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Abstract: <p>The alliance contract method is a relatively new project delivery method that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. The result of it being so new is that it is still unclear around the world as to what exactly an alliance is and for what projects it is suitable. This thesis explores the concept of alliancing in the context of large infrastructure projects by comparing the results of a literature and document study with results obtained from interviews conducted in the UK, Finland and Australia.</p> <p>This research shows that alliancing can be identified by 25 “hard” elements and that it is most likely the case that no single element is unique to alliancing, but rather it is the unique combination of elements that really makes the alliancing model a unique project delivery method. The study identified twelve project characteristics that make a project suitable for alliancing, along with an explanation of how the alliance elements address these characteristics. Existing success factors were studied, their relevance in a modern, practical context were challenged, and new success factors were identified. A number of barriers are presented that should be considered when undertaking an alliance. Current and future trends are explored.</p> <p>These findings will help assist academics and practitioners new to the alliancing method to understand what alliancing is, when to use it, what to consider, and how to make it successful.</p>
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Keywords:

1. Alliancing
2. Infrastructure
3. Project Delivery Method
4. Contract

ABSTRACT

The alliance contract method is a relatively new project delivery method that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. The result of it being so new is that it is still unclear around the world as to what exactly an alliance is and for what projects it is suitable.

This thesis explores the concept of alliancing in the context of large infrastructure projects by comparing the results of a literature and document study with results obtained from interviews conducted in the UK, Finland and Australia.

This research shows that alliancing can be identified by 25 “hard” elements and that it is most likely the case that no single element is unique to alliancing, but rather it is the unique combination of elements that really makes the alliancing model a unique project delivery method. The study identified twelve project characteristics that make a project suitable for alliancing, along with an explanation of how the alliance elements address these characteristics.

Existing success factors were studied, their relevance in a modern, practical context were challenged, and new success factors were identified. A number of barriers are presented that should be considered when undertaking an alliance. Current and future trends are explored.

These findings will help assist academics and practitioners new to the alliancing method to understand what alliancing is, when to use it, what to consider, and how to make it successful.

PREFACE

This study has been conducted to satisfy the requirements of the NTNU subject, TBA4910 Project Management, Master Thesis. It builds upon the pilot study undertaken for the subject, TBA4530 Specialisation in Project Management and Construction Engineering, in autumn 2015. The study was supervised by Ola Lædre, Associate Professor at the Department of Civil and Transport Engineering and guided by Ali Hosseini, PhD candidate at the Department of Civil and Transport Engineering.

This document is divided into three parts: Part 1 – The Master Thesis, Part 2 – Research Articles, and Part 3 – Appendices.

Based on the results from the study performed in this master thesis, two conference papers were published. A paper titled *The Characteristics of Australian Infrastructure Alliance Projects* was published based on the literature study and findings of the Australian interview series, as laid out in this thesis. I presented the paper at the Sustainable Build Environment (SBE) conference in Tallin, in October 2016 (*Young et al., 2016a*).

A key finding from the interview in Finland was that they have started experimenting with the introduction of lean construction into their alliance projects. This finding initiated an offshoot of this research, which resulted in a second conference paper titled *Alliancing and Lean Construction Principles*. I presented this paper at the International Group for Lean Construction (IGLC) conference in Boston in July 2016 (*Young et al., 2016b*). The paper takes a theoretical look at the relationship between alliancing and lean construction, which can then be used to compare against the practical findings that will stem from the experiences in Finland. If the results in Finland appear to be successful, then we could see the beginning of a new trend in the field of alliancing. A follow up paper is being written to submit to the IGLC2017 conference. A draft version is included in Part 2.

This study is original, independent work by the author, Brendan Young, with supervision and guidance from Ola Lædre and Ali Hosseini.

Trondheim, 1 December 2016

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I would like to acknowledge those who helped contribute to this study. I would like to thank Don Ward, Construction Excellence; Ces Shaw, PTP Associates; Mike Lyons, HS2; Simon Diggle and John Cole, Highways England; and Roger Dickinson, Lee Ratcliffe and Liz Baldwin, Network Rail and the Wessex Capacity Alliance who took the time out of their busy schedules to allow us to interview them in London.

For their help with the pilot study, I would also like to thank Peter Letts from RMS for giving me the details of project managers experienced with alliancing and the permission to contact them, and Tony Gant, Ian Allan and Ross Abraham who were helpful enough to respond to my questionnaire.

