66.67%	33.33%	0.00%
All team members contribute	8	66.67%	33.33%	0.00%
Early warning systems to identify any problems	8	66.67%	33.33%	0.00%
Effective information sharing	8	66.67%	33.33%	0.00%
Environment of mutual trust	8	66.67%	33.33%	0.00%
Open book environment	8	66.67%	33.33%	0.00%
Open dialogue environment	8	66.67%	33.33%	0.00%
Everyone achieves a reasonable profit margin	8	66.67%	33.33%	0.00%
Respect for the input of the other team members	8	66.67%	33.33%	0.00%
Understanding the other team member's roles and responsibilities	8	66.67%	33.33%	0.00%

Table 34. 'Essential' aspects for Designers



Designers chose 13 aspects as 'essential'. Designers ranked 'contract supporting collaboration', 'few to zero claims' and 'regular meetings between the parties (Client and Supply chain)' as the most important aspects.

The Designers agreed with most of the 'essential' aspects from the complete data set but excluded the following:-

- 'A common aim for all contributors'
- 'Pain share gain share mechanism fair to both Client and the Contractor'
- 'Team spirit between all personnel'
- 'Non-adversarial environment'
- 'Risks allocated fairly'
- 'Relationships between the parties are managed'
- 'Early involvement of key members of the Supply chain'
- 'Aim for a win/win outcome'

They felt however that the following were also 'essential':-

- 'Few to zero claims'
- 'Open book environment'
- 'Everyone achieves a reasonable profit margin'

The Designers seem to have a focus on money and controlling costs.

#### 6.5.1.6 Clients

Three Clients responded therefore the 'essential' score range was 8-9 with a further five aspects included due to a minimum of 50% 3s.

Aspect	Total Score	Essential	Desirable	Nice to Have
Client leads project	9	100.00%	0.00%	0.00%
Early warning systems to identify any problems	9	100.00%	0.00%	0.00%
Team spirit between all personnel	9	100.00%	0.00%	0.00%
A common aim for all contributors	8	66.67%	33.33%	0.00%
A problem-solving environment	8	66.67%	33.33%	0.00%
Environment of mutual trust	8	66.67%	33.33%	0.00%

Open dialogue environment	8	66.67%	33.33%	0.00%
Relationships between the parties are managed	8	66.67%	33.33%	0.00%
Respect for the input of the other team members	8	66.67%	33.33%	0.00%
Early involvement of key members of the Supply chain	8	66.67%	33.33%	0.00%
Aim for a win / win outcome	7	66.67%	0.00%	33.33%
Contract supporting collaboration	7	66.67%	0.00%	33.33%
Effective information sharing	7	66.67%	0.00%	33.33%
Pain share gain share mechanism fair to both the Client and the Contractor	7	66.67%	0.00%	33.33%
Performance is measured using KPI's	7	66.67%	0.00%	33.33%

Table 35. 'Essential' aspects for Clients

Clients chose 15 aspects as 'essential'. The Client's ranked 'Client leads project', 'early warning systems to identify any problems' and 'team spirit between all personnel' as the most important aspects.

The Clients agreed with most of the 'essential' aspects from the complete data set but excluded:-

- 'All team members contribute'
- 'Understanding the other team member's roles and responsibilities'
- 'Non-adversarial environment'
- 'Regular meetings between the parties (Client and Supply chain)'
- 'Risks allocated fairly'

They felt however that 'Client leads project' and 'performance is measured using KPI's' were also 'essential'.

The Clients excluded non-adversarial from the essential list this is a surprising result given its importance in producing a collaborative environment.

#### **6.5.1.7 Educationalists**

Two Educationalists responded therefore the 'essential' score range was 5-6.

Aspect	Total Score	Essential	Desirable	Nice to Have
A problem-solving environment	6	100.00%	0.00%	0.00%
All team members contribute	6	100.00%	0.00%	0.00%
Contract supporting collaboration	6	100.00%	0.00%	0.00%
Everyone achieves a reasonable profit margin	6	100.00%	0.00%	0.00%
Regular meetings between the parties (Client and Supply chain)	6	100.00%	0.00%	0.00%
Understanding the other team member's roles and responsibilities	6	100.00%	0.00%	0.00%

Table 36. 'Essential' aspects for Educationalists

Educationalists only chose six aspects as 'essential'. Respondents from Education ranked 'a problem solving environment', 'all team members contribute', 'contract supporting collaboration', 'participants achieve a reasonable profit margin', 'regular meetings between the parties (Client and Supply chain)' and 'understanding the other team member's roles and responsibilities' as the most important aspects but there were only two Respondents.

The Educationalists agreed with some of the 'essential' aspects from the complete data set but excluded:-

- 'Open dialogue environment'
- 'A common aim for all contributors'
- 'Early warning systems to identify any problems'
- 'Environment of mutual trust'
- 'Team spirit between all personnel'
- 'Non-adversarial environment'
- 'Effective information sharing'
- 'Risks allocated fairly'
- 'Respecting input of other team members'
- 'Pain share gain share mechanism fair to both Client and the Contractor'
- 'Relationships between the parties is managed'
- 'Early involvement of key members of the Supply chain'
- 'Aim for a win/win outcome'

They felt however that ‘participants achieve a reasonable profit margin’ was also ‘essential’.

They did not consider many aspects to be essential. Their role is not directly involved in the day to day running of collaborative projects and this may mean they do not place the same importance on the aspects.

#### 6.5.1.8 Solicitor

One solicitor responded therefore the ‘essential’ score range was 3-3.

Aspect	Total Score	Essential	Desirable	Nice to Have
A common aim for all contributors	3	100.00%	0.00%	0.00%
All team members contribute	3	100.00%	0.00%	0.00%
Early warning systems to identify any problems	3	100.00%	0.00%	0.00%
Effective information sharing	3	100.00%	0.00%	0.00%
Everyone achieves a reasonable profit margin	3	100.00%	0.00%	0.00%
Open dialogue environment	3	100.00%	0.00%	0.00%
Pain share gain share mechanism fair to both the Client and the Contractor	3	100.00%	0.00%	0.00%
Relationships between the parties are managed	3	100.00%	0.00%	0.00%
Risks allocated fairly	3	100.00%	0.00%	0.00%
Team spirit between all personnel	3	100.00%	0.00%	0.00%
Understanding the other team member's roles and responsibilities	3	100.00%	0.00%	0.00%

Table 37. ‘Essential’ aspects for Solicitors

The Solicitor chose 11 aspects as ‘essential’. As there was only one Solicitor there is no rank order. The Solicitor agreed with some of the ‘essential’ aspects from the complete data set but excluded:-

- ‘A problem-solving environment’
- ‘Environment of mutual trust’
- ‘Contract supporting collaboration’
- ‘Non-adversarial environment’
- ‘Regular meetings between the parties (Client and Supply chain)’

- ‘Respecting input of other team members’
- ‘Early involvement of key members of the Supply chain’
- ‘Aim for a win/win outcome’

They felt however that ‘everyone achieves a reasonable profit margin’ was also ‘essential’. Surprisingly the Solicitor excluded aspects that the Author had expected to be included such as contracts and some of the aspects generally seen as important such as non-adversarial, trust and problem solving. Further data is required to draw interpretations from these results.

### 6.5.2 Essential Aspect Correlations

When the rank orders for the various roles were compared to each other there were no aspects that were considered ‘essential’ by all roles.

	Quantity Surveyor	Project Manager	Other	Engineer	Designer	Client	Educationalist	Solicitor
Aspect	%	%	%	%	%	%	%	%
Open dialogue environment	90.00	100.0	88.89	100.0	66.67	66.67		100.0
A common aim for all contributors	95.00	80.00	66.67	100		66.67		100.0
Early warning systems to identify any problems	80.00	90.00	55.56	75	66.67	100.0		100.0
A problem-solving environment	70.00	100.0	77.78	75.00	66.67	66.67	100.0	
Environment of mutual trust	60.00	90.00	100.0	100.0	66.67	66.67		
All team members contribute	75.00	90.00	55.56	75.00	66.67		100.0	100.0
Team spirit between all personnel	60.00	80.00	100.0	75.00		100.0		100.0
Understanding the other team member's roles and responsibilities	65.00	80.00	100.0		66.67		100.0	100.0
Contract supporting collaboration	80.00	60.00	66.67	50.00	100.0	66.67	100.0	
Non-adversarial environment	70.00	90.00	88.89	50.00				
Regular meetings between the parties (Client and Supply chain)	65.00	70.00	77.78	100.0	100.0		100.0	
Effective information sharing		90.00	66.67	50.00	66.67	66.67		100.0
Risks allocated fairly	60.00	80.00	66.67	75.00				100.0

Pain share gain share mechanism fair to both the Client and the Contractor	65.00	70.00	66.67	75.00		66.67		100.0
Relationships between the parties are managed	60.00	80.00	66.67	75.00		66.67		100.0
Respect for the input of the other team members		80.00	55.56	75.00	66.67	66.67		
Early involvement of key members of the Supply chain			88.89	75.00		66.67		
Aim for a win/win outcome	55.00			75.00		66.67		
Long term relationships develop				75.00				
Everyone achieves a reasonable profit margin				75.00	66.67		100.0	100.0
Regular workshops held				50.00				
Open book environment					66.67			
Subcontractors involved in core team				50.00				
Few to zero claims				50.00	100.0			
Client leads project				50.00		100.0		
Value engineering utilised				75.00				
Continuity of work for the Supply chain.				50.00				
Team members are allowed to develop skills and extend traditional role input				50.00				
Performance is measured using KPI's				50.00		66.67		
Repeat business encouraged				75.00				
Supply chain more closely involved				50.00				
Innovation encouraged				50.00				
Efficiency in design produced				50.00				

Table 38. 'Essential' aspects for all roles compared

The closest the results came to agreement were five aspects that all but the Educationalists agreed were 'essential'; these were:-

- 'Open dialogue environment'
- 'Early warning systems to identify any problems'
- 'A problem-solving environment'
- 'All members contribute'
- 'Contract supporting collaboration'

All these aspects are considered 'essential' within the overall results.

At the other end of the scale though eleven of the 'essential' aspects were chosen by only one role group, these are:-

- 'Open book environment'
- 'Long term relationships develop'
- 'Regular workshops held'
- 'Subcontractors involved in core team'
- 'Value engineering utilised'
- 'Continuity of work for the Supply chain'
- 'Team members are allowed to develop skills and extend traditional role input'
- 'Repeat business encouraged'
- 'Supply chain more closely involved'
- 'Innovation encouraged'
- 'Efficiency in design produced'

The ten aspects highlighted above in grey were chosen only by the Engineers. These aspects can be grouped into three general themes i.e. involvement of the extended team, continuity of the relationship and innovation and value through design. They also chose 'regular workshops' as 'essential'. Workshops could be the mechanism through which this innovation and value through design is achieved. The original data shows that there were only four Engineers and two of these scored a lot of aspects as 'essential'. In the Author's opinion the lack of numbers has skewed the data which makes it hard to draw conclusions and really requires further research with more data for each group. Time and resources precluded further research but this is a possible avenue for the future.

The Designers were the only Respondents who chose 'open book environment'. This was an unexpected result. Further research is required to identify why this aspect was chosen by the Designers but not the Quantity Surveyors or Clients who have more of a vested interest in the aspect.

The aspects chosen by one or two groups were not considered 'essential' in the overall results. The only aspect that was chosen as 'essential' by four roles (Engineers, Designers, Educators and Solicitors) was 'everyone achieves a reasonable profit margin'. It would be interesting to see if this was still the case if the number of participants increased.

### 6.5.3 Role Statistics

The results were tested statistically for differences in the means between the various roles using an ANOVA test in SPSS. The results are provided in Appendix 26 but no significant results were found. This may be due to the small numbers per role involved when the results are divided up.

### 6.5.4 Definitions by Role

Using these data the Author reflected on the 'essential' aspects to produce what she believes are two justifiable definitions for collaboration for the Quantity Surveyor and Project Manager. In the Author's opinion these two roles had enough Respondents to produce a reasonable definition. These are shown below, the blue indicates the differences between the definitions:-

#### Quantity Surveyors

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands the roles and responsibilities of others. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where, problems can be solved together and everyone contributes towards a common aim to ensure that everyone is a 'winner' motivated by a fair pain share gain share.**

#### Project Managers

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their roles and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, problems can be solved together and everyone contributes towards a common aim motivated by a fair pain share gain share.**



## 6.6 INITIAL CONCLUSIONS ABOUT SUBDIVIDED DATA

The data - when divided into corporate affinity, years' experience and role - yield slightly different results. The differences are summarized below. These results were checked in the final model to see if the aspects were incorporated into the model through the control of other aspects.

### 6.6.1 Effect of Corporate Affinity Upon Essential Aspects

The extra 'essential' aspects were:-

- 'Long term relationships develop'
- 'Everyone achieves a reasonable profit margin'
- 'Open book environment'
- 'Client leads project'
- 'Value engineering utilised'.

Each corporate affinity group has a slightly different interpretation of what collaboration is and so their definitions would be slightly different to each other as shown in section 6.3.4 and in Appendix 27. As described in section 6.3.2 the Clients appear to focus on control with 'Client leads the project' and 'open book environment'. The Independent Respondents were the only group to describe 'everyone achieves a reasonable profit margin' as essential. This may be due to their objectivity. The Contractor on the other hand seems to have a more commercial focus by including 'long term relationships develop', 'value engineering utilised' and 'aim for a win/win outcome' as 'essential'.

### 6.6.2 Effect of Years' Experience Upon Essential Aspects

The extra 'essential' aspects were:-

- 'Long term relationships develop'
- 'Everyone achieves a reasonable profit margin'
- 'Regular workshops held'
- 'Open book environment'
- 'Subcontractors involved in core team'
- 'Few to zero claims'
- 'Client leads project'

- 'Formal quality control mechanism'
- 'Supply chain more closely involved'
- 'Close supervision of the Contractor and Subcontractor'
- 'Value engineering utilised'

Each group has a slightly different interpretation of what collaboration is and so the definitions change over time as shown in section 6.4.4 and in Appendix 28. A 'formal quality control mechanism', 'supply chain more closely involved', 'close supervision of the Contractor and Subcontractor' and 'value engineering utilised' were only chosen by the least experienced Personnel. They seem to place importance on quality and early involvement. As experience increased the control measures chosen decreased apart from 'open book environment' which seems to remain important.

### **6.6.3 Effect of Roles Upon Essential Aspects**

Again, as with corporate affinity and experience, the role that people take within construction affects how they see collaboration and may impact on the model as shown in Table 38, section 6.5.2.

Each group has a slightly different interpretation of what collaboration is which the Author felt reflected their role. Their definitions would differ but with the low number of Respondents' roles only Quantity Surveyors and Project Managers are provided in section 6.5.4 (see Appendix 29 also).

Table 38 shows the 'essential' aspects for all the groups, listing the differences between the definitions. Comparing the Quantity Surveyors to the Project Managers resulted in three differences. The Quantity Surveyor, perhaps unsurprisingly, focusses on finance by having 'aim for a win/win' as an 'essential' aspect. While the Project Manager focused more on the team and communication by choosing 'respect for the input of other team members' and 'effective information sharing' as 'essential' aspects.

A table showing the essential aspects for all the groups is shown in Appendix 30, showing the differences between the definitions.

### **6.6.4 ANOVA Results and the Model**

The ANOVA tests carried out only highlighted a few statistically significant differences in the mean for corporate affinity as described previously and listed below:

- 'Efficiency in design produced'
- 'Low turnover of personnel'
- 'Long term relationships develop'
- 'Team members have a record in collaboration'
- 'Formal quality control assurance mechanism utilised'
- 'Early warning systems to identify any problems'

This small number of statistically significant results would indicate that people generally have a similar opinion of what collaboration is but, for these six aspects they will be coming from different viewpoints and this may affect the model and how the team needs to approach the aspect. In the Author's opinion the most significant results are the differences in opinion between the Client and the Contractor rather than the Independent with either the Client or the Contractor. There are two results where the Client and Contractor have significantly different opinions and they are:-

- i Formal quality control assurance mechanism utilised
- ii Client leads project

Both these aspects are 'desirable' and therefore will not be addressed directly in the model but should be kept in mind for further research.

## 6.7 SUMMARY

The analysis of the aspects has identified that the perspectives of the Respondents produced different rank orders. This results in differing definitions of collaboration. The results though do not vary greatly from the complete data set. The ANOVA test resulted in only a few statistically significant results which were in the 'desirable' category and therefore do not impact on the 'essential' aspects for the model. However it is something which should be considered in further research and by the people involved in collaborative projects. The model will also be checked to see if these points are actually picked up within the control of some of the other aspects in the draft model in Chapter Eight.

In the following chapters the 'essential' aspects from the primary research described in this and the previous chapter, together with the secondary research, is used to develop a model for collaboration.

## **Chapter Six Summary**

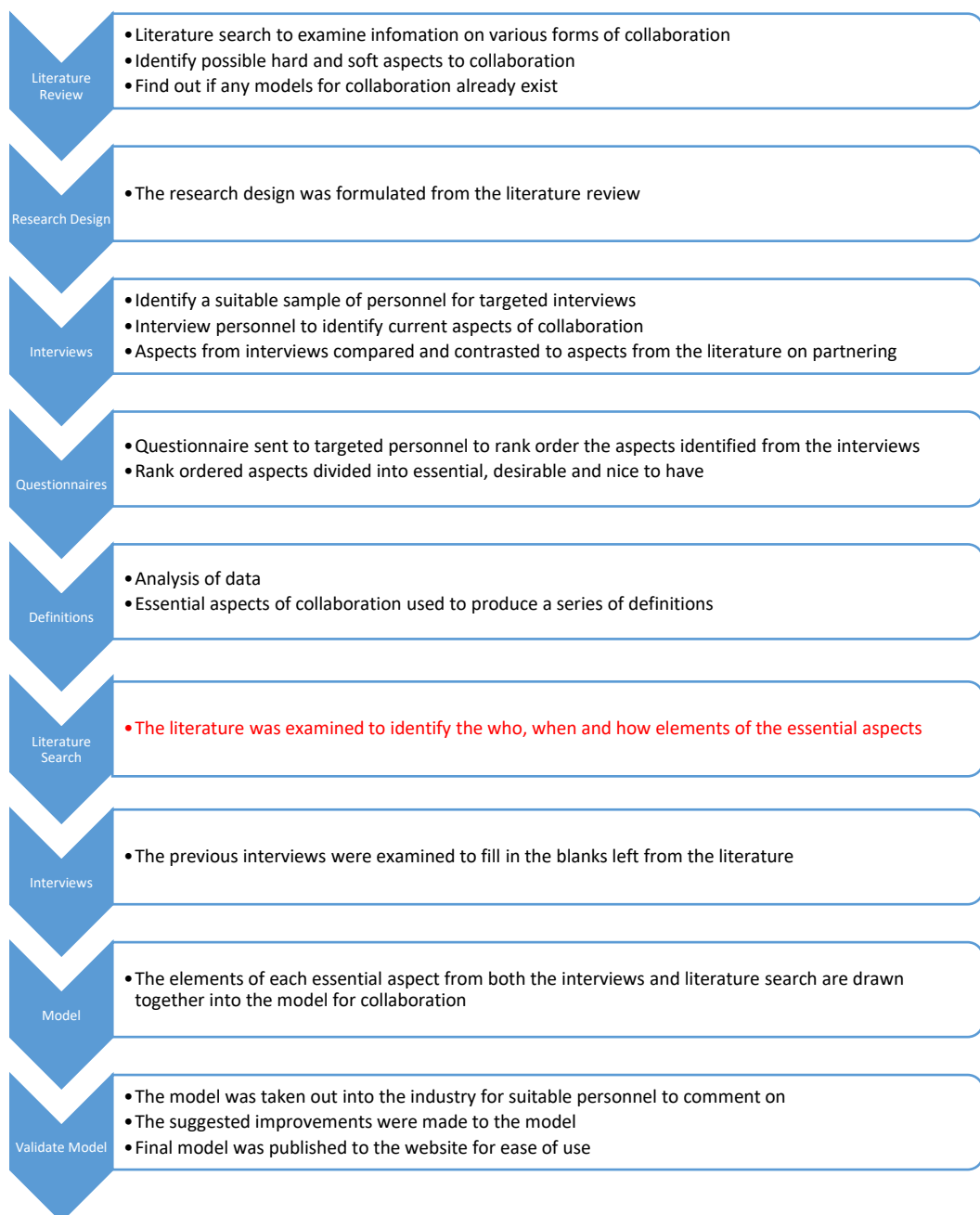
- 1. Analyse how corporate affinity affects the Respondents view of collaboration**  
**The Client wants to lead and use quality control which the Contractor does not want.**
- 2. Analyse how number of years' experience affects their view of collaboration**  
**The opinion of personnel involved in collaboration differs over time.**
- 3. Analyse how role affects their view of collaboration**  
**The roles would seem to produce different opinions on collaboration but this requires further research.**
- 4. Discuss impact on model of collaboration**  
**Results to inform future research and to be considered by participants involved in collaboration.**

## *Chapter Seven*

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# Identification of the Elements for the Model

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# Chapter Seven

## Identification of the Elements for the Model

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### **Chapter Seven Aims**

- 1. Identify the who, when and how (referred to as elements) for each of the 18 'essential' aspects**
- 2. Clarify certain tools and techniques – first workshop and incentivisation**
- 3. Clarify certain roles – Collaboration facilitator and Collaboration advisor**

### **7.1 INTRODUCTION**

The previous chapters have established the aspects which are currently seen as part of collaboration within the UK construction industry (Chapter Four, section 4.4.3). The aspects were then rank ordered to establish the 18 'essential' aspects to collaboration as described again by personnel within the UK construction industry (Chapter Five, section 5.4.2.1). As described in Chapter Three (section 3.2.4) the next stage (stage 3) in developing the model is to identify the elements that relate to each of the essential aspects as shown in the flow chart (Figure 19).

The elements consist of the 'who' (which personnel need to be involved), the 'how' (what tools and techniques can be used to help achieve the aspects) and the 'when' (at what point in the project do people/tools and techniques need to be involved/used).

The context in which the model is to be applied is to guide Personnel within the UK construction industry in implementing collaborative working. The Author decided that if the model was going to work then it had to use the language of the industry and the custom and practice of project management. Elements necessary for the successful implementation of the identified 18 'essential' aspects of collaboration have been identified within this chapter from the analysis and subsequent synthesis of the literature.