I would like to thank Vison Alliance Partners Oy, particularly Miika Ronkainen, Rami Tuokko and Anders Nordström, for taking the time to meet me in Finland to discuss the Finish experience with Alliancing.

From Australia, I would like to thank Ray Hezkial, Ross Abraham, Peter Trueman, Peter Letts, Jim Ross, Richard Moorewood, Steve How Lum, Ian Allan, Peter Wellings, George M, Frank De Santis, Peter Chatburn, Adrian Pearse, Tim Hanh, Warren Stalder, Ian Matthews, James Gregory, Alan Clegg, Kate Champman, Michael Leach, Ross Hamilton, Andrew Cartlidge, Mark Hazebroek, Holly Dinh, and Jim Dingwall for taking the time to share their wealth of experience with me.

I would like extend a big thank you to Paul Goldsmith, a mentor of mine who not only supported my move to leave my job in Australia to pursue the opportunity to undertake this masters in Norway, but took the time to be interviewed and also to put me in touch with many of his contacts. Without that connection, the list of interviewees would have been much shorter.

A sincere thank you goes to Ali Hosseini, and my professor Ola Lædre for their support and guidance. Their input and feedback to this study has been invaluable and it is greatly appreciated.

I will also take this chance to honour my father, Lionel Young, who sadly passed away during the writing of this thesis. He meant so much more to me than he ever would have realised. It was his love and support that helped me become the person I am today and to be in the position where I am realising my dreams.

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LIST OF ACRONYMS

ALT – Alliance Leadership Team

AMT – Alliance Management Team

DBB – Design Bid Build

D&C – Design and Construct

KRA – Key Result Area

LC – Lean Construction

NOP – Non-Owner Participants

NPRA – Norwegian Public Roads Administration

NSW – New South Wales (A State of Australia)

NTNU – Norwegian University of Science and Technology

PA – Project Alliancing

PDM – Project Delivery Method

PM – Project Manager

PO – Project Owner

PP – Project Partnering

RMS – The NSW Roads and Maritime Services

TOC – Target Outturn Cost

UK – United Kingdom

SUMMARY

The alliance contract method is a relatively new project delivery method that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. The result of it being so new is that it is still unclear around the world as to what exactly an alliance is and for what projects it is suitable.

This study sets out to address the following research questions:

1. What makes an alliance an alliance?
 - What elements make up an alliance?
 - What elements are unique to alliancing?
2. What characteristics of a project make it suitable for alliancing?
 - How do alliance elements address these characteristics?
3. What are the key success factors and barriers when choosing alliancing?
4. Are there any indications as to the current and future trends of alliancing?

Addressing the research questions will help to fill an identified gap in the alliancing body of knowledge, namely, the missing clear breakdown of what elements make up an alliance, the identification of elements unique to the alliancing method, and the lack of a clear summary of what characteristics of a project determine its suitability for alliancing. In addition, addressing the last three questions assists project owners who are considering alliancing to gain a complete understanding of what is involved in choosing and running an alliance.

Chapter 2, Methodology, details and describes the methods used throughout this study. A literature and document study, interviews with practitioners, and a set of case studies of real alliance projects were chosen to form the basis of the study.

Chapter 3, Literature Study, outlines the findings identified by the literature. It includes an introduction into the alliancing method, a brief overview of the history of alliancing, covers some current definitions of alliancing and common ambiguities, and explores alliancing around the world. Furthermore, this chapter presents a list of alliance elements and project characteristics identified from the literature, outlines reasons to choose alliancing and identifies the success factors and barriers to alliancing.

The findings uncovered as part of the interviews and case studies are presented in Chapter 4, Findings and Discussion, and are compared against the findings from the literature.

The Conclusion, Chapter 5, summarises the main findings and answers the first two research questions by presenting two tables: a table of elements that make up alliancing, with an explanation of elements identified as being unique to the alliancing method; and a table of characteristics of a project that make it suitable for alliancing. Following this, answers to the remaining research questions are provided. Also presented here is the implications that this research may have to theory and practice.

To finish, Chapter 7 presents departure points for further work that can stem from the work performed in this master thesis.

Part 2 contains two published conference papers and one draft conference paper that are based on findings of this study.

Part 3 contains the appendices.

PART 1 – MASTER THESIS

Alliancing in Infrastructure Projects

1 INTRODUCTION

The project alliance contract model is a relatively new project delivery method (PDM) that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. The result of it being so new is that it is currently only being utilised in a few countries, and with that, it is still unclear around the world as to what exactly an alliance is and for what projects it is suitable.

Throughout this report, unless otherwise stated, all alliances discussed within are project alliances (PA).

1.1 Background

For the delivery of large infrastructure projects, alliancing is a relatively new contracting method. One that has yet to reach the shores of Norway. In recent years, alliancing has been receiving worldwide attention with more and more countries exploring its use. Having originated in the UK, it has become a booming success in Australia. The success in Australia has shown by example that there are alternative methods to delivering projects in order to move away from the often-adversarial, traditional project delivery methods. As projects become larger and more complicated, and the pressure from various stakeholders increases (*Sakal, 2005*), alliancing is proving itself as being able to deal with these ambitious targets.

Around the world, there is an increasing trend of large-scale complex projects (*Walker and Lloyd-Walker, 2016*), and the number of international organisations who are considering using alliancing is increasing (*Mills et al., 2011*). However, internationally, alliancing is still in its early development phase (*Hauck et al., 2004*) and Australia is the country most experienced in with this PDM (*Ross, 2009, Sakal, 2005*).

Here in Norway, the Norwegian Public Roads Administration (NPRA) has begun undertaking a study to determine suitable delivery methods for their Ferry-less E39 Upgrade Project. The Ferry-less E39 program aims to upgrade the existing E39, which runs along the western coast of Norway between Kristiansand and Trondheim, by bridging (or tunnelling) the seven fjord crossings still currently operated by ferries. The program covers a total of 1100 Km and has an estimated cost of almost 300 billion Norwegian kroner (NOK). A program of this scale will consist of a number of very large, complex projects and the NPRA is looking for new ways to deliver such projects. As part of their study, they are interested in learning more about alliancing.

Since alliancing is relatively new, and has developed differently in different industries and countries, it can take on different meanings, and this has created a confusing situation (*Hauck et al., 2004*). For example, in some cases within the construction industry, “partnering” and alliancing are often used interchangeably despite being fundamentally different methods (*Chen et al., 2010, Ingirige and Sexton, 2006, Rowlinson and Cheung, 2004*). Currently there does not seem to exist a commonly established alliancing definition (*Chen et al., 2010, Yeung et al., 2007*) and so this report aims to give a clear picture of what exactly alliancing means, in terms of “hard” elements, when it applies to delivering infrastructure projects.

The work and results obtained from this study form part of a bigger undertaking conducted by Ali Hosseini, a PhD candidate funded by the NPRA for his research into innovative implementation strategies.

1.2 Research Gap

The proposed contribution to knowledge is the clarification of what alliancing is, and which projects suit alliancing, when discussed in the context of infrastructure delivery. In addition, it contributes to an updated look at alliancing success factors and barriers and an identification of current and future trends.

It appears that the body of knowledge is missing a clear breakdown of what elements make up an alliance and the identification of elements unique to the alliancing method. In addition, there does not seem to be a clear summary of what characteristics of a project determine its suitability for alliancing. Further, Jefferies et al. (2014 p466) have identified that “*there is a clear gap in Project Alliancing, particularly with regards to identifying factors for its successful implementation in the Australian construction industry*”. As countries and industries with no alliancing experience, and in particular, limited to no experience with relational contracting, begin adopting alliancing, they will no doubt face a number of challenges. To help overcome these challenges practitioners will need to be educated in the factors that make alliancing successful and be aware of what challenges they can expect to face.

By addressing this, the report aims to provide a reference point going forward, for both academics and practitioners, to know what is and is not alliancing. For example, practitioners in the United Kingdom (UK) often point towards the PPC 2000 when discussing alliancing, yet the PPC 2000 does not mention the term alliancing once and refers to itself as a Partnering contract (*Association of Consultant Architects, 2015*). It is this kind of confusion within the industry that this report is aiming to resolve.