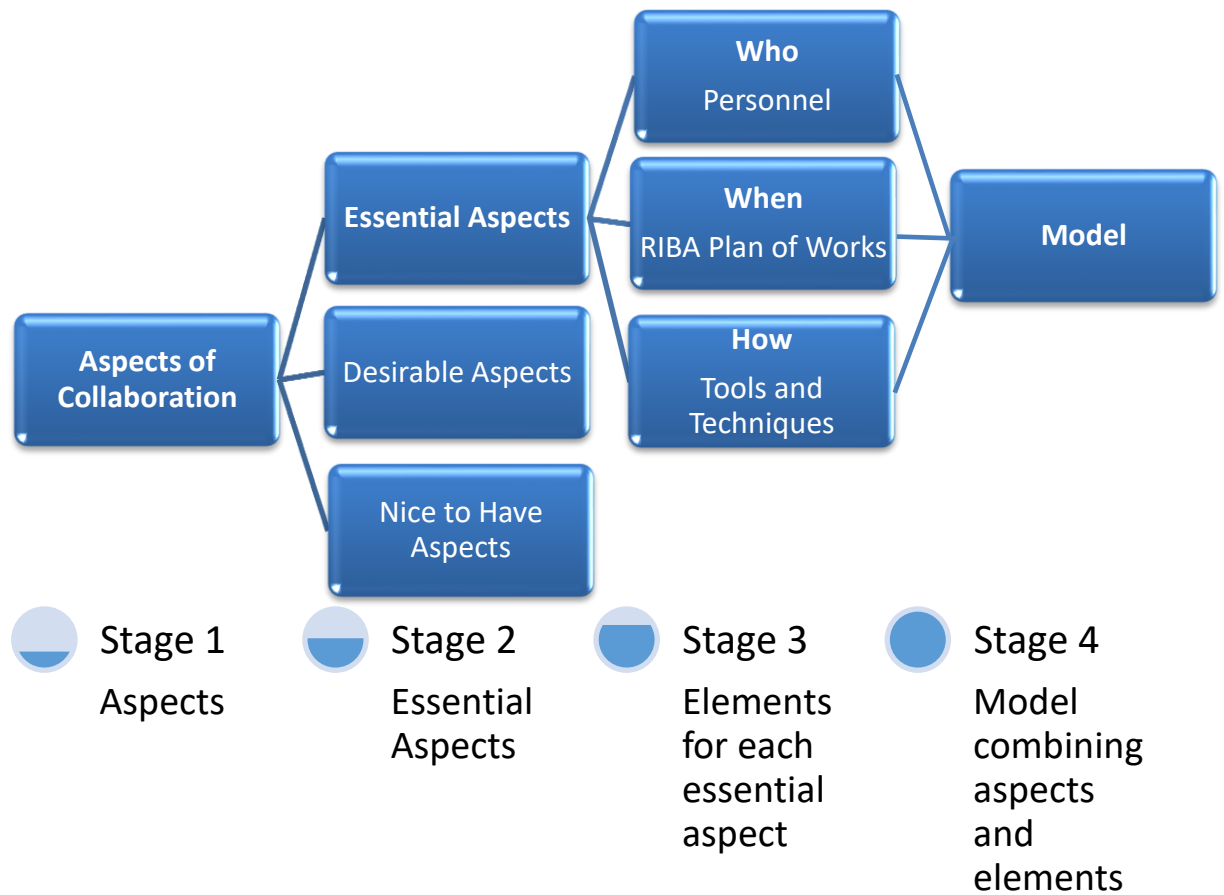


Figure 19. Flow chart showing the production of the model

The Author initially turned to the traditional literature (journals) to help in writing the model. However the focus of the literature is not sufficiently practical and lacked the concise information on tools and techniques required. This meant the Author needed to find alternative sources. The Construction Information Service yielded useful information in the form of documentation and guidance from Government and industry bodies.

In order to produce a model, it was important to identify the ‘elements’ relevant for each ‘essential’ aspect. As shown in Figure 17 these elements consist of a tool or technique, when this tool or technique should be used and also who should be responsible and/or involved. For example, the ‘essential’ aspect for team spirit could involve the whole team (who) attending social events (tool or technique) during the construction phase (when). This approach was taken by the Author to produce a model of practical use to people in the industry.



For clarity of presentation, the elements are identified separately for each essential aspect. These are then included under each aspect heading together with their supporting references. The elements linked to the aspects are subsequently used in the model development described in Chapter Eight. These elements have been chosen because they represent the people, tools / techniques and or time required for each specific aspect. Finally, certain terms that will be used within the model are clarified at the end of this chapter to avoid ambiguity. Stages 0 to 7 the RIBA plan of work 2013 (RIBA, 2013) were used as the time frame. The reason for this is discussed in Chapter Eight. This chapter however examines each of the 'essential' aspects identified in Chapter Five.

## **7.2 ELEMENTS ASPECT BY ASPECT**

### **7.2.1 Elements for Open Dialogue Environment**

The most important part of collaboration according to Muir and Rance (1995) is communication. Openness and communication are important in trust (*NHS Estates*, 1997). This is reinforced by the National Economic Development Office (1991) who states that problems should be openly discussed rather than hidden. Good communication improves decision-making which in turn makes for improved project management (Muir and Rance, 1995). With good communication it should be possible to decrease time taken and maintain quality but bring it in under budget (Muir and Rance, 1995).

From the literature, targeting this aspect of open dialogue, the Author has identified the following five elements that require consideration for inclusion into the model to be developed.

#### **7.2.1.1 *Open dialogue should begin early in the process***

Open dialogue needs to begin early in the process (*The European Construction Institute*, 1996 and *Construction Industry Council*, 2001). The communication structure at all levels needs to be decided at the first workshop (*NHS Estates*, 1997). The literature discusses that the process should start early but does not tie down when this is. The Author will examine if the interviews can identify the exact time in Chapter Eight, or if the Author needs to use her experience to identify when the first workshop should be.

### **7.2.1.2**      *A communication plan should be drawn up*

It is essential that the mechanism of communication is agreed (*Office of Government Commerce, 2003*). A communications plan is necessary so that everyone is aware of how they should be communicating (*British Standards Institution, 2011a*). Construction Industry Council (2005) and Shaughnesy (1995) suggest the goals and procedure for communication should be decided at the first workshop. Again the Author cannot identify when the communication plan should be drawn up.

### **7.2.1.3**      *Social events held regularly*

According to Sammuellsson-Brown (2002) social events are rated as the 5<sup>th</sup> most important mechanism and they should be held early in the process to help communication and team building. Social events are mentioned in the literature but the timing and what the social event should be is left open to interpretation.

### **7.2.1.4**      *Workshops should be held at the beginning of each stage*

The timing of workshops will vary depending on the project but the beginning of each stage should be considered (*HM Treasury, 1996*). This view suggests a frequency for the workshops. The National Economic Development Office (1991) also supports this view, pointing out that these workshops need to take place in a non-judgemental environment. The latter indicates the nature of the workshops. This is elaborated later in this chapter.

### **7.2.1.5**      *Facilitator leads the workshop*

At the first collaborative workshop the team, with the help of the Facilitator, should establish what they require in terms of effective communication and set this out as a communication plan (*The European Construction Institute, 1996*). This identifies one person who should be present at the workshops.

## **7.2.2**      **Elements for A Common Aim for All Contributors**

Egan (1998) discusses that you should “integrate the process and the team around the product”, indicating the need for a common aim, but does not discuss how this can be achieved. Medcof (1997), Shaughnesy (1995) and Stiles (1995) also discuss the importance of a common aim through common objectives.

From the literature review, targeting common aim, the following six elements arise that require consideration for inclusion into the model. Again the term 'early' is used and describes how all parties need to be involved but does not explain who they are.

#### **7.2.2.1**      *Aims and objectives should be discussed early*

Several authors (*National Economic Development Office, 1991, Construction Industry Council, 2001, and Office of Government Commerce, 2003a*) emphasise that early discussion is important. If the objectives of the project are not clear then no amount of management will improve the collaboration between the parties (*Office of Government Commerce, 2003*). The objectives should be mutual and acknowledge the needs of all parties (*The Joint Contracts Tribunal, 2001*).

#### **7.2.2.2**      *Client, End Users and Collaboration Advisor involved*

The client is responsible for informing the contractor of their needs or objectives (*National Economic Development Office, 1991*). Clients must be able to clearly describe their requirements (*Office of Government Commerce, 2003*). The client establishes the brief that contains the project objectives. Once the brief is completed the team is constructed (*Construction Industry Council, 2001*).

Kelly and Male (1993) disagree and state that the objectives and therefore the common aim should be designed together as a team, especially the Collaboration Advisor and the End Users where required, which should improve co-operation and reduce conflict (Kelly and Male, 1993 cited in Emmitt and Christoffersen, 2009 and *British Standards Institution, 2011a* and *Construction Industry Council, 2001*).

The Contractor's proposal should be examined by the client, possibly with their Engineer. This should reveal any discrepancies in how they view the scope of the work and where problems may occur. This should be carried out prior to the contract being awarded (Perry *et al*, 1982).

This has identified that the Client, Engineer, Contractor, Collaboration Advisor and End Users should be involved.

### 7.2.2.3 *Output specification in brief*

Often the importance of the brief is not fully appreciated and insufficient funds are provided, which can lead to misunderstandings and delays with the resulting extra cost (*Office of Government Commerce, 2003*). The project brief must be prepared properly (Richmond-Coogen, 2001). The Client must clearly communicate what 'best value' is to them and inform all tenderers (Sammuelsson Brown, 2002). An output specification is the best way to ensure that the design and performance of the product meets the requirements of the Client and End Users (*Office of Government Commerce, 2003*). An output specification describes the outcomes required and therefore allow innovation and the possibility of further price savings. This specification can also be used with performance measures to help focus the aim of the project (*Office of Government Commerce, 2003*).

The objectives should provide a clear understanding of what value means to the Client (*The Association of Consultant Architects, 2007*). The objectives should also be rated so that the Contractor understands the relative importance of each individual objective (*Construction Industry Council, 2001*). The Client needs to be transparent in their requirements to allow the Contractor to meet them in the most effective way (Egan, 2002). In general the sort of objectives the Client should be including in the project brief is: the minimum quality standard indicated with an output specification, the onsite construction period with certainty of completion, the best value whole life cost, health and safety with regards to zero accidents, zero defects, cost certainty through target cost with a maximum cost, a sustainable solution and the determination to enter into a multi-party partnering project (*Construction Industry Council, 2001* and *Office of Government Commerce, 2003*).

The project brief should also establish a realistic budget and programme and indicate the statutory and regulatory requirements (*Construction Industry Council, 2001*). The brief should include information about the future use of the project and include any available plans (*National Economic Development Office, 1991*). The Client should clearly define the activities and use this to programme them into a critical path (*Construction Industry Council, 2001*). Value for money can only be achieved when the project objectives and their relative importance are understood (*Construction Industry Research and Information Association, 1996*). The literature has provided quite detailed information on the brief and its importance for objectives.

#### **7.2.2.4 Target cost agreed prior to construction**

It is thought that the target cost can be used to help align the objectives of the team (Heaphy, 2011). There is no time allocation to the target cost element or personnel element.

#### **7.2.2.5 Contract should set out aims**

The objectives and the common aims should be placed into the contract (*The Joint Contracts Tribunal*, 2001). Both PPC 2000 and NEC option x12 apply this (*The Association of Consultant Architects*, 2000 and *The Joint Contract Tribunal*, 1998). A good contract will define goals and state how to achieve them (*Construction Industry Council*, 2001).

#### **7.2.2.6 Workshops held regularly to help monitor aims**

The initial team-building workshops should be used to identify the project objectives for individuals so that a common aim can be established (*Construction Industry Council*, 2001). The initial partnering workshop is where all the stakeholders start to align their objectives prior to the contract being signed (Loraine and Williams, 1997). The objectives should be identified and then reinforced through discussions in both the team-building but also the team-maintaining partnering workshops (*Construction Industry Council*, 2005).

Setting clear rules of engagement ensures that behaviours don't deviate away from the objectives set at the beginning (*British Standards Institution*, 2011a). Monitoring should then be carried out throughout the project in relation to the project aims (Loraine and Williams, 1997). This literature is more precise about the personnel required with stakeholders and provides more information on workshops specifically focusing on common aim.

### **7.2.3 Elements for Early Warning Systems to Identify Any Problems**

With enough warning then a best or appropriate response can be made by the appropriate party (*Department of Business, Innovation and Skills*, 2011).

The literature review, targeting early warning systems, identified the following five elements arise that require consideration for inclusion into the model.

### **7.2.3.1      *Arbitration used rather than going to adjudication***

Problem solving and arbitration mechanisms need to be put in place from the first workshop only then leading onto adjudication (Lorraine and Williams, 1997 and *Construction Industry Council*, 2005).

### **7.2.3.2      *Core group involved***

There should be a core group of people responsible for the early warning of problems (*Construction Industry Council*, 2001). This describes a core group but doesn't elaborate on who the core group is. Again in Chapter Eight the Author will examine her research interviews to identify who the core group should be.

### **7.2.3.3      *KPI's / incentives used***

KPI's should be used as an early warning system for problems to do with soft issues such as team spirit (*Office of Government Commerce*, 2003).

### **7.2.3.4      *Contract should utilise early warnings***

Both PPC2000 and NEC 3 Option C require the use of early warning systems (*The Association of Consultant Architects*, 2000 and *The Joint Contracts Tribunal*, 2013). The contract used should describe how disputes are to be resolved (*Construction Industry Council*, 2001). There should also be a non-contractual mechanism as well (Sammuelsson-Brown, 2002). This clarifies how 7.2.3.3 can be encouraged/controlled.

### **7.2.3.5      *Meetings held regularly***

The core team should meet regularly and review any issues (*Construction Industry Council*, 2001). Like 7.2.3.2 the core group is not elaborated.

## **7.2.4      *Elements for A Problem-Solving Environment***

The following five elements arise that require consideration for inclusion into the model from the literature review, targeting problem solving.

### **7.2.4.1      *Collaboration Facilitator and Collaboration Advisor as first port of call***

The Collaboration Advisor should be present to help the team through the non-technical problem-solving (Mosey, 2000). The Facilitator's role is also to support

problem-solving within the collaboration team (Sammuelsson-Brown, 2002). This is useful as the literature indicates who should be responsible for problem-solving.

#### **7.2.4.2** *Everyone involved*

Part of the team selection process should be on ability to problem-solve as everyone should be involved (*Construction Industry Council, 2001*). The Author may have to decide how extensive 'everyone' is in Chapter Eight.

#### **7.2.4.3** *Incentives used*

Incentive schemes can be used to encourage problem-solving (Richmond-Coogan, 2001). NHS Estates (1997) also discusses how issue identification should be incentivised. Incentivisation is a complex element and so is further discussed at the end of this chapter.

#### **7.2.4.4** *Problem resolution procedure used*

At the first workshop, time should be spent identifying potential problems and then putting a problem resolution mechanism in place (*Construction Industry Council, 2005*). This mechanism should be kept updated during the project as other workshops occur (*Construction Industry Council, 2005*). As with previous aspects workshops play a role in problem-solving and the next chapter needs to identify timing.

#### **7.2.4.5** *Workshops held regularly*

Workshops should include brainstorming exercises designed to get the team problem-solving; they should feedback to the team at the end and be held regularly (Loraine and Williams, 1997). The next chapter will also need to identify who needs to be involved as the Author could not identify this from the literature.

### **7.2.5** *Elements for Environment of Mutual Trust*

Trust is fundamental to a collaborative project (Barlow *et al*, 1997). When there is trust there is open communication and therefore a willingness to help one another to achieve the common aim (Loraine and Williams, 1997). The people in the team need to positively choose to trust (Powell, 1993). Powell (1993) suggests that over-management of a collaborative project will be seen as lack of trust. One of the greatest difficulties faced is breaking the cycle of distrust that has existed for so long between

client and contractor (Prior and Nowak, 2005). Many people start out trusting and it is important that this is sustained. Managers are very important to the subordinates feelings of 'fairness'(Searle and Ball, 2004).

From the literature review, relating to trust, the following seven elements arise for inclusion into the model.

#### **7.2.5.1** *Everyone should behave in a professional manner*

According to Powell (1993) professionals should be trustworthy. They should be competent and act with integrity. Choosing the right people to form the team is important as the individual is essential to trust. People trust people who always behave in the same way (Powell, 1993).

#### **7.2.5.2** *Team set up early (stage 2)*

Team building should begin early in the process (Sammuelsson–Brown, 2002). Again this indicates a time which is not specific but it would seem to indicate RIBA Stage 2.

#### **7.2.5.3** *Advisor involved to promote trust*

The Partnering Advisor should be the person that people go to if there are any misunderstandings and therefore they help to improve trust (*Construction Industry Council, 2001*). It is essential that the Collaboration Adviser is neutral, this could be achieved through being jointly employed by the Contractor and Client, and this will make them more trustworthy in people's eyes (*Construction Industry Council, 2001*). This is useful as it places a person in charge of trust.

#### **7.2.5.4** *Open book accounting utilised*

The Association of Consultant Architects (2007) suggests that the Client sets up a project bank account out of which payments are made so you have open book accounting. An open book approach can help with the openness required to aid trust (Richmond-Coogan, 2001 and Heaphy, 2011).

#### **7.2.5.5** *Incentives used to promote trust*

Incentives in some papers are seen as a method of building trust (Bresnen and Marshall, 2000b). There are three types of trust; Calculus-based (rational choice), Relational (working together over time) and Institutionalised (societal norms). It is



Calculus-based trust that incentives are said to induce (Kadefors, 2004). For incentives within a partnering arrangement it is misalignment of measurements and rewards and untrustworthy information that is important. Incentives with joint objectives have been suggested as a way of increasing trust (Eriksson and Laan, 2007). Incentives can be used to reward things like trust that is being constantly monitored (*British Standards Institution*, 2011a). Often trust is built up between the parties over many years (*National Economic Development Office*, 1991). One way to build up trust faster is to use collateral (Powell, 1993). As described incentives can promote trust but if used incorrectly could destroy trust. Therefore needs to be handled carefully in the model.

#### **7.2.5.6**            *Charter used to record intentions*

Cheung *et al* (2003) suggests a collaboration charter may promote trust. The Author has anecdotal evidence from her MSc interviews that charters are seen as pointless and so will need careful use in the model.

#### **7.2.5.7**            *Workshops and social events held regularly*

Social events held early in the project can help friendships form and therefore trust (Sammuelsson–Brown, 2002). Cheung *et al* (2003) suggests that workshops, meetings and social functions may promote trust. As can be seen, the literature sees social events and especially workshops as important in collaboration.

### **7.2.6**            **Elements for All Team Members Contribute**

The whole team needs to commit to achieving the project (Richmond-Coogan, 2001).

From the literature review, examining contribution, the following three elements arise for inclusion into the model.

#### **7.2.6.1**            *Balanced team required using Belbin's ideas*

The European Construction Institute (1996) suggests utilising tools such as Belbin (Belbin, 1981) to identify people's nature and using this information to make sure that teams are balanced.

### **7.2.6.2      *Empowerment of personnel***

Empowerment may help to improve team contribution. If senior members of the team allow others to make decisions and use their creativity then this may improve motivation (*The European Construction Institute, 1996*). Boone and Kurtz (1992) define motivation as “forces leading to behaviour directed toward the satisfaction of some need”. This provides an idea for the model but requires further elaboration before inclusion.

### **7.2.6.3      *KPI's and incentives used***

There is a lot of research into motivation. Taylor for example thought money worked well as a carrot, and sanctions as a stick. However Hawthorne's experiments seem to indicate that if you treat people well they work well out of gratification (cited by Reis and Pena, 2001). Vroom came up with the expectancy theory where people are motivated if they can see value in achieving a goal (cited by Boone and Kurtz, 1992). As Brumback (2003) states “Only individuals literally perform. It is how well they perform together that makes a championship team possible”.

Milne (2007) discusses how reward and recognition programmes work very well in motivating individuals but that teams are not so easy to motivate. This appears to be because it is difficult for individuals to see how individual effort results in the group performance. There is also a risk of certain members not pulling their weight within the group. They also found that it can bring about a competitiveness which goes against the team ethos (Milne, 2007).

The advantages that can be obtained from a partnering arrangement is seen by some researchers as a sufficient enough incentive on its own. The intrinsic motivation provided with rewards such as social recognition is also seen as an important motivational tool (Lu and Yan, 2007a). The way in which this intrinsic motivation is triggered is not fully understood but it is thought that flexible work hours, training, employee recognition and a pleasant working environment can help (Appelbaum and Kamal, 2000). It may be that the extrinsic motivation of monetary rewards triggers as the task becomes more complex (Mohd-Sanusi and Mohd-Iskandar, 2007). Evans and Weir (1995) discuss how it is important to get the balance of incentives right, not too easy to achieve and not too difficult. Bresnen and Marshall (2002) also believe that a lot of the motivation research into incentives tends to ignore the intrinsic and personal

motivation of individual team members. The goal must be challenging but achievable (Bresnen and Marshall, 2000b). As described previously incentives are also important to team contribution but only if used in the right way.

### **7.2.7 Elements for Team Spirit Between All Personnel**

The whole team is important for team spirit but some have a more active role to play (*Construction Industry Council, 2001*). The National Economic Development Office (1991) discusses how it is necessary for all parties to form a single team if all the benefits are to be achieved from collaboration. Working collaboratively requires a different sort of mind-set to the traditional construction worker. An important part of team spirit is trust and open communication where risks and problems are dealt with as a group (*National Economic Development Office, 1991*). The individuals do not form a true team until they have all been honest about their objectives and an outcome that answers their mutual benefit is agreed (*Office of Government Commerce, 2003d*). A team should understand the project objectives and have mechanisms in place for risk and incentives (*Office of Government Commerce, 2003d*). Each team member should understand their role within the team (*HM Treasury, 1999*). Team-building needs to be considered by the client and their team right from project conception (*Construction Industry Council, 2001*). The team should include the Client and their representatives, the Contractor as well as Sub-contractors, Key specialists and Suppliers (*Construction Industry Council, 2001*).

From the literature review, targeting team spirit, the following nine elements arise that require consideration for inclusion into the model.

#### **7.2.7.1 Client and Advisor choose team on team ability**

The tendering process should include a mechanism for selecting for team-working (*Construction Industry Council, 2001*). This means that individuals should be selected for their disposition to work in a team or being trained to work (*National Economic Development Office, 1991*). Construction Industry Council (2001) suggests that shortlisted contractors etc should be interviewed as potential team members. The individual's attitude to collaborative working is important as well as to be innovative and seek solutions (*Construction Industry Council, 2001*). Some people are unable to adapt to a collaborative environment for various reasons and the only option left is to remove them from the team (*National Economic Development Office, 1991*).

Construction Industry Council (2001) agrees that any individuals not fitting in during the first workshop may need to be removed from the project.

#### **7.2.7.2      *Collaboration Advisor and Collaboration Facilitator should be promoting team spirit and solving problems***

The collaboration Advisor's role is important in forming the team and then to work with the team on team-building (*Construction Industry Council, 2001*). The collaboration Facilitator is important for team spirit and they should lead the first workshop (*Construction Industry Council, 2001*).

#### **7.2.7.3      *If possible everyone should be housed in the same office***

Team spirit can be improved if the team are all working in the same place; if this is not possible then an intranet system should be used at least (*HM Treasury, 1999*). The team working in one place has also been raised in the Author's MSc research and so although only mentioned in one paper it will be included in the model.

#### **7.2.7.4      *Team-building training required***

Team-building training can be used to help form the team at the beginning (*HM Treasury, 1999*). The form that the team building should take is not stated and therefore open to interpretation.

#### **7.2.7.5      *Social events held regularly***

Social events are especially important in the early phase of the project, a month or two after the first workshop (*Sammuelsson-Brown, 2002*). Group activities and social events both help to build a team relationship (*Construction Industry Council, 2001*). Social events are considered important to collaboration as you are more likely to trust friends (*Sammuelsson-Brown, 2002*).

#### **7.2.7.6      *KPI's and incentives utilised***

Team spirit should be measured against KPI's and improved with incentives (*Office of Government Commerce, 2003c*). How team spirit should be measured through the use of KPI's was not described and will require thought before placing in the model.

#### **7.2.7.7 Leadership required in a top down approach – lead by example**

Senior management need to lead from the top with regards to team-working and should be encouraging collaboration through the supply chain (*Office of Government Commerce, 2003* and *HM Treasury, 1999*). Collaboration often requires more management and procedures in place than traditional procurement (*Office of Government Commerce, 2003d*).

#### **7.2.7.8 Workshops held regularly with whole team**

The workshop is central to the formation of a team with one common aim (*Construction Industry Council, 2005*). Team spirit will result more easily in a neutral setting. The first workshop should ideally be hosted in a neutral setting without the commercial pressures where the team can have fun (*Construction Industry Council, 2001*). Workshops are seen as important in team spirit but also to find out if people are not going to bond into the team and need to be removed (Sammuelsson-Brown, 2002). Workshops are for team-building and setting up of mechanisms important to the smooth running of the project and not for mundane everyday issues (*Construction Industry Council, 2005*). The Construction Industry Council (2005) states that the people who should be present at the workshops are:

- An external facilitator
- The partnering advisor
- The client/client representative
- The user representative
- The facilities manager
- The lead and specialist designers
- The contractor/construction manager
- Specialist contractors and trades
- Key materials suppliers, and health and safety/human resources specialists (*Construction Industry Council, 2005*).

There are four stages to team formation. They are: forming, storming, norming and performing and it is the aim of the workshop to take it through to performing as quickly as possible (*Construction Industry Council, 2005* cited Brue Tuckman, 1965). There is a section on workshops later in this chapter which goes into greater detail.

#### **7.2.7.9**      *Team building should start early and stay together to completion*

Team spirit needs to be formed early as the more the project goes on the more difficult it is to achieve (Emmitt and Christofferssen, 2009). The team should be formed during conception and continue to work as a team until completion (*Construction Industry Council*, 2001). This information provides more insight into when the team should form.

### **7.2.8**      **Elements for Understanding the Other Team Members' Roles and Responsibilities**

From the literature review, targeting roles and responsibilities, the following four elements arise that require consideration for inclusion into the model.

#### **7.2.8.1**      *Whole team should be involved in deciding roles and responsibilities in workshop*

The first workshop should include time for the team to decide their respective role and responsibilities so they all understand their contribution (*Office of Government Commerce*, 2003d and *British Standards Institution*, 2011a). This 'element' appears again and again in the literature as useful for many aspects to collaboration.

#### **7.2.8.2**      *Collaboration Advisor should guide and record roles and responsibilities with Client*

The collaboration Advisor is responsible for recording the outcome of the workshop and making sure everyone gets a copy (*Construction Industry Council*, 2001).

#### **7.2.8.3**      *Correct contract used to reflect correct roles and responsibilities*

The role and responsibilities differ under various contracts and so it is important for the Client to consider if the contract and their interpretation of the role are compatible (Perry *et al*, 1982). The collaboration documents should contain a document stating the roles and responsibilities of each member of the team (Mosey, 2000).

#### **7.2.8.4**      *Workshops used to identify roles and responsibilities*

Roles and responsibilities should be decided in the first workshop (Sammuelsson-Brown, 2002). Again no information is provided about when this should occur.

## 7.2.9 Elements for Contract Supporting Collaboration

Some people think that contracts don't play a role in collaboration but the National Economic Development Office (1991) disagrees. The same sentiment is stated by the Cabinet Office (2001). Standard forms are preferred as they are tested in court (Clamp *et al*, 2007). The JCT framework agreement, the NEC 3 Option C and PPC 2000 are all possible contracts (*Construction Industry Council*, 2001). Both PPC2000 and NEC 3 Option X12 are multi-party contracts (*Construction Industry Council*, 2001). The contract should support team integration (Egan, 2002). The contract should set out the common aim, should describe the rules and rewards, KPI's and dispute resolution (*Construction Industry Council*, 2001). Performance based contracts require less day-to-day supervision on site (Nanayakkara, 2003). Contracts suitable for collaborative working include PPC2000, JCT CE and NEC3 (Rich, 2008). The main contracts are shown below:-

### TPC 2005

"TPC 2005 contains:

Roles and responsibilities; early warnings; adjudication; core group; meetings and decisions; objectives; KPI's; incentives; targets; added value; partnering advisor; open book and inspection of financial records" (*The Association of Consultant Architects*, 2005).

### PPC2000

With PPC 2000 the contract can be signed prior to the detailed designs being in place (*The Association of Consultant Architects*, 2000).

PPC2000 was written to address Latham's recommendations including:-

"Team based multi-party approach; Integrated contract; Integrated design/supply/construction process; Egan objectives; Key performance indicators; Supply chain partnering; open book basis; core group; early warning systems; contracts; a partnering timetable.

Incentives – added value incentives, value engineering and value management exercises are expressly recognised.

Risk management – agree the balance of risk appropriate to each project.

Non Adversarial Problem resolution

Partnering advisor” (*The Association of Consultant Architects*, 2000).

### NEC3

The NEC suite of contracts provide a core of clauses to manage the project and then appropriate extra clauses can be used (Prior and Nowak, 2005).

The NEC contracts includes early warnings, risk register, early dispute resolution, KPI’s, incentivisation, spirit of mutual trust, open book with contractor and has a system for dealing with variations in price (*Arup Project Management*, 2008).

### JCT Constructing Excellence

The JCT Constructing Excellence contract is based on collaboration, there is a risk allocation schedule, dispute resolution mechanisms and KPI’s (*Arup Project Management*, 2008).

From the literature review, targeting contracts, the following six elements arise that require consideration for inclusion into the model.

#### **7.2.9.1 Target cost should be utilised and set early**

Target cost contracts can provide greater flexibility and allow an earlier start on site (*Construction Industry Council*, 2001). This suggests the use of target cost contracts which agrees with the Author’s MSc research (Hughes *et al*, 2009).

#### **7.2.9.2 Risk management should be incorporated into the contract**

The contract should set out the risks and set out the mechanism for those risks (*Construction Industry Council*, 2001).

#### **7.2.9.3 Contract should promote collaboration such as PPC2000, JCT CE or NEC3 option X12**

Whichever contract is chosen it should support collaboration (*Construction Industry Council*, 2001). The contract that supports collaboration are PPC2000, JCTCE and NEC3 option X12.



#### **7.2.9.4**            *Collaboration Facilitator and Collaboration Advisor should not be in the main contract but all main parties should be*

The Facilitator and Advisor should not be party to the main contract (*Construction Industry Council, 2001*). A multi-party contract could mean that incentivisation is spread through the Supply chain further (*Construction Industry Council, 2001*).

#### **7.2.9.5**            *Advisor collects contract documents*

The Advisor should collect the relevant contract documents (*Construction Industry Council, 2001*). This provides a person responsible for organising the contract data.

#### **7.2.9.6**            *The contract should be referred to*

The contract must be referred to through the project for it to work as it should (Mosey, 2000). This disagrees with one of the Interviewees from the stage one of the research but the Author felt it should be incorporated into the model.

### **7.2.10**            **Elements for Non-Adversarial Environment**

National Economic Development Office (1991) describes collaboration as a “willingness to accept and learn from mistakes without pointing the finger of criticism at individuals.” The Collaboration Facilitator plays a role in dispute resolution and keeping things non-adversarial (Mosey, 2000). Modern day contracts such as NEC 3 with option x12 requires people to co-operate which can support non-adversarial working (*The Joint Contracts Tribunal, 2013*).

From the literature review, targeting a non-adversarial environment, the following five elements arise that require consideration for inclusion into the model.

#### **7.2.10.1**        *Team members selected for team-working ability*

In the first workshop the team should be identifying their roles and responsibilities, identifying fears and concerns and dealing with them and removing people who can't work in a team; these will all help towards a non-adversarial environment (*Construction Industry Council, 2001*).

#### **7.2.10.2      *Alternative dispute resolution utilised***

To back up a non-adversarial environment adjudication should be used rather than escalating problems to arbitration and litigation (Turner, 1997 citing Latham, 1994). The contract should therefore incorporate alternative dispute resolution.

#### **7.2.10.3      *Collaboration Advisor acts as intermediary***

The Collaboration Advisor's role includes maintaining the team and therefore is responsible for trying to maintain a non-adversarial environment (*Construction Industry Council, 2001*).

#### **7.2.10.4      *Incentives used***

Incentives can be used for dispute avoidance and co-operation (Lorraine and Williams, 1997). Again incentives have been used to control behaviour in the literature and will be further examined at the end of the chapter.

#### **7.2.10.5      *Workshops and social events held regularly***

NHS Estates (1997) suggests that the first workshop should include identification of conflict and discussions on how it can be avoided. Construction Industry Council (2005) agrees that workshops are important for discussions, dealing with conflict and problem solving and therefore support a non-adversarial environment (*Construction Industry Council, 2005*). Team-maintaining workshops are a chance to discuss problems and come up with solutions to ensure that it remains non-adversarial (*Construction Industry Council, 2005*). Team-repairing workshops are especially important if things have started to become adversarial in the team (*Construction Industry Council, 2005*). While Samuelsson-Brown (2002) discusses how social events can help towards a non-adversarial environment as it is harder to blame friends. Both will be considered within the model.

#### **7.2.11      *Elements for Regular Meetings Between the Parties (Client and Supply Chain)***

Meetings are frequently stated in literature as a tool for achieving many targeted outcomes. There are different sorts of meetings and workshops. All parties should be present at the workshops (Lorraine and Williams, 1997). At the end of the project a workshop should be held to obtain feedback and learn for the next project (Lorraine

and Williams, 1997). The reason for the first workshop is to establish the team, set the project aims and objectives, encourage innovation and remove people who will not work within a team (Sammuelsson–Brown, 2002). The initial workshop should be used to agree the roles and responsibilities, should address any concerns, setting the project KPI's, organise open book accounting, set pain gain mechanism and to set the action plan (*Construction Industry Council, 2001*). During the first workshop the team should be given the opportunity to carry out problem-solving exercises (Loraine and Williams, 1997). It is important that the team decide the communication mechanism at the first workshop (Loraine and Williams, 1997). Once the first workshop is complete a summary should be issued to all the team (Loraine and Williams, 1997).

From the literature review, targeting regular meetings, the following four elements arise that require consideration for inclusion into the model.

#### **7.2.11.1      *Workshops held at neutral venue***

As expected workshops are considered an important meeting within the literature. The workshops should take place in a neutral venue away from the project (*Construction Industry Council, 2001* and Loraine and Williams, 1997).

#### **7.2.11.2      *Workshop should be relevant to stage of project***

Construction Industry Council (2005) describes how there are four types of collaboration workshops - team building, team maintaining, team completing and team repairing. Team building is the initial workshop and team completing is the final workshop after handover. Team maintaining are the intermediate workshops and team repairing is a fire fighting workshop to get things back on track and hopefully would not be required (*Construction Industry Council, 2005*).

#### **7.2.11.3      *Workshops should be led by the Collaboration Facilitator with Advisor present***

The workshop should be led by a neutral person such as the collaboration facilitator with the presence of the Collaboration Advisor (*Construction Industry Council, 2001* and Loraine and Williams, 1997).

#### **7.2.11.4 Workshops and meetings held regularly**

Sammuelsson –Brown (2002) suggest that the first workshop should be held as soon as possible, whilst Loraine and Williams (1997) suggest that the initial workshop should be arranged as soon as the contract is signed. The workshops should take one to two days (*Construction Industry Council, 2005*). Different authors suggest varying numbers of workshops. A collaboration timetable should be drawn up at the beginning of the project which agrees when meetings and workshops should take place (Mosey, 2000). The European Construction Institute (1996) suggests two workshops, one during concept and one during feasibility, dependent on the individual project. HM Treasury (1996) suggests three - one during feasibility, one during outline design and finally one during technical design. Construction Industry Council (2005) suggests that workshops should be held every 4-6 months (*Construction Industry Council, 2005*). Cabinet Office (2001) suggests that the workshops continue throughout the project. Too few meetings and information is not disseminated efficiently while too many meetings interrupt the flow of the project (*HM Treasury, 1996*). The precise number should reflect the complexity of the project (*HM Treasury, 1996*). The literature suggests different frequencies, for the model the Author had to decide on a frequency. The initial model utilised early workshops then with follow on workshops every 4-6 months. However during the validation of the model this frequency was consider too frequent and so was reduced in the final model.

#### **7.2.12 Elements for Effective Information Sharing**

The most important aspect of collaboration is information-sharing (*National Economic Development Office, 1991*). It is important that information-sharing can occur in a supportive non-judgemental environment (*National Economic Development Office, 1991*). Within any collaborative project it is essential that the means of communication and how knowledge is shared is established early on (*Office of Government Commerce, 2003*). BS11000 was designed to help people with information-sharing (*British Standards Institution, 2011a*). The information management should be covered by the contract (*British Standards Institution, 2011a*). At the end of the project the communication should be evaluated (Loraine and Williams, 1997).

From the literature review, targeting information sharing, the following six elements arise that require consideration for inclusion into the model.

### **7.2.12.1**      *Communication plan drawn up together*

The people that should be involved in deciding the communication strategy are:-

- Client
- Project sponsor
- Project manager
- Senior executive of the contractor
- Project manager's or client's site representative
- Contractor's site manager
- Consultants
- Partnering champions
- Facilitator

(Lorraine and Williams, 1997). The information on the 'who' is clear from this article.

### **7.2.12.2**      *All involved overseen by the Collaboration Facilitator with Client deciding what information is required initially*

The Client should be asking for certain information to be supplied by the Supply chain that improves measurement and management (*Construction Information Service, 2011*). The Facilitator is important in helping to form the communications plan/strategy initially (Sammuelsson-Brown, 2002). This provides some 'how' information and also 'who' information for the model.

### **7.2.12.3**      *Same computer network used*

Computers provides an effective method of sharing information (Prior and Nowak, 2005). This provides another 'how' element for the model.

### **7.2.12.4**      *BIM utilised*

BIM is a system of storing and displaying information required for a project (*British Standards Institution, 2010*). RIBA (2012) defines BIM as covering "geometry, spatial relationships, light analysis, geographic information, quantities and properties of building components. BIM data can be used to illustrate the entire building life cycle, from cradle to cradle (earliest conception, to demolition and reuse). Furthermore the systems assemblies and sequences can be shown in relative scale to each other and

relative to the entire project. The whole process is about different information resources feeding into the documentation, which then becomes a necessary part of the model” (Smith, 2012).

BIM allows all the different disciplines to feed into one information model (Smith, 2012).

BIM should mean less errors on site from clashes and should save time and decrease waste (Smith, 2012). BIM can be used to assist the Facility Manager in handing over a building (*British Standards Institution, 2010*). The aim of BIM is to provide the information when it is required to the correct quality level (*RIBA, 2012*). BIM can, if used correctly, be an excellent way of storing all the information about the building being produced (*Department of Business, Innovation and Skills, 2011*).

#### **7.2.12.5      *Open book accounting for pain share gain share***

Open book accounting is a form of information-sharing that can help with trust and can help with improving the target cost (*The Association of Consultant Architects, 2007*).

#### **7.2.12.6      *Workshops and social events held regularly***

Social events are an informal method of information-sharing but workshops are a much more structured form of information-sharing (Sammuelsson-Brown, 2002). Workshops can be used to exchange information (Emmitt and Christoffersen, 2009). Workshops are good mechanisms for information-sharing; one workshop should be held during the concept stage and one during feasibility depending on the project (*Construction Industry Research and Information Association, 1996*). Cabinet Office (2001) however felt that workshops should be maintained throughout the project. Communications at all levels should be agreed at the initial workshop (Loraine and Williams, 1997). Workshops are more prominent in the literature but the Author has decided to also include social events.

#### **7.2.13      *Elements for Risks are Allocated Fairly***

“Risk is usually referred to as an exposure to losses in a project or as a probability of losses in a project.” (Ahmed *et al*, 2007). Attitudes to risk can have a large impact on the success of the project according to Office of Government Commerce (2003c) and should be backed up by senior management. Collaboration should be the fair sharing

of risk. This can help towards trust within the team (Black *et al*, 2000). Risk management is important in avoiding delays to the project, penalties, having work condemned etc (Ahmed *et al*, 2007). Often value management and risk management should be considered together (*Office of Government Commerce*, 2003c).

From the literature review, targeting risk, the following three elements arise that require consideration for inclusion into the model.

#### **7.2.13.1 Risk register drawn up together allocating to best person and a management mechanism**

The person/s best able to manage the risk should deal with the risk (Nanayakkara, 2003). On complex larger projects a Risk Manager should take charge of co-ordinating the management of the risk register (*Office of Government Commerce*, 2003c). It is important to handle risk as a team as unfair risk transfer can lead to adversarial contracts, conflict and cost from excessive pricing (Nanayakkara, 2003 and Loraine and Williams, 1997). Risk needs to be managed within the project. The risks need to be identified in terms of their impact and their likelihood. A joint risk register should be held (*Office of Government Commerce*, 2003c). Procedures should be agreed on how to manage and monitor the risks throughout the project. The allocation of risk should be discussed as a team with allocation being based on ability to manage the specific risk (*Office of Government Commerce*, 2003c). This risk register needs to provide an open and fair way of handling risk (*Construction Industry Council*, 2001).

#### **7.2.13.2 Risk requirements put into tender documents**

It is easier to manage risks within the contract in a far more organised way if the risk has been handled during the tendering stage (Richmond-Coogan, 2001). The initial requirements for risk management should be within the tender documentation (*Office of Government Commerce*, 2003c). The contract should set out the mechanism for managing risks (*Construction Industry Council*, 2001). The contract and therefore risk management should be in place long before the Contractor starts on site (Mosey, 2000 and Nanayakkara, 2003).

#### **7.2.13.3 Risk workshops held regularly**

The initial team-building workshop should include time to decide how to manage risk (Sammuelsson-Brown, 2002). Risks should be identified as a team in a workshop and

placed on the risk register (*Office of Government Commerce, 2003c*). It is not clear who the team is but the article does describe that workshops should be used again.

#### **7.2.14 Elements for Pain Share Gain Share Mechanism Fair to Both the Client and the Contractor**

Pain / gain mechanisms can increase client satisfaction and reduce the overall project cost (Nanayakkara, 2003). Pain/gain mechanisms can also encourage team work (Heaphy, 2011).

Pain gain is based on the difference between the target and final cost and is paid out at the end of the contract, though some interim payments can be made (Perry *et al*, 1982).

Each party within a construction project has a different agenda which causes a conflict. The contractor and consultants want to make a profit while the client wishes to complete the project at minimum cost (Himes, 1995).

For the Author's research on incentives please see Appendices 8 and 9. Further information on incentives is provided at the end of this chapter in section 7.4.2, which was also used to inform the elements. Cheung *et al* (2005) notes that some research has found that only the client benefits and that the contractor absorbs the extra cost of the partnering arrangement to increase the chances of further work. Construction Industry Council (2001) discusses how incentives should not be used as a chance to attack the contractor's profit margin. In contrast to this Kadefors (2005) discusses that it is the focus on economic incentives which stands in the way of developing true partnering relationships. He found that contractors on pain share / gain share showed no innovation but waited for instructions (Kadefors, 2005).

From the literature review, targeting pain share / gain share, the following six elements arise that require consideration for inclusion into the model.

##### **7.2.14.1 Attitude to risk needs to be discussed**

The incentive contracts payment schedule consists of a fixed fee plus some proportion of the predicted project cost. Usually, the higher the sharing ratio used, the larger the incentive to reduce cost. However the client will expect the contractor to take a greater share of the risk as well. Therefore in order to calculate the optimal sharing ratio it is important to consider the uncertainty in the project, risk aversion and the contractor's



ability to control costs. Construction is unusual in that the project costs are not known when the contract is being drawn up (Weitzman, 1980). It is important that both parties recognize exactly the same possible risks inherent in the project in order to set the incentives correctly. Performance is very hard to judge in construction and so incentives are set on the target cost rather than on the success of the project in terms of quality etc (Sappington, 1991). Agency theory looks at the relationship of a principal engaging the services of an agent to achieve a specific task. The theory examines the fact that the objectives of the agent and principal are not the same and the verifying of the work of the agent is difficult if not impossible. The theory links these problems to the individuals having different attitudes to risk (Eisenhardt, 1989). Risks must be managed if better performance is to be achieved. Also the risk register should be used to inform the incentive level (*Construction Industry Council*, 2001).

#### **7.2.14.2**      *Percentage should be agreed together*

Espling and Olsson (2004) discuss a Swedish partnering project where the aim was to “create a win-win situation where each partner gains more than they would have, through a non-partnering relationship”. The agreed pain share / gain share was 30% between the client and the contractor. Al-Suhbi Al-Harbi (1998) came to the conclusion that it is important that the contractor and client come to an agreement together about the value of the pain / gain percentage.

#### **7.2.14.3**      *Mechanism to recover pain*

Within the contract there may be a requirement to provide a mechanism to recover pain from the contractor (Perry *et al*, 1982). This provides a ‘how’ control element which may be questioned by the contractor but was incorporated into the model.

#### **7.2.14.4**      *Open book accounting*

Open book accounting can be important in target cost and therefore incentive schemes (Richmond-Coogan, 2001). This is another control mechanism within the literature.

#### **7.2.14.5**      *Subcontractor involved in process as well*

Incentives are focused, according to Eriksson *et al* (2007), on the main contractor and client relationship and occasionally with the consultants. This incentivisation does not permeate down the complete supply chain (Eriksson *et al*, 2007). Bayliss *et al* (2004)

argue the need to share the incentives amongst all the key personnel. The Author's research on incentivisation found that incentivisation was not used effectively with the Contractor and found similar results to Eriksson et al (2007) that the incentivisation did not include the supply chain.

#### **7.2.14.6**      *Feedback at end of project*

There needs to be feedback at the end of the contract about the efficiency of the incentive schemes (Richmond-Coogan, 2001).