As the adoption of alliancing in the construction industry has started becoming more prevalent worldwide, knowledge of when alliancing is appropriate could be valuable to practitioners looking at implementing non-traditional forms of contracting. Many countries, particularly in Europe, have recently started adopting alliancing. In addition, Finland, who started using alliancing in 2007, has begun experimenting with the model by adopting lean ideology into their alliance projects (*Petäjaniemi and Lahdenperä, 2012*). A clear understanding of the current state of alliancing could potentially lead to the creation of improved project delivery models.

1.3 Research Questions

To give the study a clear focus, the following research questions, along with their corresponding secondary research questions have been identified:

1. What makes an alliance an alliance?
 - What elements make up an alliance?
 - What elements are unique to alliancing?
2. What characteristics of a project make it suitable for alliancing?
 - How do alliance elements address these characteristics?
3. What are the key success factors and barriers when choosing alliancing?
4. Are there any indications as to the current and future trends of alliancing?

Addressing the secondary research questions will support the answers to the primary research questions.

The research questions are addressed in this thesis by comparing the findings from a literature and document study, a series of interviews and a number of case studies.

By addressing these research questions, this study will provide a means for those less experienced with alliance to understand what alliancing is and to recognise projects that are suitable for the alliancing PDM. It will provide them with an understanding as to how the model addresses these projects, will give them an insight into how to ensure success, and offer some points of concern when considering whether to choose alliancing. In addition, it will provide them with insight into the current and future trends of alliance to assist them in planning their alliancing journey.

1.4 Limitations of the Study

A number of factors have been identified that limit this research. Firstly, the time allocated meant that limitations were placed on the amount of research that could be undertaken. This included the number of journal articles that could be extensively reviewed and the number of interviews and surveys that could be undertaken. Thirty-four articles were selected for the study and a heavy bias was placed on results from Australia. Australia has the greatest experience with alliancing (*Sakal, 2005*) and this is also where the majority of the literature originates (*Chen et al., 2012*).

In the literature, alliancing is often defined using both hard and soft elements. Due to the time limit of this study, focus was placed on the hard, tangible elements, without the inclusion of purely soft, intangible elements such as *Trust* etc.

The results from the case projects represent the experiences of practitioners and are limited by their memories. They provided us answers to the best of their knowledge. Where possible, facts were cross-checked against project documentation. This discussion presents the authors' interpretation of the studied literature and interviews.

In addition to the above, this study is being conducted in Norway, a country with no experience with alliances. This lack of experience has meant that all research has had to come from abroad.

1.5 Structure of the Thesis

Chapter 2, Methodology, details and describes the methods used throughout this study. A literature and document study, interviews with practitioners from the UK, Finland and Australia, and a set of case studies of real alliance projects were chosen to form the basis of the study.

Chapter 3, Literature Study, outlines the findings identified by the literature. It includes an introduction into the alliancing method, a brief overview of the history of alliancing, covers some current definitions of alliancing and common ambiguities, and explores alliancing around the world. Furthermore, this chapter presents a list of alliance elements and project characteristics identified from the literature, outlines reasons to choose alliancing and identifies the success factors and barriers to alliancing.

The findings uncovered as part of the interviews and case studies are presented in Chapter 4, Findings and Discussion, and are compared against the findings from the literature.

The Conclusion, Chapter 5, summarises the main findings and answers the first two research questions by presenting two tables: a table of elements that make up alliancing, with an explanation of the elements identified as being unique to the alliancing method; and a table of characteristics of a project that make it suitable for alliancing. Following this, answers to the remaining research questions are provided. Also presented here is the implications that this research may have to theory and practice.

To finish, Chapter 7 presents departure points for further work that can stem from the work performed in this master thesis.

Part 2 contains two published conference papers and one draft conference paper that are based on findings of this study.

Part 3 contains the appendices and includes supporting documentation and information including a questionnaire, interview guide, and detailed sample information on the literature evaluation process.

2 METHODOLOGY

The research questions were addressed by conducting a thorough literature and document study of publications from Australia and other countries. In addition to academic articles and papers, documentation from government organizations were also be reviewed (national contract guidelines, procurement guides etc.).

The results from the literature study were compared and contrasted with findings obtained from interviews conducted with a number of construction industry practitioners from the UK, Finland and Australia. The results from the literature study and UK interviews also formed the basis of a case study review that was based on a questionnaire completed by experienced industry professionals from Australia who had been involved with recently completed large infrastructure alliance projects. This questionnaire helped to clarify the literature results prior to developing the interview guide for the face-to-face interviews conducted in Finland and Australia.