### **7.2.15**      **Elements for Relationships Between the Parties are Managed**

From the literature review, targeting management of relationships, the following six elements arise that require consideration for inclusion into the model.

#### **7.2.15.1**      *Alternative dispute resolution utilised including arbitration*

The initial workshop should produce a system for resolving conflicts (Alternative dispute resolution) that reduces the likelihood of going to litigation (*Construction Industry Council, 2005*).

#### **7.2.15.2**      *Collaboration Advisor manages relationships*

There are two main people responsible for leading relationship management (the advisor and facilitator). The partnering advisor's role includes managing the relationships of members of the team (*Construction Industry Council, 2001*).

#### **7.2.15.3**      *Collaboration Facilitator forms the team*

The facilitator is also responsible for forming a team in the early stages (*Construction Industry Council, 2001*). However everyone needs to be involved. The facilitator at the first workshop should address people's concerns about each other and deal with any personality clashes that occur (*Construction Industry Council, 2001*).

#### **7.2.15.4**      *Incentives used*

Incentives should be used to motivate individuals and therefore could be used to help to manage relationships (*NHS Estates, 1997*).

#### **7.2.15.5 Roles and responsibilities in the contract**

Part of managing relationships is to discuss roles and responsibilities in the first workshop so everyone is aware of who should be dealing with what, which is written into the contract (*Construction Industry Council, 2001*).

#### **7.2.15.6 Workshops and social events held regularly and concerns discussed**

As with quite a few of the other aspects, social events should be held early in the project (*Sammuelsson-Brown, 2002*). Social events are important for team spirit and therefore can play a part in managing relationships.

According to British Standards Institution (2011a) relationships need to keep striving for improvement otherwise over time they will stale. A team repairing workshop may be required if relationships have started to deteriorate, if any conflicts arise they should be resolved so that the team can move forward (*Construction Industry Council, 2005*).

The workshop can help to manage relationships by setting down the ground rules for communications, risk information management etc (*British Standards Institution, 2011a*). *Sammuelsson-Brown (2002)* agrees that workshops are important for laying the path for the rest of the project.

#### **7.2.16 Elements for Respect for the Input of the Other Team Members**

The author could not find anything in the literature directly relating to respecting the input of other team members. The tools and techniques used in the model therefore relied on personal experience and using the sort of tools used for other aspects. However it is difficult to conceive that the open dialogue aspect in section 7.2.1 could be achieved without a degree of mutual respect.

#### **7.2.17 Elements for Early Involvement of Key Members of the Supply Chain**

The greatest percentage of cost is allocated during early design and therefore to gain the best benefit the team needs to be in place for this (*Defence Estate Organisation, 1996*). The best benefits can only be achieved if the team is brought on board early enough to have an effect (*Greenwood, 2005*). Up to 70% of savings on a project come from including the supply chain (*Greenwood, 2005*).

From the literature review, targeting early involvement, the following one element arose that requires consideration for inclusion into the model.

#### **7.2.17.1 Whole team involved at stage 2**

Early involvement should involve the whole team which should include the client, the consultants, contractor, key specialists, sub-contractors and suppliers (*Construction Industry Council, 2001*). The contractors, certain sub-contractors and key manufacturers should be involved in the project as soon as possible (Egan, 2002).

The Construction Industry Council (2001) agrees that the full project team should be involved as early as possible. Emmitt and Christoffersen (2009) go further and say that the entire team should be in place from the conception to completion.

The literature varies on when the team should be assembled but a few opinions are provided here. The team needs to be in place prior to submission of the detailed planning application (*Construction Industry Council, 2001*). The contractor should be naming the team including the supply chain in the tender document and they should stay in place until the completion of the project (Nanayakkara, 2003). Mosey (2000) agrees that the team should be composed as soon as possible to allow the target cost to be set before starting on site. The team should be put in place as soon as the project brief has been written (*Construction Industry Council, 2001*).

#### **7.2.18 Elements for Aim for a Win/Win Outcome**

Egan (1998) discussed how every member of the partnership should make a fair and reasonable return. Part of working collaboratively should be to establish a win, win situation. A win, win situation is achieved through negotiation. There needs to be a focus on the end game or the negotiations could result in the traditional 'everyone for themselves' (*British Standards Institution, 2011a*).

From the literature review, targeting win / win outcome, the following one element arises that requires consideration for inclusion into the model.

#### **7.2.18.1 Contract should be agreed as a team**

To achieve this, the contract should be agreed together (*British Standards Institution, 2011a*). The establishment of a win, win situation therefore begins prior to signing the

contract (*British Standards Institution, 2011a*). The team is not elaborated upon but the 'how' is provided.

### 7.3 ELEMENTS FOR THE MODEL

From the literature specifically on the 18'essential' aspects the Author identified the following elements. Where the literature gave conflicting views the Author has chosen the elements to be used, based on the Author's experiential knowledge. Table 39 below shows the hard or tools and techniques elements in red and the soft or cultural elements in blue.

Aspect	Element/s
<b>Open dialogue environment</b>	Schedule facilitator to lead <b>workshops early in the project</b> . Set out a <b>communication structure and protocols early in the project</b> . Create a <b>non-judgemental environment in workshops</b> . This can be fostered by <b>regular social events</b> between parties.
<b>A common aim for all contributors</b>	The <b>whole team should be involved</b> in deciding the <b>aims and objectives</b> but especially the client, end user and <b>collaboration advisor</b> early in the project. The <b>output specification</b> should be written clearly and be included in <b>the brief</b> , which should then transfer into <b>the contract</b> . <b>The target cost</b> should be agreed with the contractor prior to construction. Finally <b>workshops</b> should be used to identify and manage the aims and objectives.
<b>Early warning systems to identify any problems</b>	The <b>contract should set out early warnings</b> and a <b>dispute resolution process</b> . There should be a core group of people coordinating <b>early warnings</b> which <b>meet regularly</b> and <b>incentives</b> incorporated to encourage their use.
<b>A problem-solving environment</b>	Everyone needs to be involved in <b>problem solving</b> but this should be <b>led by the collaboration facilitator and advisor</b> . A problem-solving <b>procedure</b> should be put in place and <b>workshops</b> are useful for the discussion of this. <b>Incentives</b> can also be used to encourage a problem-solving environment.
<b>Environment of mutual trust</b>	The team should be <b>established early</b> with <b>workshops</b> and <b>social events</b> used to help form friendships. Everyone should behave professionally and the <b>collaboration advisor</b> should oversee this and formally record intentions in a <b>charter</b> .

	<p><b>Open book accounting and incentives</b> should be used to encourage mutual trust.</p>
<p><b>All team members contribute</b></p>	<p>The <b>right group of people</b> need to be in place. The team should be motivated through <b>empowerment</b> and <b>incentivisation</b>.</p>
<p><b>Team spirit between all personnel</b></p>	<p>A top down approach is required and the client should choose a <b>team that can work together</b>. Team building should start early and continue throughout the project with <b>regular training</b>. Regular social events and <b>workshops</b> should be used to improve team spirit, led by the collaboration <b>facilitator</b> and advisor. Where possible everyone should be <b>housed in the same office</b>. <b>Incentives</b> used to motivated people.</p>
<p><b>Understanding the other team member's roles and responsibilities</b></p>	<p>The <b>whole team should decide their roles and responsibilities</b> together at the first <b>workshop</b> overseen by the <b>collaboration advisor</b> and then reviewed periodically. The <b>correct contract</b> should be used to reflect the roles and <b>responsibilities decided by the team</b>.</p>
<p><b>Contract supporting collaboration</b></p>	<p>The <b>contract</b> should promote collaboration and include all the main parties except the collaboration facilitator and advisor. The <b>collaboration advisor</b> should collect the contract documents which should include the early <b>use of target cost and a risk management strategy</b>. Finally the <b>contract should be referred to throughout the project</b>.</p>
<p><b>Non-adversarial environment</b></p>	<p>The <b>right people should be selected for the team</b> and the <b>collaboration advisor</b> should act as an intermediary. <b>Workshops</b> and <b>social events</b> should encourage friendships to form. An <b>alternative dispute resolution procedure</b> should be utilised. <b>Incentives</b> should be used to motivate people.</p>
<p><b>Regular meetings between the parties (Client and Supply chain)</b></p>	<p><b>Workshops and meetings</b> should be held regularly at a neutral venue. The <b>facilitator</b> should lead the meeting which should be relevant to the project stage.</p>
<p><b>Effective information sharing</b></p>	<p>A <b>communication plan</b> should be drawn up, overseen by the client and <b>collaboration facilitator</b>. Certain facilities such as <b>BIM</b> and use of the <b>same computer network</b> can provide an effective method of information sharing. <b>Workshops</b> and <b>social events</b> should be held regularly as an informal method of information sharing. The type of information shared should also include <b>open book accounting</b>.</p>

<b>Risks allocated fairly</b>	The <b>risk requirements</b> should be put into the <b>tender documents</b> so everyone is aware of them. <b>Risk workshops</b> should be held regularly and a <b>risk register</b> drawn up.
<b>Pain share gain share mechanism fair to both the Client and the Contractor</b>	The percentage of <b>pain share gain share</b> should be discussed together including key subcontractors. They need to <b>discuss attitude</b> to risk and a <b>mechanism to recover pain</b> . <b>Open book accounting</b> should be used. Finally <b>feedback</b> should be given at the end of the project.
<b>Relationships between the parties are managed</b>	The <b>collaboration facilitator</b> should help form the team and the advisor help manage it as an impartial member. The <b>contract</b> should contain the roles and responsibilities and an <b>alternative dispute resolution procedure</b> . <b>Workshops, social events</b> and <b>incentives</b> should be used to reinforce relationships.
<b>Respect for the input of the other team members</b>	
<b>Early involvement of key members of the Supply chain</b>	<b>The team</b> should be formed at RIBA stage 2.
<b>Aim for a win/win outcome</b>	<b>The contract</b> should be agreed as a team to promote inclusion.

Table 39. Elements from literature for inclusion in the model

Table 39 shows that by using both partnering and general construction management literature elements have been identified for most of the 18 ‘essential’ aspects. The only aspect in which the literature failed to mention any elements is ‘respect for the input of the other team members’. All the other aspects had at least one element i.e. ‘aim for a win/win outcome’ has that the contract should be agreed. This is the ‘how’ element but no information is available on ‘when’ it should be agreed and the ‘who’ is only described as ‘a team’ with no explanation of who the team consists of.

In some cases there is another element which was not considered initially which is ‘where’. ‘Regular meetings between the parties (Client and Supply chain)’ discusses that the workshops should be held at a neutral venue. As most of the time ‘where’ is not relevant the Author made the decision to include ‘where’ only when relevant in with the ‘how’ element.

Sometimes all three ‘elements’ have been identified such as Schedule facilitator (who) to lead workshops (tools and techniques) early in the project (when) have been

identified for open dialogue environment. As can be seen from Table 39 there are gaps in the information as the 'how' is often present but the 'who' is less frequent and the 'when' even less frequent. The gaps left in the model after using the literature is addressed in Chapter 8. As described above Table 39 shows the hard or tools and techniques elements in red and the soft or cultural elements in blue. Using a greater variety of literature sources has resulted in both hard and soft elements for the majority of the 18 'essential' aspects. The table shows that 13 of the 'essential' aspects can be controlled or encouraged through the use of a balance of hard and soft elements. There are three aspects which would appear from the literature to be controlled only through hard elements which are:

- Contract supporting collaboration
- Risks allocated fairly
- Aim for a win/win outcome

There was one aspect which would appear from the literature to be controlled only through soft elements which is:

- Early involvement of key members of the supply chain

The Author has utilised both types of worldview which involve the tools and techniques that some researchers recommend and also the social/ cultural spirit that others recommend. This for example can be seen with regards to the non-adversarial environment aspect. Using Crowley and Karim's (1995) categorisation from page 46:

1. By its attributes such as trust and team working.
2. By the process (verb) such as alternative dispute resolution and workshops.
3. Partnering organisation

The construction industry council (2001) think of partnering through its attributes by identifying team members on their team working ability and using a collaboration advisor.

Whereas Turner (1997) takes a more process driven approach to collaboration by using alternative dispute resolution. This is also shown by Lorraine and Williams (1997) in using incentivisation.



The Author by incorporating both the attributes and the processes into the model hopes to achieve a more rounded model that is of practical use to the industry.

As described previously in this second review of the literature the focus was on the identification of elements that potentially either control or encourage the 18 'essential' aspects identified in Chapter Five. In examining the literature the Author found that the traditional source of information from peer reviewed papers did not elicit the amount of information expected. The papers on collaboration especially tend to discuss the aspects but provide little information on elements (full details of the references used are to be found in Appendix 31). The literature from the general construction management theory on the 18 'essential' aspects elicited slightly more information but was not enough to form the framework of a model let alone complete a model. The Author examined other sources of information such as books and government or industry generated documents. These sources elicited far more information on the 'elements' that potentially could either control or encourage the 18 'essential' aspects. Graph 18 below shows the number of documents used to inform the model.

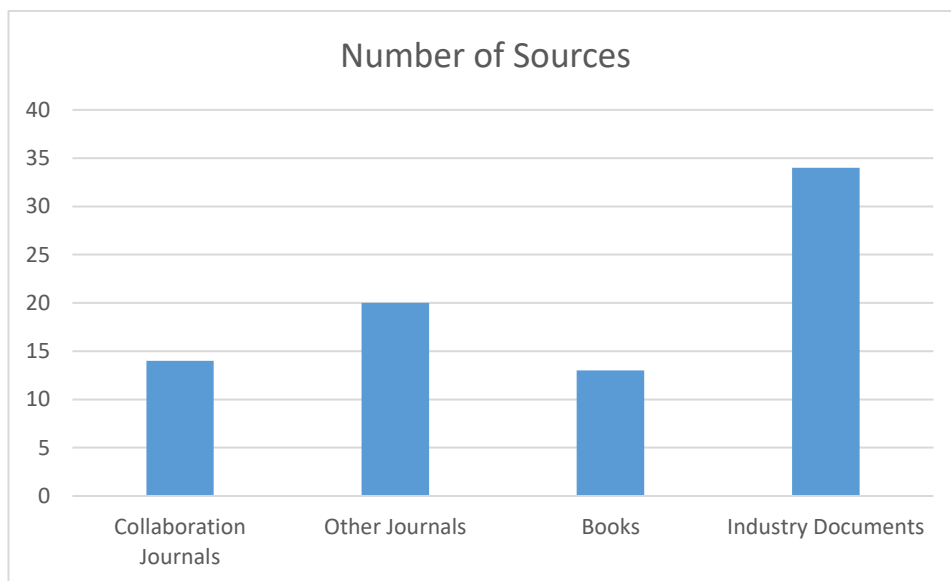


Figure 20. Graph showing the number of individual documents from each type of source

The Author found that 34 journal articles (14 on collaboration and 20 on management) were useful to the production of the model and that also 34 industry

documents were useful to the model. However the amount of useful elements from each source varied greatly as shown in figure 19 below.

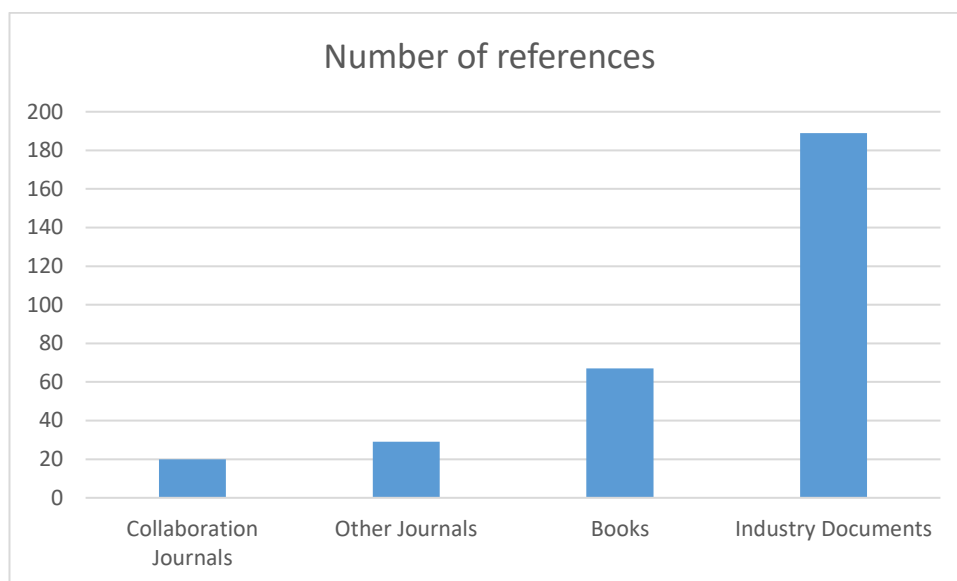


Figure 21. Graph showing the number of references from each source

The government and industry generated documents were more useful to the production of the model. The journals provided a total of around 49 'elements' while the industry documents produced around 189 'elements'. The Author found that they took a far more rounded approach and integrated the hard and soft elements which provided far greater insight into how the model could work.

## 7.4 TOOLS AND TECHNIQUES

The Author felt that some of these eighteen essential aspects use similar 'tools and techniques' which require clarification before use in the model. Therefore workshops and incentivisation will be clarified below.

### 7.4.1 First Workshop

Within the literature workshops are considered as very important to a lot of the 18 'essential' aspects. Collaboration needs to start as soon as the contract is awarded (normally at stage 2) and therefore the first workshop needs to reflect this (Loraine and Williams, 1997 and Samuelsson Brown, 2002). Collaboration should align objectives, establish teamwork and create trust for the whole team (Loraine and Williams, 1997). The team should be asked to contribute to the agenda of the first

workshop when the details of time and location are sent to them (Lorraine and Williams, 1997). This will help to alleviate concerns and engender a sense of ownership in the process (Lorraine and Williams, 1997). The collaboration facilitator should lead the workshop in a neutral venue with no more than 40 people present and utilise brainstorming and team building techniques (Lorraine and Williams, 1997). The agenda for the first workshop according to Sammuellsson-Brown (2002) should include:-

- Alternative dispute resolution
- Identification of key objectives
- Defining roles and responsibilities
- Identify and possibly remove people who cannot collaborate
- Set out risk management

Lorraine and Williams (1997) adds to this list with:-

- Introduction by the facilitator on the collaborative process
- Identification of anything which may be a barrier or opportunity to the process with brainstorming to be used to identify solutions
- Improving performance within the team
- Communication plan drawn up
- Summary of the workshop and drawing up of an action plan

Mosey (2000) states that that a collaboration timetable should be drawn up which should include:-

- Dates for meetings and workshops
- Dates for value management / engineering and risk management
- Date for finalising the project timetable
- Site surveys and investigation
- Health and safety plan
- Integrated design and construction process including granting of consents
- Dates for design team meetings
- List of the supply chain
- Agreement of target cost
- Agreement of incentives, KPIs and targets

- The project brief

Finally the facilitator should circulate the results of the workshop (Lorraine and Williams, 1997).

Using this information, the Author was able to identify when workshops should be carried out and who should be present. This was then applied to the 'essential' aspects that the literature review identified could be controlled or encouraged by workshops.

#### 7.4.2 Incentivisation

Incentives are seen as a method of building trust (Bresnen and Marshall, 2000b). Research found that, out of the mechanisms used, it is the incentives and review meetings which were the most influential on maintaining the partnering spirit (Bayliss *et al*, 2004). Incentives with joint objectives have been suggested as a way of increasing trust (Eriksson and Laan, 2007). For incentives within a partnering arrangement it is misalignment of measurements and rewards and untrustworthy information that is important (Bresnen and Marshall, 2000b).

Kadefors (2005) describes how incentivisation is not a good method for providing the best collaboration as it goes against the partnering ethos. Incentives have been found to bring about self-interest rather than the benevolent attitude required in the collaborative project (Kadefors, 2005). The research indicates that parties prefer collaboration when both risk and trust is high. The feeling of equity is important in a partnership and the feeling that one partner is gaining more from the partnership may cause them to commit less to the partnership (Das and Teng, 2001). In the Author's opinion this is important for incentives.

In contrast Naoum (2003) expresses the view of the majority when discussing how incentives, if used correctly, can be used to motivate teams to consider time or quality. He goes on to discuss how the correct use of incentives could be used to reflect the client's priorities within the project. Milne (2007) discusses how reward and recognition programmes work very well in motivating individuals but that teams are not so easy to motivate. Incentives may focus the objectives of all parties in the same direction (Himes, 1995).

The incentive schemes need to be designed carefully so that they motivate everyone to achieve the common aim (Espling and Olsson, 2004). Incentivisation should link into the KPIs for the project to help achieve the common aim (*British Standards Institution, 2011a* and *Office of Government Commerce, 2003*). Hard and soft issues need to be incentivised differently (Richmond-Coogan, 2001). The incentivisation scheme should be adaptable to evolve with the project (Perry *et al*, 1982).

Incentivisation should not just be utilised with the contractor but the onsite staff and consultants (Bayliss *et al*, 2004). The incentive scheme should reward the correct person for their individual contribution (Richmond-Coogan, 2001). It is important to measure and manage performance if incentives are to work, however this is not carried out as much as it should be (Busi and Bititci, 2006).

Incentive schemes should be designed pre-contract so that there is a level playing field (Richmond-Coogan, 2001). Incentivisation requires the right people in place (Richmond-Coogan, 2001).

Given its importance, many researchers (e.g. Bresnen and Marshall, 2000b, Kadefors, 2005, Luthans *et al*, 2008) have examined how incentives may affect a business relationship. Holmström (1979) discussed the relationship in terms of principal and agent. If the agent is given a fixed wage then there is an incentive to not work to the best of their ability because they get paid anyway. If however the agent is only paid a basic rate and to earn more has to achieve certain targets there is an incentive to work harder. It is important however that both the agent and the principal benefits from this arrangement. The incentive aims to make the agent work for the best interest of the project but there is a risk that the agent will work for their own best interest; this is called the moral hazard. When using incentives with groups of people it is further complicated because not all members of the group may be working for the best interest of the project and there may be 'free-rider' problems (Holmström, 1979).

Badenfelt (2007) found during his research clients expressed the opinion that to give the contractor too high a sharing ratio is counterproductive as they may focus too much on saving money and the quality of the project will suffer. The clients also felt that the target cost was not always set accurately in Sweden. To encourage the contractor to set a realistic target cost it was suggested that the contractor is offered 70% of the savings but only 30% of the losses. Also during the tender process the target costs

were averaged to find the most sensible target cost. The contractor's view was that the earlier they were involved in the process the less the target cost was altered. Finally it was felt that the target cost became more accurate the longer the client and contractor worked together (Badenfelt, 2007). This was not found to be the case by Hughes *et al* (2009).

Researchers such as Shavell (1979) and Badenfelt (2007) use mathematics to calculate the appropriate levels of incentives. The starting point is to calculate the target cost. Once the target cost has been ascertained, the level of pain or gain (incentive) can be set (*The Joint Contract Tribunal*, 1998). Usually, the higher the sharing ratio used, the larger the incentive to reduce cost. The level of perceived risk is used to help calculate the level of incentive and this is difficult to value. Traditionally the higher the sharing ratio, the higher the perceived risk involved in the project and vice versa. Therefore risk adverse contractors will accept a lower sharing ratio. In working out the sharing ratio the client and contractor need to discuss their attitudes to risk, and the probability of achieving the set target cost (Badenfelt, 2007).

Black *et al* (2000) found that adjusting price was the most difficult of procedures to establish within a partnering arrangement and it was important that cost control was maintained.

## 7.5 ROLES

Many roles in construction are well understood such as quantity surveyor, project manager, contractor, sub-contractor and supply chain but others are less well understood. Some of the roles require definition before use in the model.

### 7.5.1 Collaboration Facilitator

The Collaboration Facilitator is described by Construction Industry Council (2005) as an independent professional. The Facilitator needs to be trained in team-building and have the ability to run workshops (*Construction Industry Council*, 2005).

Lorraine and Williams (1997) also suggests that the Facilitator should aid communication and develop common goals that will make the project a success.

## 7.5.2 Collaboration Advisor

Construction Industry Council (2001) describes that the role of the Collaboration Advisor is to help with the selection of the team and guide the collaborative process.

They assist in the team-building process and are responsible for recording the team decisions such as roles and responsibilities, their commitments and expectations.

They are also the first port of call if there are any misunderstandings or disagreements within the team (*Construction Industry Council, 2001*).

Mosey (2000) agrees with this but also includes responsibility for checking contracts for suitability and preparing documents such as joining, prepossession and commencement agreements.

The collaboration advisor needs to provide fair and constructive advice with regards to collaboration, to attend workshops and meetings and to assist in problem-solving (Mosey, 2000).

## 7.6 SUMMARY

This chapter has presented the elements the Author identified from the literature. The literature utilised were Government and industry body publications which yielded more practical information about suitable elements for the 18 'essential' aspects. These specific elements were subsequently used in constructing the initial model as described in the next chapter.

Through the use of guidance from Government and industry bodies a lot of the elements were identified that answered the question about the hard 'tools and techniques' and soft 'cultural' elements. These tools and techniques have been utilised by the industry to control/encourage each of the 18 'essential' aspects. Some information regarding the element of 'who' should be involved was identified but very little information was obtained on the 'when' element for each of the 18 'essential' elements.

The next chapter describes how these gaps in the information were filled so that the model could be completed.

At the end of this chapter workshops and incentives are described as well as the role of collaboration advisors and collaboration facilitators. These terms have been explained for the purpose of clarity as the Author felt that sometimes the terms meant different things to different people.

The next chapter (Chapter Eight) describes the model development, utilising the summaries in this chapter with the correlations from Chapter Five and the extra elements of Chapter Six to produce a draft model, which could then be taken out to experienced personnel and refined.

### **Summary of Chapter Seven**

- 1. Identify the who, when and how (referred to as elements) for each of the 18 'essential' aspects, in order to develop the aspects into a realistic model of practical use on large construction projects.**
  - **The practical guides contained a lot of information on how, less for who and little for when.**
- 2. Clarify certain tools and techniques - first workshop and incentivisation**
  - **What the first workshop should entail and what should be considered with incentivisation has been discussed.**
- 3. Clarify certain roles - Collaboration facilitator and Collaboration advisor**
  - **The terms Collaboration facilitator and Collaboration advisor have been defined.**

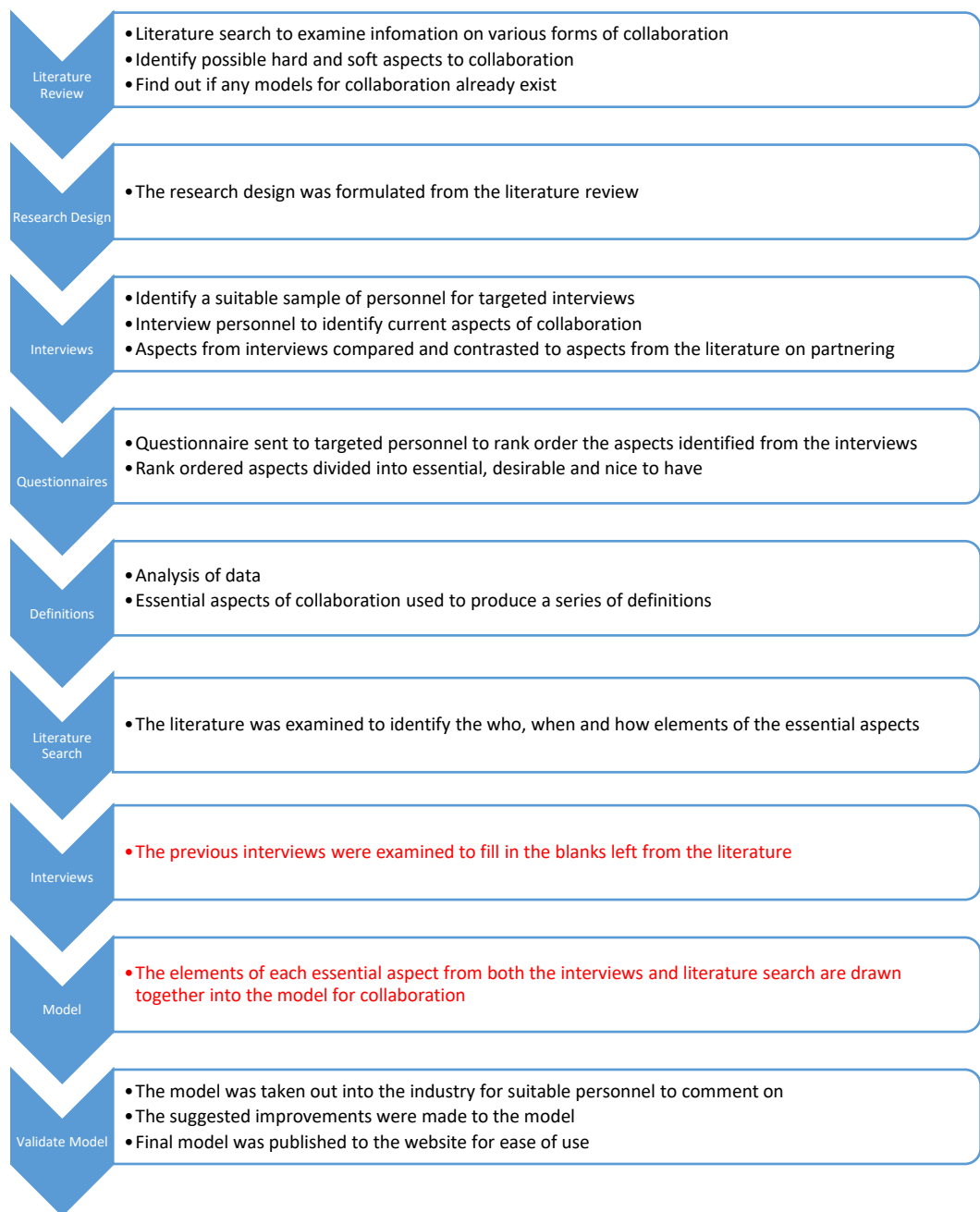


## *Chapter Eight*

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# Model Development

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# Chapter Eight

## Model Development

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### Chapter Eight Aims

- 1 Completion of element lists through the use of the Author's interview data**
- 2 Incorporation of the corporate affinity and experience results into the model**
- 3 Incorporation of the correlation results into the model**
- 4 Describe the framework for the model**
- 5 Present the model**

### 8.1 INTRODUCTION

The previous chapter described the elements (who, how and when) identified from the initial literature review and the Government and industry body publications related to the 18 'essential' aspects. This resulted in lists of elements to be included in the model for each aspect. The elements produced for the model however were not complete. The literature produced a lot of 'how' (tools and techniques) but the 'who' and 'when' were often unidentifiable. To complete stage 3 in producing the model the gaps in the lists needed to be filled. This chapter describes the extra elements that complete the lists. To finalise the model the analysis from Chapter Five (effect of perspective) and Chapter Six (correlations) are also added into the model. Subsequently the completed lists were then used to produce the first draft of the model. Finally the draft model is presented aspect by aspect.

### 8.2 ELEMENTS FOR THE MODEL FOR COLLABORATION

The previous chapter produced a series of elements for each of the 18 essential aspects for use within the model for collaboration. The lists from the secondary sources are however incomplete. 'Respect for the input of other team members' for example was not discussed at all in the literature. Other aspects had little written about them, such as 'aim for a win/win outcome', 'risks allocated fairly' and 'early involvement of key members of the supply chain'.

To address these gaps the transcribed interviews carried out in the first stage of this research together with the interviews from the MSc research were used to complete the lists.

### 8.2.1 Additional Elements from Interviews

As with the previous chapter each 'essential' aspect was examined in turn and the following list of additional elements were produced from the interviews carried out for the Author's research for addition to the model:-

<b>Aspect</b>	<b>Additional Element/s</b>
<b>Open dialogue environment</b>	Interpersonal skills training All team members should share an office
<b>A common aim for all contributors</b>	
<b>Early warning systems to identify any problems</b>	Regular workshops held Communication plan drawn up identifying early warning mechanism
<b>A problem solving environment</b>	
<b>Environment of mutual trust</b>	Target price should be set together The client should consider abolishing the use of retention
<b>All team members contribute</b>	Workshop used to define roles Roles and responsibilities understood
<b>Team spirit between all personnel</b>	Form of charter drawn up about working together
<b>Understanding the other team member's roles and responsibilities</b>	
<b>Contract supporting collaboration</b>	Consider the prior experience of personnel involved Contract should be referred to throughout the project
<b>Non-adversarial environment</b>	Team building training required
<b>Regular meetings between the parties (Client and Supply chain)</b>	Weekly site meetings during RIBA stage 5
<b>Effective information sharing</b>	
<b>Risks allocated fairly</b>	
<b>Pain share gain share mechanism fair to both the Client and the Contractor</b>	Performance should be monitored
<b>Relationships between the parties are managed</b>	Team building training required Unsuitable people need to be removed from the team All team members need to be housed in the same office
<b>Respect for the input of the other team members</b>	The roles and responsibilities should be decided together at the first workshop

	Regular workshops and social events held A supportive environment
<b>Early involvement of key members of the Supply chain</b>	Engineer and advisor in place at stage one Client should know who the end users are at stage one
<b>Aim for a win/win outcome</b>	Incentives should be used Client and contractor should agree the percentages together Open book accounting utilised

Table 40. Extra elements for inclusion in model

These extra elements from the interviews were added to the elements for the model. The elements obtained from the interviews in some cases gave more information about 'who' should be responsible. These were added to the elements from the literature which focussed on the 'how' (tools and techniques). The 'when' however was still often missing from the elements assembled for the model. The literature provided little elements for the essential aspects:-

- 'Early involvement of key members of the Supply chain'
- 'Risks allocated fairly'
- 'Respect for the input of other team members'
- 'Aim for a win/win outcome'

The interviews identified more elements for 'Early involvement of key members of the Supply chain', 'Respect for the input of other team members' and 'Aim for a win/win outcome' to produce a more complete picture. However the interviews yielded no new information on 'Risks allocated fairly'. These gaps in the information were completed by the Author as described in 8.4.

### 8.2.2 Elements from Corporate Affinity and Experience

The analysis in Chapter Five described the effect of perspective on results. Analysis of the effect of corporate affinity on opinions resulted in five extra 'essential' aspects. Analysis of the effect of years' experience on opinion resulted in 11 extra 'essential' aspects. The evolving model was examined to assess if these extra 'essential' aspects have been incorporated into the model within the elements of the 18 essential aspects.

The model utilises elements which explicitly includes:-

- 'Participants achieve a reasonable profit margin'
- 'Regular workshops held'

- 'Open book environment'
- 'Subcontractors involved in core team'
- 'Client leads project'
- 'Early involvement of key members of the supply chain'

The Author felt that the model would also implicitly contribute to the other aspects in the model through the following elements:-

- 'Close supervision of the Contractor and Subcontractor'
- 'Long term relationships develop'
- 'Few to zero claims'
- 'Formal quality control mechanism'
- 'Value engineering utilized'

Having assessed the model no further elements were added.

### **8.2.3 Elements from the Correlations**

The correlation analysis in Chapter Six resulted in eight strong essential aspects correlations. These correlations were examined to identify if the links were already in the lists for the model from the literature.

Six of the correlations were already in the model as they had been identified in the literature:-

- 'Open Dialogue environment' and 'Environment of mutual trust'
- 'Non adversarial environment' and 'Effective information sharing'
- 'Risks allocated fairly' and 'pain share gain share mechanism fair to both the Client and the Contractor'
- 'Environment of mutual trust' and 'pain share gain share mechanism fair to both the Client and the Contractor'
- 'Effective information sharing' and 'risks allocated fairly'
- 'A problem solving environment' and 'non adversarial environment'

The 'how' or tools and techniques between these aspects are similar or share some similarities.

Two correlations from the 'essential' aspects were not present in the evolving model:-

- ‘A problem solving environment’ and ‘environment of mutual trust’
- ‘Non adversarial environment’ and ‘risks allocated fairly’

As described in Chapter Five this links them in terms of the ‘how’ elements. The ‘how’ elements were therefore examined and links incorporated into the model.

An example of how the correlations were present within the model can be seen by examining ‘environment of mutual trust’. ‘Environment of mutual trust’ has a strong correlation with ‘open dialogue environment’ and also ‘pain share gain share mechanism fair to both the Client and the Contractor’.

‘Open dialogue environment’ uses social events and workshops to improve communication and within ‘environment of mutual trust’ social events and workshops are also used. ‘Pain share gain share mechanism fair to both the Client and the Contractor’ uses incentivisation and incentives are also used to aid an ‘environment of mutual trust’. The other correlations show similar interactions within the model. Each of the correlations were examined to check that links like the above were incorporated into the model.

### **8.3 TIME BASED FRAMEWORK FOR THE MODEL FOR COLLABORATION**

Once all the elements had been identified for the model a chronological framework for the model was required. The RIBA Plan of Works 2013 was chosen. The RIBA Plan of Works was first used in 1963 and is described by themselves as the “definitive UK model for the building, design and construction process” (RIBA, 2013). The RIBA Plan of Works was chosen as, although it represents the building sector rather than both the building sector and civil engineering, it is understood by both. The RIBA Plan of Work describes procurement in a linear manner as a process map which allowed the Author to identify points in time when specific team members, tools and techniques should be in use.

### **8.4 ASSEMBLING THE ELEMENTS FOR THE MODEL**

Although the aspects and elements had been identified it was not possible to assemble the full model directly from the assembled elements generated by the Author. In order to complete the model each tool or technique required a person or persons to carry it out and a period of time within which it is to occur. As described previously the literature often said who should be involved but rarely gave a time other than when

workshops should occur. The interviews had yielded more information on 'who' but 'when' was still often missing. The Author therefore used a mixture of the literature, interviews and the Author's experiential knowledge of industry custom and practical project management to complete all three parts for each element. Each 'essential' aspect now has all three elements, the 'how', 'when' and 'who'.

## **8.5 CONSTRUCTION OF THE MODEL FOR COLLABORATION**

The model was then drafted on paper but the Author had to find a way of presenting the model so that it was readable by others. Smart Art within Microsoft Word was used. In order to ensure that nothing was left out the model was written aspect by aspect. Each aspect was presented as a time flow chart from stage 0 to stage 7 from the RIBA Plan of Works (*RIBA*, 2013). Finally the tools/techniques and personnel were placed onto this framework.

## **8.6 AUDIENCE FOR THE MODEL FOR COLLABORATION**

As described previously the model was not designed specifically for the building sector or civil engineering but to be applicable to both. Similarly the model was written with large complex projects in mind but through sensible use it should be possible to adapt the model for use on simpler smaller projects.

## **8.7 INITIAL MODEL**

The initial model was drawn up within Microsoft Word. An example of one aspect is shown in Figure 22 overleaf.

For the full version of the initial model see Appendix 32. The model required instructions on how to read it and so an initial introduction was also written, this is provided in the following chapter.



**A common aim is shared by all contributors to the project.**

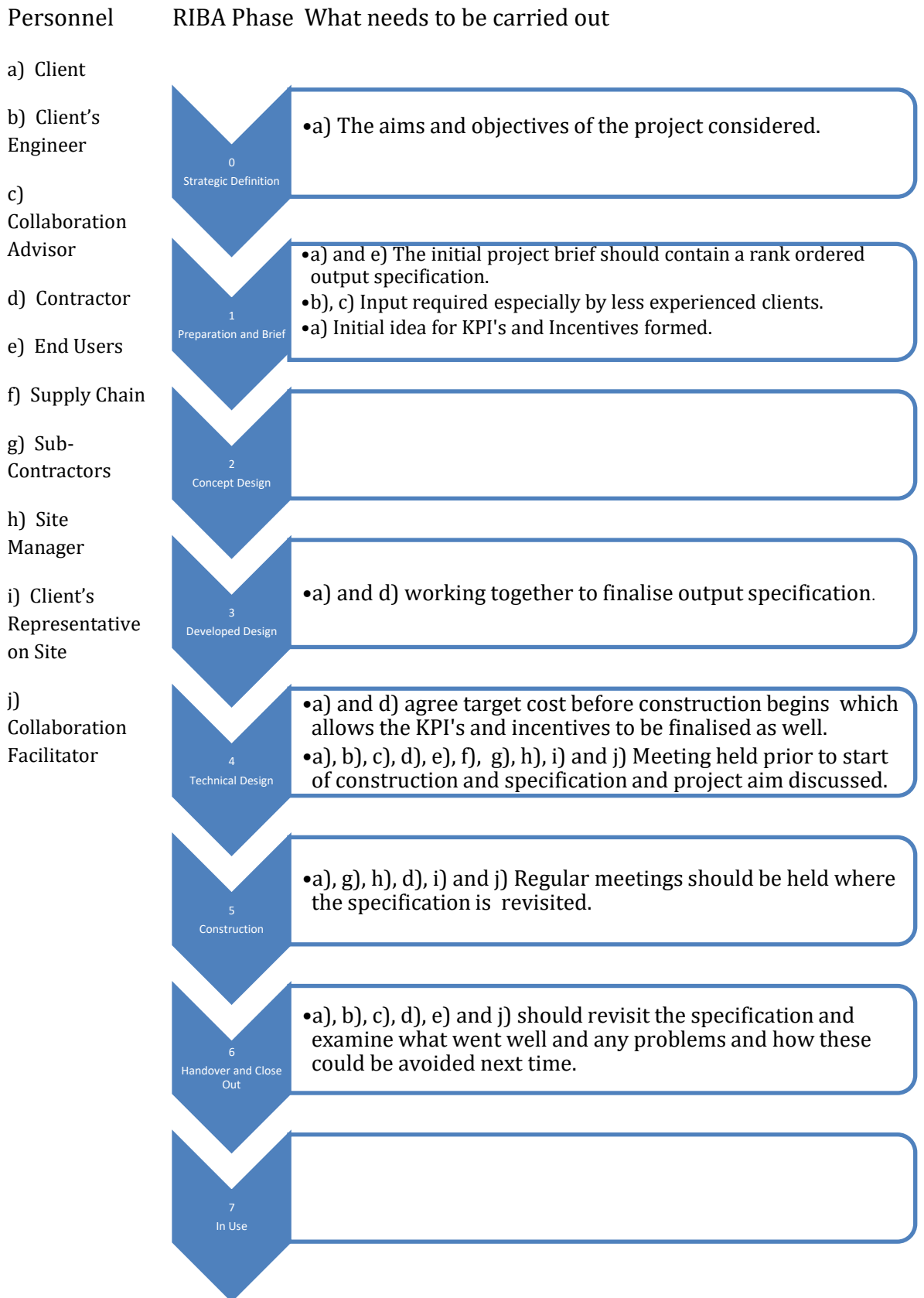


Figure 22. Page taken of the model

## 8.8 SUMMARY

This chapter has presented the extra elements generated from interviews to add to the elements provided from the literature in Chapter Seven. This chapter has also discussed how the analysis of the data on perspective and correlations (from Chapter Five and Six) fed into the model. The use of both sets of data and the Author's experience allowed the construction of a complete model. The model was constructed using the RIBA Plan of Works as a linear framework that is identifiable to both the building sector and civil engineering. To ensure the model incorporates as much experience as possible the literature interviews and correlations were all included. The intension was to increase the likelihood that all personnel should be able to identify with it.

Smart Art within Microsoft Word was used to set the model out in a readable format. Finally the model is presented in Appendix 32. The next chapter discusses the validation of the model and the production of the final version of the model for presentation on the website.

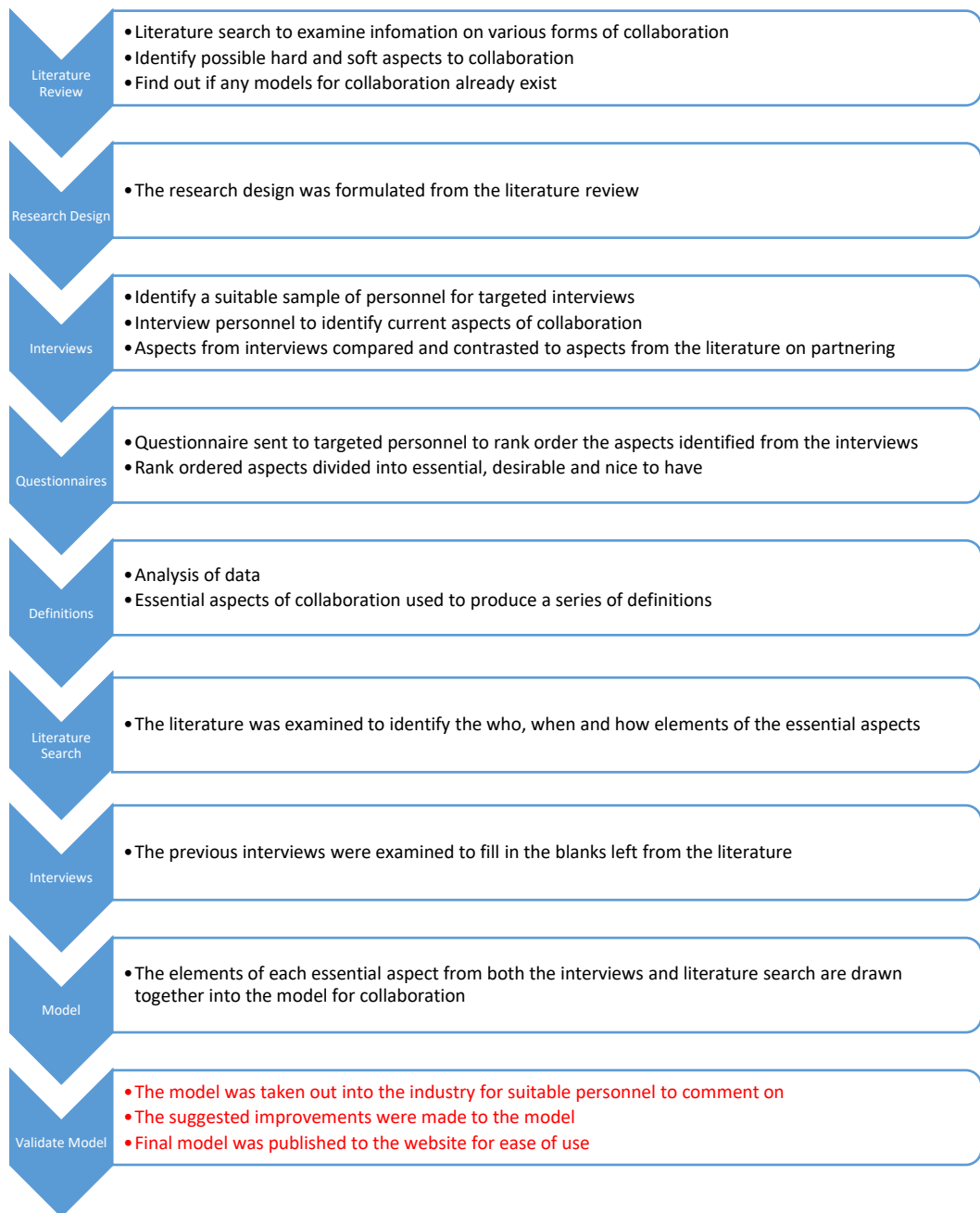
### **Summary of Chapter Eight**

- 1. Completion of elements lists through the use of the Author's interview data.**
  - **Extra elements were identified from the Author's MSc research and phase 1 interviews to complete the gaps left from Chapter Seven.**
- 2. Incorporation of the corporate affinity and experience results in to the model.**
  - **The results of the analysis on corporate affinity and experience were examined to see if they were present in the components of the draft model or if they required incorporation.**
- 3. Incorporation of the correlation results into the model.**
  - **The results of the correlations were examined to see if they were present in the draft model or if it required incorporation.**
- 4. Describe the framework for the model.**
  - **RIBA Plan of Work was described as the framework as although it is building orientated, civil project Personnel can identify with it.**
- 5. Present the model.**
  - **The model is described and an example page of the model included with the full model being presented in Appendix 31.**

## *Chapter Nine*

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# Model for Collaboration Validation



# Chapter Nine

## Model for Collaboration Validation

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### Chapter Nine Aims

- 1 Formulation of interviews**
- 2 Opinions of Respondents established**
- 3 Model refined accordingly**
- 4 Final model presented**
- 5 Model compared and contrasted to published models**

### 9.1 INTRODUCTION

The Chapter Eight discussed the development of the model and this chapter describes the validation or refining it by taking the model out to people in the industry. Interviews were carried out with a new set of experienced Personnel within the industry. The interviews were transcribed and analysed to amend elements within the model. The model for collaboration was then refined and the final model presented in paper and electronic form. Finally the model is compared to the models described in Chapter Two from the literature.

### 9.2 VALIDATION INTERVIEW DETAILS

The previous chapter presented the draft model. The final phase of the research is to identify if the model produced is accepted by people working within the UK construction industry.

#### 9.2.1 Number of Validation Interviewees

Again, it was estimated that five to ten interviews would be required. As described in Chapter Three, it was decided that sufficient interviews had been carried out through diminishing returns. A range of people were interviewed and the Interviewees only suggested minor alterations to the model, generally agreeing with it.

The model was sent to five people prior to being interviewed, who had been chosen to represent the range of experience as described below.

## 9.2.2 Suitability of Validation Interviewees

The research required the interviewing of people who are ‘expert’ in collaboration. Targeted selection was therefore made of Interviewees. Constructing Excellence Wales provided links to possible Interviewees from companies with national experience. In order to assess the suitability of possible Interviewees a few questions were asked. These were asked via email prior to the interview but also reiterated at the beginning of the interviews to confirm. They were asked how many years’ experience they had within collaborative projects. They were expected to have a minimum of five years’ experience within collaboration. So that a broad sample was interviewed they were also asked whether they represented the Contractor or the Client and was their background within the building sector or civil engineering.

The model was tested on people in the industry. A range of people were interviewed as shown in the table below

<b>Code</b>	<b>Role</b>	<b>Represents</b>	<b>Types of Projects</b>	<b>Years’ Experience</b>
1301	Project Manager	Client	Civils	12 Years
1302	Construction Manager	Contractor	Civils	11 Years
1303	Advisor	Neutral	Both	10 + Years
1304	Procurement Manager	Client	Building	10 Years
1305	Construction Manager	Contractor	Building	6 + Years

Table 41. Range of people interviewed for validation

### 9.2.2.1 *Years’ experience of validation interviewees*

Table 41 shows that all Interviewees had at least six years’ experience in collaboration and four out of the five Interviewees had at least ten years’ experience and therefore in the Author’s opinion were an experienced group.

### 9.2.2.2 *Validation interviewees corporate affinity*

The Interviewees were selected so that one neutral Interviewee was interviewed from Constructing Excellence and officers of that organisation introduced the Author to two Clients and two Contractors involved in their current exemplar projects.

### **9.2.2.3 Validation interviewees projects experience**

The Interviewees were selected so that one Client's representative had experience in the building sector and the other had experience in civil engineering. The same was achieved for the Contractor's representatives. The neutral Interviewee had experience of both civil engineering and the building sectors.

### **9.2.3 Interview Process**

The model was sent to the five people who had at least one week to look at the model prior to being interviewed. The model was presented to them aspect by aspect. This was to try to ensure that when the Interviewees were questioned they discussed all the aspects. The Interviewees were asked open-ended questions. Those Interviewed were reminded of each 'essential' aspect in turn and asked to comment on the model.

## **9.3 VALIDATION INTERVIEW TRANSCRIPTS**

All the interviews were recorded and transcribed afterwards. The full transcribed interviews are provided in Appendix 33 but examples are summarised below:-

### **9.3.1 Some Key Elements Derived from Interviews**

#### **9.3.1.1 Interview notes for 1301**

##### **Comments that agreed with the model**

"We did a workshop as soon as the Contractor was appointed."

Suggestions for things that could be useful to the model:-

"We tend to set objectives and then monitor how well we are doing by using KPI's to measure how successful we are. We use surveys to monitor if we are achieving the KPI's."

"I think I need to understand where procurement comes into it or where the appointment of the Contractor comes into it."

##### **Comments which disagree with the model**

"We don't tend to hold workshops at frequencies of four weeks."

## **Overall comment about the model**

“This model should be useful once complete.”

### **9.3.1.2 Interview notes for 1302**

## **Comments that agreed with the model**

“The NEC Suite of contracts is definitely the way to go because they are non-adversarial.”

“The sharing open plan definitely helps because you are doing it day in day out without knowing it really.”

“We use a collaborative tool; it is an intranet tool, it is a filing system.”

“Open book accounting; we do budgets on a monthly basis.”

Suggestions for things that could be useful to the model:-

“We tend to have buffet lunches where everyone can switch off their computers and have a bit of a chat.”

“We also have a project website.”

“We have taken pain gain down to some of our Subcontractors.”

## **Comments which disagree with the model**

“We didn’t do a lot of team building training but it depends on what works in different teams.”

“We certainly will continue to have meetings after construction has finished.”

## **Overall comment about the model**

“That is some tool you have got here”

“It is fairly straight forward, it is common sense and it can be flexible enough to adapt with the team you are working in.”

“It’s good.”



### **9.3.1.3 Interview notes for 1303**

#### **Comments that agreed with the model**

“So you have split this by saying effectively at stage zero they are looking at their own roles and stage one they are looking at the others, yeah I agree.”

Suggestions for things that could be useful to the model:-

“Is there anything anywhere that draws the Client towards a preferred procurement strategy and contract.”

“Handover can be a critical stage.”

“You could build in somewhere along the way for an appraisal of the contract.”

#### **Comments which disagree with the model**

“Collaboration facilitator is not a commonly understood term.”

“Personally I would underplay the social bit only because I feel it detracts from the professionalism of the whole thing.”

“Is there any reason why the concept design stage doesn’t cover anything about common aim.”

“Mutual trust should extend down into the after care services.”

“I think you have to establish the principal of open book accounting before this stage as part of procurement.”

#### **Overall comment about the model**

“My first impression was great, nice and simple, very clean. It’s got people, time and the doing bit.”

### **9.3.1.4 Interview notes for 1304**

#### **Comments that agreed with the model**

“You are working to get the footprint agreed so there are a lot of workshops going on there, yes.”

"I wouldn't disagree with the personnel involved or the principles behind any of that."

Suggestions for things that could be useful to the model:-

"We have a governance chart at about stage 3."

"We use less workshops but use meetings instead."

"We tend to pick our team at two."

### **Comments which disagree with the model**

"I included the End User at strategic definition."

"Workshops, whether they are held every four weeks or six weeks, it is really up to the people involved really isn't it."

"There has to be collaboration between Client, Contractor, Sub Contractor, Agent, Site Manager and the End User at hand over and possibly close out."

"At technical design stage you probably don't need the End User."

### **Overall comment about the model**

"The base of it seemed fine, I think. Virtually all of these would be involved in a collaborative process. It is worth carrying on with this model."

#### **9.3.1.5 Interview notes for 1305**

### **Comments that agreed with the model**

"NEC Option C, which does lend itself to the partnering ethos."

"We do use the early warning system and it is quite a good mechanism really."

"We use an intranet based system."

Suggestions for things that could be useful to the model:-

"We have three risk reviews throughout the project."

"Every member of the team feeds in electronically and we review progress."

“We have certain milestone events through the project.”

**Comments which disagree with the model**

“We carry open dialogue further into hand over.”

“We have two post occupancy reviews.”

**Overall comment about the model**

“It is worthwhile carrying on. It doesn’t exist does it, something like this, it is good definitely.”

**9.3.2 Final Elements for Addition to the Model**

The above is only a selection of the elements but the transcribed interviews were examined and the full range of elements to be added to the final model for collaboration were extracted and are shown below aspect by aspect.

<b>Aspect</b>	<b>Additional Element/s</b>
<b>Open dialogue environment</b>	Client should discuss the project with the End Users from RIBA Stage 0 and with the Engineer as well from RIBA Stage 1. Client and End User should meet for building projects at RIBA Stage 5. Client, Contractors, End Users, Subcontractors, Site Manager and Client’s representative on site should input into soft landings for End User for building handover (RIBA Stage 6).
<b>A common aim for all contributors</b>	End User should consider aims and objectives as well if available at RIBA Stage 0. Client, Contractor and Subcontractors should use KPI’s to measure if aims are being achieved using surveys at RIBA Stage 5.
<b>Early warning systems to identify any problems</b>	Client should be considering the use of a contract utilising early warnings at RIBA stage 1. Client and Contractor should incorporate early warning into the communication plan and make sure everyone is aware at RIBA Stage 2. Client, Contractor, End Users, Sub-contractor, Site Manager, Client’s representative on site and Collaboration Facilitator should meet for hand over especially for building project at RIBA Stage 6.
<b>A problem-solving environment</b>	Meetings should be held as necessary at RIBA Stage 2, 3, 4 and 5. Client, Contractor, End User, Sub-contractor, Site Manager and Client’s representative on site should

	<p>be at meetings where Client and End Users discuss problems with handover and review problem solving throughout project at RIBA Stage 6.</p>
<p><b>Environment of mutual trust</b></p>	<p>Site Manager and Client's representative on site should also be part of team if available at RIBA Stage 2 and 3.</p> <p>Client and Contractor should measure performance using surveys to assess level of trust at RIBA Stage 5, 6 and 7.</p> <p>Whole team should behave in a professional, approachable and consistent manner in RIBA Stage 7 as well.</p>
<p><b>All team members contribute</b></p>	<p>Client and End User should be discussing the project if End User is available at RIBA Stage 0 and with the Engineer as well at RIBA Stage 1.</p> <p>The roles and responsibilities should be placed onto the management structure chart at RIBA Stage 2.</p> <p>Client should monitor performance with KPI's, surveys etc. at RIBA Stage 3, 4 and 5.</p> <p>Client, Contractor, End User, Site Manager, and Client's representative on site should form a soft landings team for handover at RIBA Stage 6.</p>
<p><b>Team spirit between all Personnel</b></p>	<p>Client and End User should be discussing project if available at RIBA Stage 0.</p> <p>Client selects Engineer and other team members on team work ability at RIBA Stage 0.</p> <p>Team skills should be put in tender document at RIBA Stage 1.</p> <p>Copy RIBA Stage 5 into RIBA Stage 6.</p>
<p><b>Understanding the other team member's roles and responsibilities</b></p>	<p>Client and Collaboration Advisor should discuss the role of End User with them during process at RIBA Stage 0 if available.</p> <p>Whole team reminded of roles and responsibilities if a new team member joins during RIBA Stage 3 and 4.</p> <p>Client, Contractor, End User, Sub-contractor, Site Manager, Client's representative on site and Facilitator should be present when team reminded of roles and responsibilities post construction.</p>
<p><b>Contract supporting collaboration</b></p>	<p>Client and Engineer needs to start considering possible contracts at RIBA Stage 0.</p> <p>Client should discuss contract possibly with Sub-contractors as well at RIBA Stage 2.</p> <p>Whole team needs to appraise the contract in RIBA Stage 6.</p>
<p><b>Non-adversarial environment</b></p>	<p>Client should select internal team for team working skills as well as technical ability at RIBA Stage 0.</p> <p>Thorough selection process in the tender RIBA Stage 1.</p>

	<p>Client and Contractor should issue survey or questionnaires to whole team to monitor status of team and problems to be dealt with.</p> <p>Meeting of Client, Contractor, End User, Subcontractor, Site Manager and Client's representative on site held to discuss soft landings approach at RIBA Stage 6.</p>
<b>Regular meetings between the parties (Client and Supply chain)</b>	<p>Client, Engineer and End User should discuss requirements of End User available in RIBA Stages 0 and 1.</p> <p>Client, Contractor, End User, Sub-contractor, Site Manager and Client's representative on site should hold post occupancy meetings at six and twelve months where applicable at RIBA Stage 7.</p>
<b>Effective information sharing</b>	<p>Client and End User if available should start discussing requirements at RIBA Stage 0.</p> <p>Client and Contractor could use websites, Facebook and Twitter to include Stakeholders at RIBA Stage 5.</p> <p>The whole team should have regular meetings to allow discussions of issues and allow the sharing of information at RIBA Stage 6.</p> <p>Client and Advisor should make sure End Users are provided with handover documentation at RIBA Stage 6.</p>
<b>Risks allocated fairly</b>	<p>Engineer assists Client to put together a list of common risks in RIBA Stage 1.</p> <p>Client, Engineer, Contractor, supply chain, sub-Contractor, Site Manager and Client's representative on site should be part of post project appraisal of risk management at RIBA Stage 6.</p>
<b>Pain share gain share mechanism fair to both the Client and the Contractor</b>	<p>Client, Engineer and Contractor should examine risk specific to the project and discuss their attitude to risk in the initial workshop at RIBA Stage 2.</p>
<b>Relationships between the parties are managed</b>	<p>Client and Engineer have meeting with End User if available at RIBA Stage 0 and 1.</p> <p>Client and Contractor should hand out and monitor questionnaire or surveys on relationships between whole team at RIBA Stage 5.</p> <p>Include team maintaining in RIBA Stage 6 as well as 5.</p>
<b>Respect for the input of the other team members</b>	<p>Define roles with Engineer and End Users if available at RIBA Stage 0.</p> <p>Add social events and workshops to RIBA Stage 6, the same as 5.</p>
<b>Early involvement of key members of the Supply chain</b>	<p>Client, Engineer and End User if available should be discussing project at RIBA Stage 0.</p>
<b>Aim for a win/win outcome</b>	<p>Copy RIBA Stage 5 into RIBA Stage 6 about incentives.</p>

Table 42. Additional elements for incorporation in model

Many of the additional elements that were suggested by the Interviewees revolved around the differences between building and civils projects. The building Interviewees wanted the End User more involved early in the process and then more feedback at the end of the project. A new element suggested though was the use of surveys to identify if the soft aspects such as trust was being achieved.

### 9.3.3 Elements for Removing from the Model

The transcribed interviews also suggested the elements be removed from the final model for collaboration. These were extracted and are shown below aspect by aspect.

<b>Aspect</b>	<b>Element/s for Removal</b>
Open dialogue environment	
A common aim for all contributors	
Early warning systems to identify any problems	a) Initial incentive scheme drawn up (RIBA Stage 1). a), d) and g) incentivisation scheme finalised (RIBA Stage 2). Remove mention of 3-4 months on workshops (RIBA Stage 5).
A problem-solving environment	Remove mention of 3-4 months on workshops (RIBA Stage 2, 3, 4 and 5).
Environment of mutual trust	
All team members contribute	
Team spirit between all Personnel	
Understanding the other team member's roles and responsibilities	
Contract supporting collaboration	
Non-adversarial environment	Remove adjudication from RIBA Stage 2, 3, 4 and 5.
Regular meetings between the parties (Client and Supply chain)	Remove mention of 3-4 months on workshops (RIBA Stage 3, 4 and 5).
Effective information sharing	
Risks allocated fairly	
Pain share gain share mechanism fair to both the Client and the Contractor	
Relationships between the parties are managed	Remove mention of 3-4 months on workshops (RIBA Stage 3, 4 and 5).
Respect for the input of the other team members	
Early involvement of key members of the Supply chain	

Aim for a win/win outcome	
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Table 43. Elements to be removed from the model

The Interviewees did not want much removed. They did ask for the frequency of the workshops to be removed and adjudication. There were no other elements that they thought should be removed.

### 9.3.4 Elements Requiring Alteration Within the Model

The transcribed interviews were examined and elements to be altered in the final model for collaboration were extracted and are shown below aspect by aspect.

<b>Aspect</b>	<b>Element/s to be Altered</b>
Open dialogue environment	Workshops should be higher up the list to social events in RIBA Stages 3, 4 and 5 to give them more status.
A common aim for all contributors	Swap “a), b), c), d), e) and j) should revisit the specification and examine what went well and any problems and how these could be avoided next time” with “use project appraisal” instead at RIBA Stage 6.
Early warning systems to identify any problems	
A problem-solving environment	Change ‘collaborative resolution’ to ‘innovative resolution’ at RIBA Stage 1.
Environment of mutual trust	
All team members contribute	
Team spirit between all Personnel	
Understanding the other team member's roles and responsibilities	
Contract supporting collaboration	‘Needs to be referred to throughout the project’ altered to ‘needs to follow the principles of the contract throughout the project’ in stages 4 and 5. ‘PPC2000 is not user friendly’ alter to ‘PPC2000 is jargon heavy’ in RIBA Stage 1.
Non-adversarial environment	
Regular meetings between the parties (Client and Supply chain)	
Effective information sharing	Move social events down the list in RIBA Stage 3.
Risks allocated fairly	
Pain share gain share mechanism fair to both the Client and the Contractor	
Relationships between the parties are managed	

Respect for the input of the other team members	
Early involvement of key members of the Supply chain	
Aim for a win/win outcome	

Table 44. Alterations to be made to the model

The Interviewees suggested rewording a couple of the elements to improve clarity and wanted workshops placed higher on the list so that it emphasizes their importance.

#### **9.4 AUTHOR'S STATEMENT**

The comments about the model were very complimentary and encouraging. The main changes suggested were to do with clarification of the procurement and contract strategy and extending the model to collaborate into the handover phase and include the End User on certain building projects right from the start.

#### **9.5 CONTRADICTIONARY COMMENTS FROM INTERVIEWEES**

The Interviewees' comments were very similar to each other. There were however two areas where there were contradictory comments. This was a divide in the opinions of the Interviewees from a civils background and those from a building background. Interviewees from a building background thought that the involvement of stakeholders and the handover process at the end required further emphasis within the model. The Interviewees from civils however did not see the point in including stakeholders or handover. The model is designed for use by stakeholders in both sectors and so these elements were retained and emphasised with the proviso that it depends if it is relevant to the project. The only other comment that was not incorporated into the model was that the paper based model should be altered to increase the font size; as the model was intended to be web based this comment was ignored. In general though the Author agreed with the Interviewees opinions as they were drawn from their extensive experience and so the alterations etc were incorporated.

#### **9.6 THE FINAL MODEL FOR COLLABORATION**

##### **9.6.1 Presentation of the Final Model for Collaboration**

The majority of the alterations suggested by the Interviewees were incorporated into the final model for collaboration, again aspect by aspect. Some were rejected by the



Author as they did not fit the way the model was to be presented. One individual was looking for a paper based manual rather than a web based model and made comments towards that end. The model divided into the 18 essential aspects is presented in Appendix 34. The Interviewees had commented during the interviews that the model would be more useful if it was possible to read it in other ways. The Author considered two other ways in which the model may be read i.e. by phase or by role.

Once the model was complete in this form i.e. aspect by aspect, the same data were used to produce the model divided into the RIBA phases, which is presented in Appendix 35.

Then also the model is presented by role within the profession in Appendix 36. One aspect of the model is presented here as an example:-

# Open Dialogue Environment

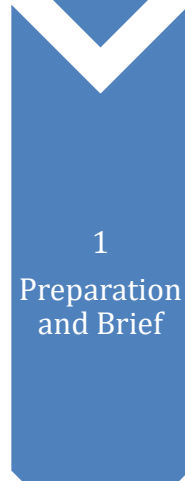
## Personnel

- a) Client
- b) Client's Engineer  
/ Design Team
- c) Collaboration  
Advisor
- d) Contractor
- e) End Users
- f) Supply Chain
- g) Sub-Contractors
- h) Site Manager
- i) Client's  
Representative on Site
- j) Collaboration  
Facilitator

## RIBA Phase What needs to be carried out



- a) and e) discuss project if e) available.



- a),b) and e) Discuss project if e) available.

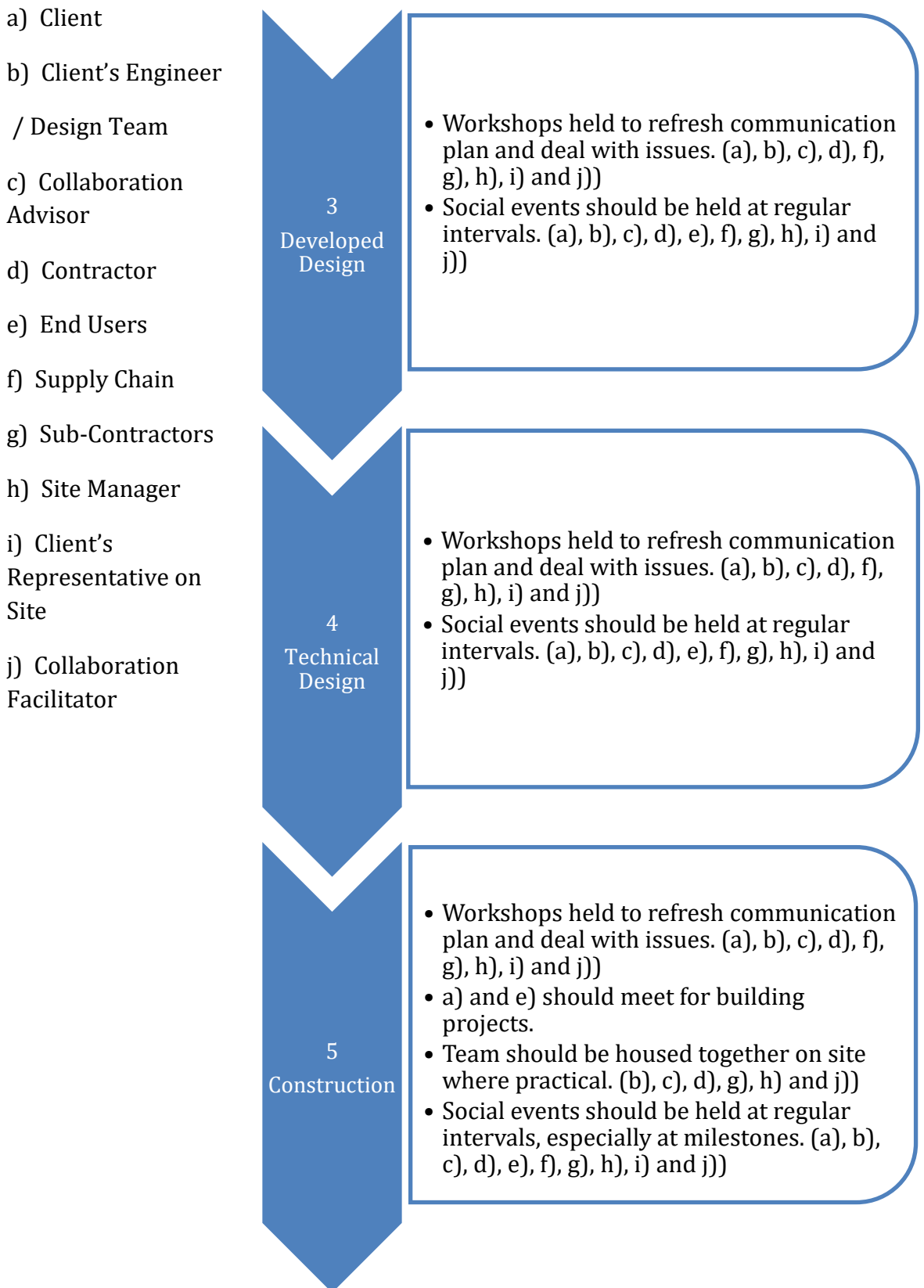


- Initial collaboration workshop should include interpersonal skills training. The participants set up their own communications plan. The workshop should last 2 days and be held in a neutral venue. (a), b), c), d), e), f), g), h), i) and j))
- j) should lead the workshop.
- Social events held to allow team to relax and talk more openly. Held 1 month after 1st workshop. (a), b), c), d), f), g), h), i) and j))

# Open Dialogue Environment

## Personnel

## RIBA Phase What needs to be carried out



# Open Dialogue Environment

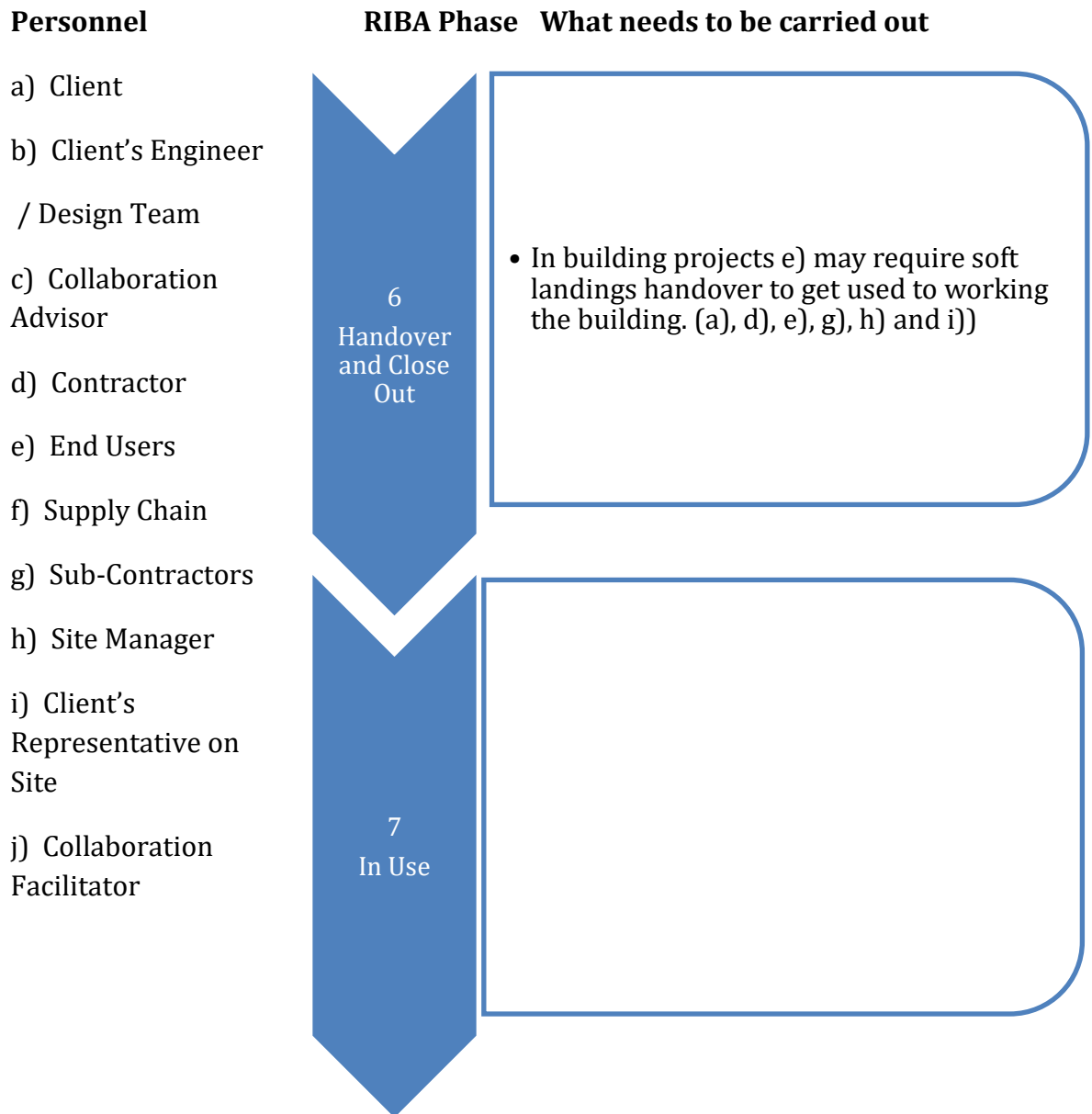


Figure 23. Open dialogue taken from the model

As can be seen from the snap shot shown in Figure 23 above is taken from the version of the model where the user can look up the aspect of interest, in this case open dialogue, and is told for each project phase what needs to be done and by who. The Author decided that the best presentation method would be to use a Smart Art process list which would clearly show the reader what stage of the construction process they are looking at and then providing the tools and techniques and who should be involved attached to the stage of the process.

The model uses both soft and hard 'elements'. For open dialogue it is suggested that social events as utilised as soft 'elements' while workshops and being housed together is used as a hard 'element'.

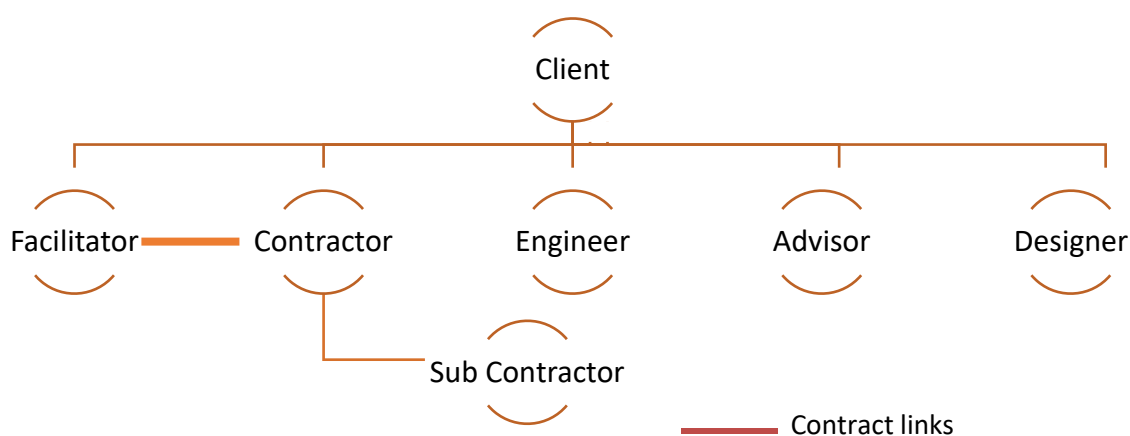
The model has been designed to be of practical use to the industry as it sets out clearly what needs to be done, when and by whom. This is different to the models available in the literature as described later in the chapter in 9.8.

### 9.6.2 Description Put onto Website to Enable Use

The Interviewees discussed the need for information to set the scene and so some information describing the model was produced. The information provided in bold here are the notes added to the website with the accompanying figures.

**It is not possible to design a model that covers every situation and so this model has been designed using certain assumptions, described below. The reader should be aware therefore that they may need to adapt the model to suit their specific project. It may not be possible to bring the team in as early as described which, for simple projects, will not have much effect (or save them money) but for complex projects could result in not making the expected savings.**

**The Client should be central to a collaborative project and therefore the contract strategy should be very similar to that found in traditional procurement. However the Contractor should jointly employ the Facilitator with the Client to retain a more independent status as shown in Figure 24.**



**Figure 24. Contract strategy**

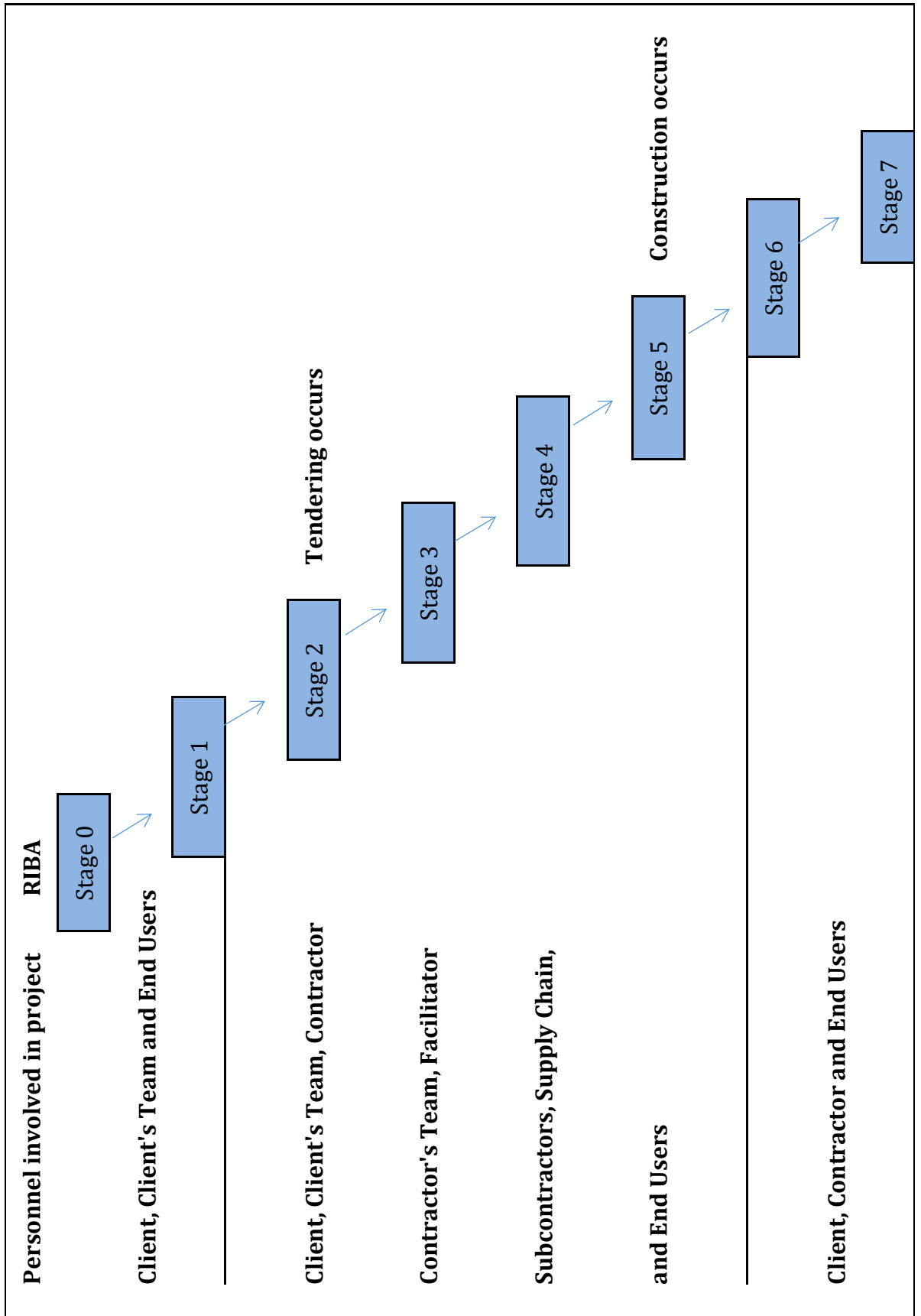


Figure 25. Showing the ideal procurement strategy

**The RIBA Plan of Work 2013 has been utilised as the backbone for the timeframe which, while not used in civils projects is normally understood by professionals in the industry. For clarity, the diagram overleaf (Figure 25) indicates the personnel that it is felt should be involved at each stage of the procurement process. The figure (Figure 25) overleaf also describes where the tender process would take place.**

**What type of project is this model designed for?**

**This model has been written with large complex projects in mind. With these projects savings can be made by including the Contractor early in the design as well as the large ticket Subcontractors and Manufacturers. In simpler projects bringing the Supply chain on board will not make enough savings to warrant the outlay and therefore should be dealt with later in the project.**

Most roles listed in the model are understandable to the majority of personnel in construction but the Facilitator and the Advisor are clarified previously in Chapter Seven (sections 7.5.1 and 7.5.2) and that clarification has been added to the website.

## **9.7 WEBSITE**

The website is currently a work in progress but, in the Author's view, a website was the most convenient method of disseminating the model for collaboration. The model can be searched aspect by aspect, role by role, or stage by stage, depending on the person's interest. The website with the three search mechanisms can be viewed at <https://collaborationinconstruction.wordpress.com/>. The website contains the model but also the background information and as it grows will contain links to useful documents and other websites.

## **9.8 OTHER MODELS**

The literature identified a lot of aspects and some papers identified conceptual models as described in Chapter Two (sections 2.5 and 2.7) however only three models of note were identified.

BS11000 Collaborative Business Relationships (*British Standards Institution, 2010a*) has similarities to the model presented in this thesis in that objectives, value and risk management are common to both. However BS11000 focusses on the production of a relationship management plan. In this research the participants focussed more on the aspects that were important to the actual construction process; therefore target setting, communication and team spirit were seen as more important. The model presented here is more specific to the phase by phase activities of the construction industry, using a time frame, tools and techniques that the industry is familiar with.

Anvuur and Kumaraswamy's model (2007) as described in Chapter Two provided a long list of factors that could be involved in collaboration. However the model contains no details of who should be involved or when these things should be carried out. The model presented within this Thesis however is designed to be a practical model and therefore answers the 'who' and 'when' for each aspect/factor.

Aarseth *et al's* model (2012) provides no indication of the importance of one aspect to another. This Thesis has clearly presented the aspects rank ordered and the essential aspects were used as the basis of the model.

Aarseth *et al's* model (2012) is based on the Norwegian and Canadian construction industry and uses a flow chart with a more general before, during and after framework. The model is simple and only includes management / collaboration. Aarseth's model (2012) does not apply a timeframe to describe when various milestones should be carried out or who is responsible for them.

The simple model presented by Aarseth *et al* (2012) is partially similar to the model presented in this Thesis in that it is solely based on secondary literature sources which form part of the basis of the Author's model. This has resulted in similar tools and techniques being used such as workshops and Facilitators. However the approach is very different.

The model presented in this Thesis is meant to be applied to the UK construction industry and uses the RIBA Plan of Works (*RIBA, 2013*) as a framework. The model includes both management /collaboration as well as legal / contractual components. The Author's model is more complex than Aarseth *et al's* model and was designed more as a 'how to' guide. The model also clearly describes when within the RIBA framework tasks should be carried out and by whom.



## 9.9 SUMMARY

The model was generally very well received and the civil engineering personnel had no issues with the use of the RIBA Plan of Work 2013 as the backbone for the model. The comments made by the Interviewees were divided into additions, removals and alterations. There were very little removals; these were 'use of adjudication' and stating the 'frequency of workshops'. The alterations were quite minor but the interviewees also came up with proposals that had not been identified in the literature, such as using surveys to monitor the status of subjective aspects like trust. The main difference of opinion revolved around building projects needing to involve the End User which civils project personnel did not require.

One comment from all the Interviewees though was that it was not easy reading through 18 aspects. The Author considered it was necessary for the interviews as a framework for gathering focused opinions. The model needs to be paper based for the Thesis. However for use by industry the model needed to be web based. Accordingly a website was developed where people can search through the data aspect by aspect. Also the website can also be searched via the RIBA stage or via their own job role.

This chapter compares and contrasts the models identified from the literature to the model presented within this Thesis. The main differences are that the aspects are ranked ordered and the 'when', 'who' and 'how' (tools and techniques) are identified for each of the aspects. The other models in the Author's opinion are simplistic and cannot be used by practitioners as a detailed guide to achieve successful collaboration.

The final chapter draws together the conclusions of all the research and re-examines the aims and objectives of the research.

### **Summary of Chapter Nine**

- 1. Formulation of interviews**
  - **Open ended questions, interviews carried out of Interviewees from both building and civil engineering projects. Interviews stopped when the Interviewees did not vary.**
- 2. Opinions of Respondents established**
  - **The main suggestions revolved around extending the model into handover.**
- 3. Model refined accordingly**
  - **Additions, removals and alterations made accordingly.**
- 4. Final model presented**
  - **Final model presented in supplementary document.**
- 5. Model compared and contrasted to published models**
  - **Model different to published models as it focusses on the 'who', 'when' and 'how' (tools and techniques) of each aspect.**

## *Chapter Ten*

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## *Conclusion*

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# Chapter Ten

## Conclusion

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### 10.1 INTRODUCTION

The aim of this chapter is to summarise and draw conclusions from the work presented in this Thesis. The PhD research began by identifying the aspects of collaboration then rank ordering those aspects. The aspects once identified allowed definitions of collaboration to be produced. From a total of 48 aspects the most important 18 were used to produce the model on collaboration. Utilising the 18 essential aspects the literature was used to identify people, timing, tools and techniques to produce the initial model. This early version was then refined using information derived from interviews. Having arrived at an unproven version it was taken back to experienced personnel for validation of the model by addition and deletion of elements, prior to the final refinement. The model is presented on a website to assist people in accessing the information. The contribution to knowledge is presented and finally further research is discussed.

### 10.2 PhD RESEARCH AIMS AND OBJECTIVES

As described in Chapter One the research aims presented in the main body of this PhD Thesis, were to:-

- i. Identify what 'aspects' participants require to produce a successful collaborative project;
- ii. Rank order the 'aspects' and utilise these to produce definitions for collaboration; and
- iii. Most importantly, to use these 'aspects' to inform a model for collaboration to achieve the 'successful' projects Egan had discussed.

Thus the 'contribution to knowledge' of this Thesis was the formulation of an effective model for collaboration which aims to improve the likelihood of a successful project.

To aid in following the logic of this research a diagrammatic methodological Thesis Roadmap was provided to assist the reader as shown in Figure 26.

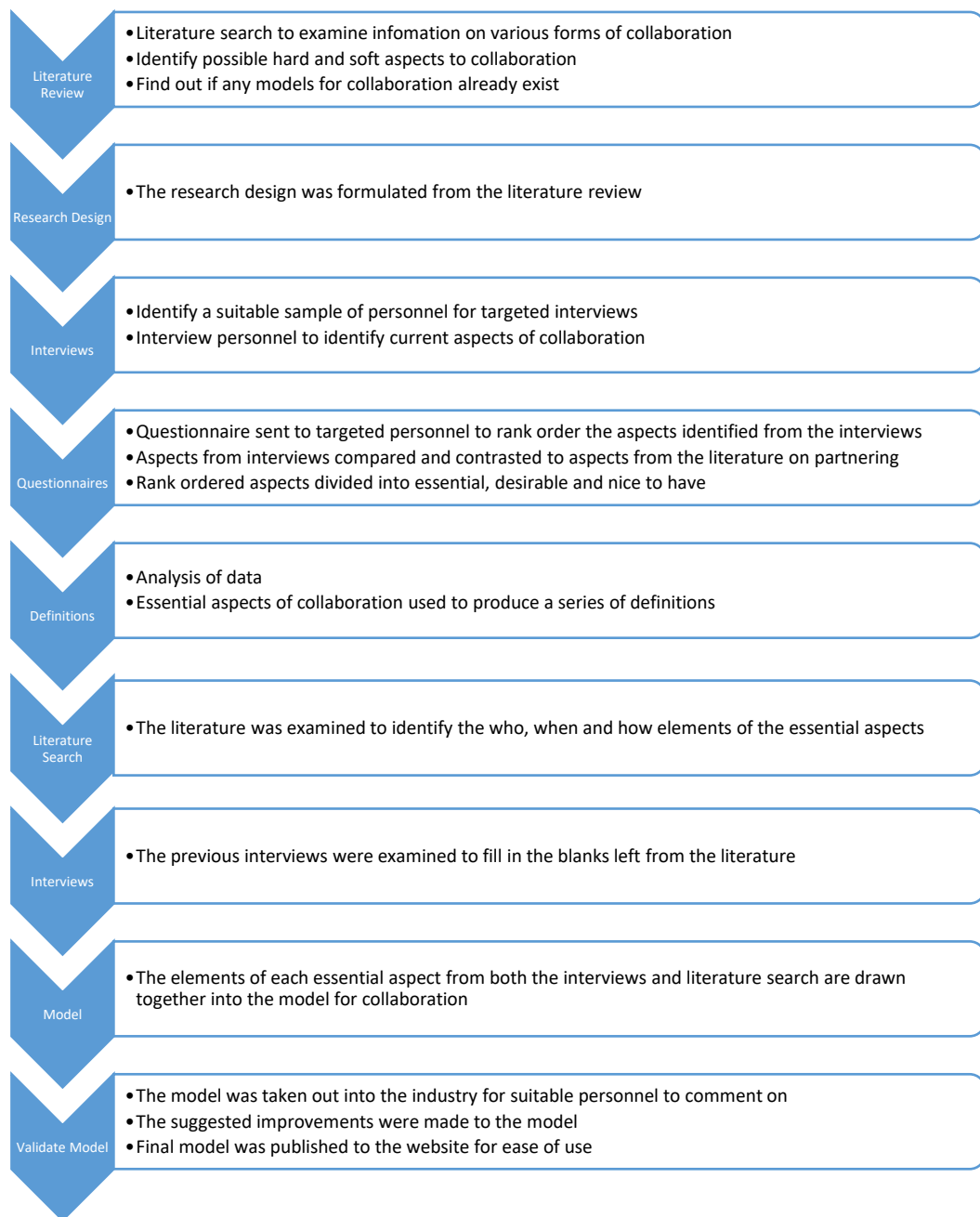


Figure 26. Thesis Roadmap

The objectives were therefore:

Aim One

- i. Identify aspects from the literature on collaboration and categorise them as hard or soft.
- ii. Identify an appropriate sample of personnel for targeted data collection.

- iii. List the aspects which practitioners consider should exist in collaborative arrangements.

#### Aim Two

- iv. Rank order the list of aspects and identify those considered essential.
- v. Produce from the data collected a series of definitions for collaboration.

#### Aim Three

- vi. Identify the 'who, when and how' (or Elements) that contribute towards each aspect of collaboration.
- vii. Produce a model which guides practitioners in improving collaboration.
- viii. Validate the model with suitable qualified personnel.

The aims of the Thesis were met by using the data obtained from secondary and primary sources to identify questions which are necessary in answering the aim. The PhD research questions were:

#### Aim One question

- What are the aspects that currently make up collaboration?

#### Aim Two questions

- What is the relative importance of these aspects to each other?
- What is the current definition for collaboration in the UK construction industry?
- Do people have different ideas of what the definition for collaboration should be?

#### Aim Three questions

- Who should be involved / responsible for the essential aspects?
- When should the various personnel be involved in each of the essential aspects?
- What tools and techniques could be utilised to help bring about the essential aspects?
- Are there sufficient data on timing, personnel or techniques/tools?
- Can a model be designed using the tools/techniques and personnel at the right time, to help produce a successful project?

- Can the personnel in the industry identify with the model and make use of it?

### **10.3 WHAT ARE THE ASPECTS THAT CURRENTLY MAKE UP COLLABORATION?**

Aim One. The initial literature review identified 71 aspects to partnering/collaboration as provided in Chapter Two (section 2.8). The PhD primary research began with a series of interviews which resulted in a list of 48 aspects for collaboration as provided in Chapter Four (section 4.4.3). The aspects provided by the interviews often mirror the aspects discussed in the numerous papers to be found in the literature on collaboration and partnering. The list of aspects produced agreed with Olsson and Espling's work (2004) that it keeps costs down, reduces litigation, completes within time and creates a better working environment. The results also agreed with Evans and Weir (1995) with regards to supervision and trust. The results only agreed with part of Fiedler and Deegan's (2007) findings of why collaboration was adopted. The results agreed with; asymmetry, economic efficiency, expertise, reciprocity and stability. The results did not agree with; legitimacy, government pressure, publicity, setting an example and stakeholder analysis. There seems to be less emphasis in the current climate on Corporate Social Responsibility (CSR) as the Interviewees didn't regard external pressures as important to collaboration. Ngowi (2001) discussed the requirement for dispute resolution systems, whereas the Interviewees' opinion was that, in a non-adversarial environment, it was not as important.

As described previously the interviews (primary research) yielded 48 aspects to collaboration. The literature review resulted in a total of 71 aspects to partnering/collaboration. As described in Chapter Four (section 4.6) there were 40 aspects mentioned in the literature which were not mentioned by the Interviewees. There were also 17 aspects which came out of the interviews which the literature review had not identified. The results show that there are differences between the literature which spans decades and how the industry currently views collaboration. To maintain the integrity of the data and work with the aspects that are currently seen as important to collaboration it was the 48 aspects that were taken forward to the next stage in the research.



Constructing Excellence provided links to experienced personnel from the industry as Interviewees. The Interviewees, when asked the difference between the current use of the word collaboration and partnering, seemed to indicate that collaboration is the “good” parts of partnering. This, in conjunction with the differences between the current research and previous research, could indicate an evolution of collaborative working within the UK construction industry. The Interviewees discussed some aspects more than others which provided an indication that the aspects could be rank ordered.

#### 10.4 WHAT IS THE RELATIVE IMPORTANCE OF THESE ASPECTS TO EACH OTHER?

Aim Two. A questionnaire was designed to identify how important people found the aspects. The results of the questionnaires resulted in a rank ordered list of aspects in Chapter Five (section 5.4.2). By analysing the total score with the individual scores it was possible to identify which aspects are essential to the success of collaboration. The table below shows the 18 essential aspects.

<b>Aspect</b>
Open dialogue environment
A common aim for all contributors
Early warning systems to identify any problems
A problem-solving environment
Environment of mutual trust
All team members contribute
Team spirit between all personnel
Understanding the other team member's roles and responsibilities
Contract supporting collaboration
Non-adversarial environment
Regular meetings between the parties (Client and Supply chain)
Effective information sharing
Risks allocated fairly
Pain share gain share mechanism fair to both the Client and the Contractor
Relationships between the parties are managed
Respect for the input of the other team members
Early involvement of key members of the Supply chain
Aim for a win/win outcome

Table 45. ‘Essential’ aspects

The desirable and 'nice to have' aspects are listed in Chapter Five sections 5.4.2.2 and 5.4.2.3 respectively.

## **10.5 WHAT IS THE CURRENT DEFINITION FOR COLLABORATION IN THE UK CONSTRUCTION INDUSTRY?**

Aim Two. By incorporating the 18 essential aspects of collaboration from the overall data into a definition it would read as:-

**Collaboration within the UK construction industry is a non-adversarial team based environment where, through the use of the correct contract, everyone understands and respects the input of others and their role and responsibilities. The relationships are managed with the help of regular meetings, early warning systems, open dialogue and risk sharing to produce an atmosphere of mutual trust where information is shared, problems can be solved together and everyone contributes towards a common aim motivated by a fair method of pain share gain share.**

The definition has been published in three peer reviewed publications (Hughes *et al*, 2010, 2011 and 2012, see Appendix 37, 38 and 39). The journal paper has been cited six times to the Author's knowledge. The University of the West of England also contacted the Author to discuss the definition and use in their lectures.

## **10.6 DO PEOPLE HAVE DIFFERENT IDEAS OF WHAT THE DEFINITION FOR COLLABORATION SHOULD BE?**

Aim Two. Based on the interview data the definition of collaboration varies to an extent according to the person's perspective.

### **10.6.1 Definitions of Collaboration by Corporate Affinity**

The data were divided by corporate affinity, and the resulting list of essential aspects were used to produce the definitions in Appendix 27. Many of the essential aspects were common to all definitions (as published in Hughes *et al*, 2010, 2011 and 2012, see Appendix 37, 38 and 39). The Client appears to focus more on control while the Contractor has a more commercial focus.

### **10.6.2 Definitions of Collaboration by Experience**

Examination of the data by experience also gave slightly different results although a lot of the essential aspects from the amalgamated results were present. The definitions for each experience group is provided in Appendix 28. Apart from 'open book environment' as experience increased the importance of control decreased.

### **10.6.3 Definitions of Collaboration by Role**

The data indicates that different roles also slightly alters the perception of what collaboration is. However, due to numbers of respondents' definitions could only be drawn for quantity surveyors and project managers as shown in Appendix 29. The Quantity Surveyor focusses on finance while the Project Manager focusses on the team and communication.

The research identified 18 essential aspects. In the Author's opinion the differences in opinions of various categories of personnel were similar enough to allow the use of the data as a whole and this was backed by the statistical results. The model needed to be representative of the many professionals involved in the industry and therefore once the model was drafted these extra aspects or differences were checked within the model to make sure they had been addressed.

## **10.7 WHO SHOULD BE INVOLVED/RESPONSIBLE FOR THE ESSENTIAL ASPECTS?**

Aim Three. The literature discusses the involvement of the Supply chain, Advisor, Facilitator and the Client with regards to some of the aspects such as mutual trust, but is less forthcoming about who should take the lead with 'tools and techniques'. Also literature is scarcer on the involvement of the End User and site management personnel. The interviews carried out previously were then used to fill in the gaps.

## **10.8 WHEN SHOULD THE VARIOUS PERSONNEL BE INVOLVED IN EACH OF THE ESSENTIAL ASPECTS?**

Aim Three. The literature was often very vague about when things should occur. The use of the RIBA plan of works (RIBA, 2013) meant that the timing needed to be more precise. The least amount of data was available from the literature on when things should occur. The previous interviews were used to fill the gaps.

## **10.9 WHAT TOOLS AND TECHNIQUES COULD BE UTILISED TO HELP BRING ABOUT THE ESSENTIAL ASPECTS?**

Aim Three. The literature supplied most of the 'tools and techniques' for most of the aspects within the model. For some aspects the literature did not say very much, such as 'respect for the input of others' however. The interviews were used to fill in the final gaps and to complete the draft model.

## **10.10 ARE THERE SUFFICIENT DATA ON TIMING, PERSONNEL OR TECHNIQUES/TOOLS?**

Aim Three. The literature did not provide all the data required for the model. As described in the previous sections the literature provided a lot of 'tools and techniques', a large amount of the personnel but was especially poor on the timings. Therefore there were a lot of gaps in the model. The interviews were used to fill in the gaps to complete the draft model.

## **10.11 CAN A MODEL BE DESIGNED USING THE TOOLS/TECHNIQUES AND PERSONNEL AT THE RIGHT TIME TO HELP PRODUCE A SUCCESSFUL PROJECT?**

### **10.11.1 Initial Model**

Aim Three. The model uses the 18 essential aspects to collaboration identified during the definition research. Utilising the literature as a source of practical guidance and then interviews to fill in the gaps the draft model was completed. Each 'tool or technique' had a time for it to be carried out and a person or persons responsible for it. The initial model used the RIBA plan of work (RIBA, 2013) as the time framework. This initial model is shown in Appendix 32.

### **10.11.2 Final Model**

Aim Three. The initial model was shown to experienced personnel from the building and civil engineering sector and they were then interviewed. The Interviewees were happy with the use of the RIBA plan of Work (RIBA, 2013) as the backbone of the model to identify the stage of the procurement process and the use of a mixture of both primary and secondary research to apply the right 'tools and techniques'. Some 'tools and techniques' were utilised early or later in the process after the model had been

validated but very few changes were required to the model. What the Interviewees were more concerned about was clarification of the nature of the projects it was intended for, the procurement strategy, the contract strategy and definition of the roles of various personnel. They also didn't think that to have to read through 18 aspects would draw in the intended market and so the data in the model was restructured so that the data can be searched by phase and also by role. The three models are shown in Appendices 34, 35 and 36.

#### **10.12 CAN THE PERSONNEL IN THE INDUSTRY IDENTIFY WITH THE MODEL AND MAKE USE OF IT?**

Aim Three. The interviews provided a list of items to add, remove or alter within the initial model but overall there were not many changes. The changes were made accordingly. Some of the main changes were more about clarification of the sort of situations in which the model should be applied and explaining some of the roles. The overall comments about the model were very positive and the model altered to produce the final model and the additional clarification was produced.

#### **10.13 WEBSITE**

The paper copy of the model can be viewed in the supplementary document. However for convenience of use a website has been utilised as a platform for displaying the model. The website was up dated to incorporate the concerns of the interviewees. The website is functional but requires polishing and can be viewed on <https://collaborationinconstruction.wordpress.com/>. Constructing Excellence Wales has asked the Author to link the website with theirs once complete.

#### **10.14 SUMMARY**

The research has identified 18 essential aspects. This produced a series of detailed definitions for collaboration. Examination of the literature and interviews allowed the production of a model. The model uses 'tools and techniques' by certain personnel at specific times. The validation interviews provided positive feedback about the usefulness of the model. However the real test of the model will only come from its use in live projects.

## 10.15 CONTRIBUTION TO KNOWLEDGE

As described above all the aims and objectives were achieved. This PhD research has provided a list of 48 aspects that were all considered part of a successful collaborative project. Through comparisons with the literature it was identified that the industry appears to be evolving the partnering approach into 'collaboration'. Through the use of questionnaires the 48 aspects were rank ordered. Eighteen of these aspects were identified as essential. From this data, definitions of what collaboration means to the UK construction industry were produced. Finally the research produced a model using the 18 essential aspects which should allow clients, contractors and consultants to improve their understanding of collaboration and provide guidance on what they should be doing at the various stages of procurement. This model is then provided on a website for ease of use. A snapshot of the model is shown in Figure 27.

# Open Dialogue Environment

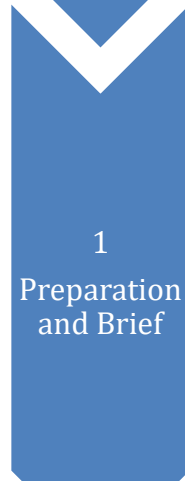
## Personnel

- a) Client
- b) Client's Engineer  
/ Design Team
- c) Collaboration  
Advisor
- d) Contractor
- e) End Users
- f) Supply Chain
- g) Sub-Contractors
- h) Site Manager
- i) Client's  
Representative on Site
- j) Collaboration  
Facilitator

## RIBA Phase What needs to be carried out



- a) and e) discuss project if e) available.



- a),b) and e) Discuss project if e) available.

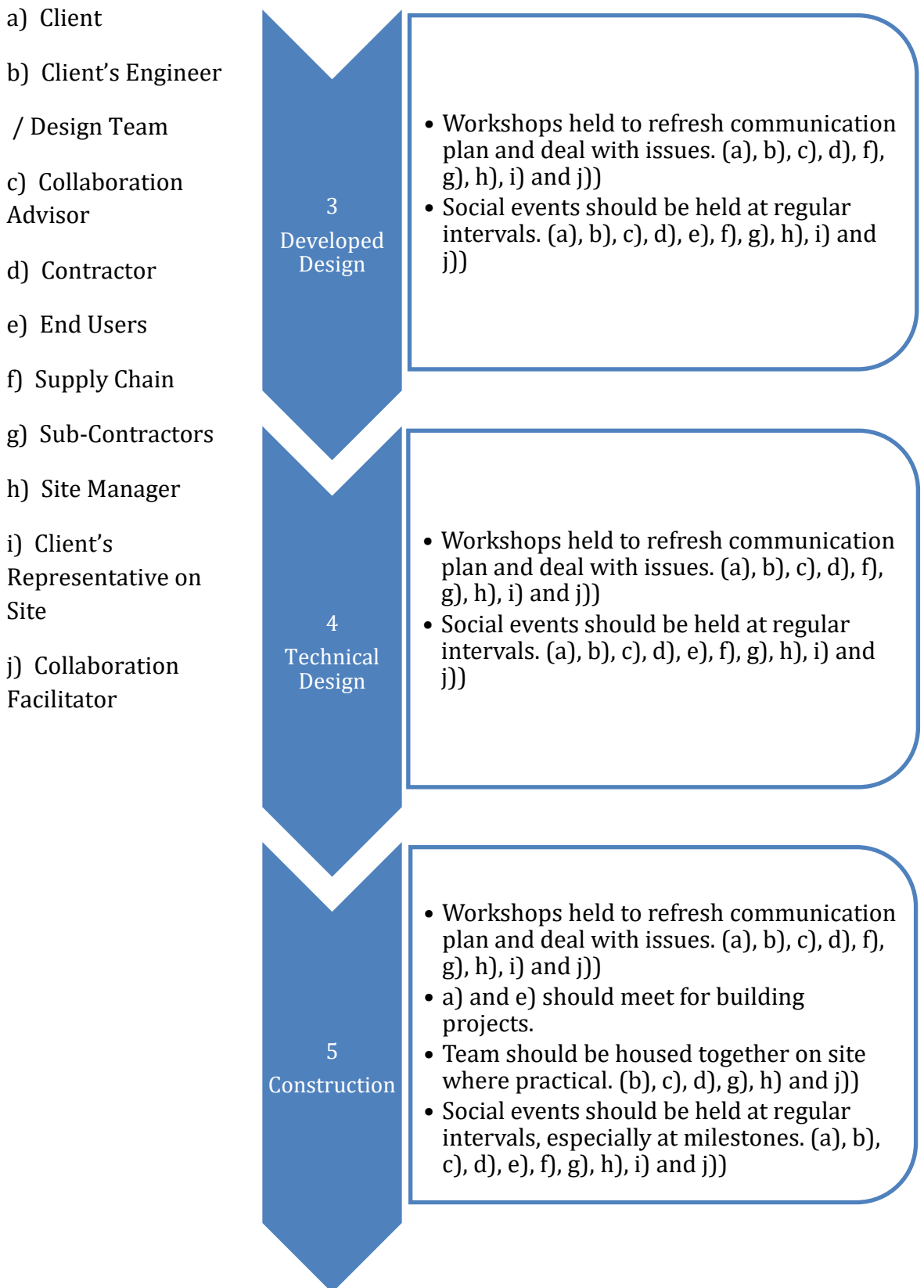


- Initial collaboration workshop should include interpersonal skills training. The participants set up their own communications plan. The workshop should last 2 days and be held in a neutral venue. (a), b), c), d), e), f), g), h), i) and j))
- j) should lead the workshop.
- Social events held to allow team to relax and talk more openly. Held 1 month after 1st workshop. (a), b), c), d), f), g), h), i) and j))

# Open Dialogue Environment

## Personnel

## RIBA Phase What needs to be carried out





# Open Dialogue Environment

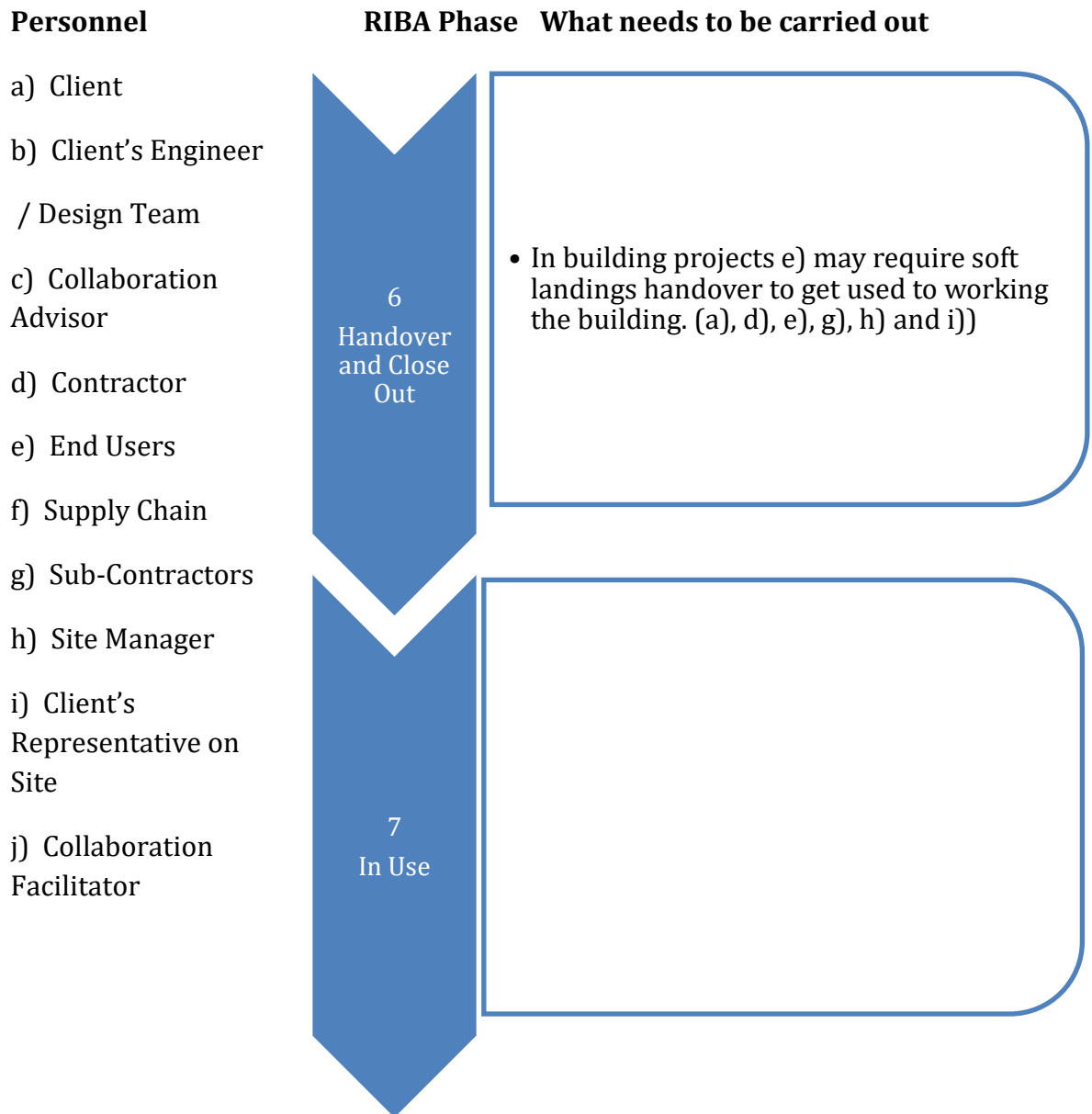


Figure 27. Snap shot of model

## 10.16 FURTHER RESEARCH

The research presented in this Thesis identified aspects to collaboration which are 'desirable' or 'nice to have' in an ideal situation, but these were not incorporated into the model. The model would have been too cumbersome if all the aspects were in one model. However these aspects could be used to produce an advanced model for collaboration for those personnel that have become accomplished in the use of the 'essential' aspects and want to gain more from collaboration.

Also the number of questionnaire responses were sufficient to rank order the aspects for the model but were not sufficient to allow the drawing of conclusions about how the roles of personnel affect the definitions. Extension of this research could involve further investigation of how particular roles affect definitions of collaboration. Further questionnaires should be sent out to particular roles until a conclusive result is established. The results of how role affects their perception of collaboration could be fed back into the model.

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## *Appendices*

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# Appendices

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