2.1 Literature Study

A literature study, following the prescription of Blumberg et al. (2014), was undertaken to develop the theoretical background for alliancing. A combination of both journal articles and conference papers was used to gain a broad perspective of the current views of the topic. A document study was performed on a number of key government and industry publications covering alliancing, for example *The National Alliancing Contracting Guidelines (Department of Infrastructure and Transport, 2015)* and *Alliancing: A Participant's Guide (Morwood et al., 2008)*. This was undertaken in order to pick up the government and industry perspective on alliancing and to supplement the academic perspective. Thus, the two studies allow us to gain insight into both the theoretical and practical aspects of alliancing.

One strength of a literature study is that it is a way to gain insight into the current body of knowledge on a chosen topic. Furthermore, due to the nature of literature publications, they can be used as a way to document the trends that have occurred over the years. To initiate the search, contact with NTNU professors and a PhD candidate was sort as a point of departure for possible known sources related to this topic. In addition, the online databases available to NTNU were utilised for finding relevant journal articles and Google Scholar was the starting point for finding the industry and government publications.

To build upon the initial results of the literature search, article reference lists were examined in order to find other relevant resources that were not uncovered in the initial searches. In

addition, resources were recommended by some of the practitioners who were contacted to participate in the interview series.

A critical evaluation was undertaken to ensure that each piece of literature included in this study was credible, reliable and relevant. A sample of this process and evaluation has been included in Appendix D for reference.

Discussion was initiated with Ali Hosseini, a PhD candidate at NTNU, who is writing his dissertation in conjunction with Statens Vegvesen (NPRA) on different contracting strategies, namely Partnering and Alliancing. This discussion resulted in acquiring a database list containing 165 references that are relevant to the work being carried out by Ali. Filtering this list by contract strategy resulted in 13 articles about alliancing.

Advice from the NTNU professors and Ali was that Australia is at the forefront of alliancing. Thus, it was decided to perform the initial search in NTNU library's Oria system for publications from Australia. The first search terms used were "Allianc* AND Australia*" as these would deliver combinations of Alliance, Alliances, Alliancing, Australia and Australian. This returned 11,489 results, 5,831 of which were articles. An immediate look at the top results revealed nothing of interest so it was evident that further refinement was required. The next search was "Allianc* AND Australia* infrastructure" which returned 445 results, 273 of which were articles. A review of the titles and abstracts of the top 20 results revealed one article of interest. As this did not return a sufficient number of articles in the top results the next step was to use the "Advanced Search" feature with the following criteria:

- Title contains: alliance* AND
- Title contains: Australia* AND
- Any contains: project
- Material Type: Articles
- Language: English

This returned a result of 51 articles. This was refined once more to:

- Title contains: alliance* AND
- Title contains: Australia* AND
- Any contains: project OR
- Any contains: infrastructure
- Material Type: Articles
- Language: English

This returned a more concise result of 13 articles. The search of the NTNU databases resulted in four relevant articles, three of which were new and one that was already found in Ali's database. Such a process was followed to find articles originating from other countries. In

addition, the reference lists in the selected articles were cross checked for other relevant publications. A search on Google Scholar using the terms “Australia alliance infrastructure documentation” resulting in two government publications.

2.2 Interviews

To build upon the findings from the literature study, face-to-face interviews were conducted with practitioners in the UK, Finland and Australia. The interviews in each country were conducted with slightly different purposes and thus will be discussed separately.

2.2.1 The UK

The UK interviews were the first to be conducted and formed part of the pilot study. Interviews were conducted with eight practitioners representing five companies from the UK (See Table 1). The interviews were conducted in person, over two days in June 2015, at various locations around London. The interviews were conducted collaboratively with a number of representatives from NTNU and centred on the theme of *UK Experiences with "Innovative" Contract Models*. Those present from NTNU included: Brendan Young, MSc Project Management candidate and author of this thesis; Ali Hosseini, PhD candidate at the Department of Civil and Transport Engineering; Ola Lædre, Associate Professor at the Department of Civil and Transport Engineering; and Nils Olsson, Professor at the Department of Production and Quality Engineering.

Table 1 - Interview Participants from the UK

Participant	Company
Don Ward	Construction Excellence
Ces Shaw	PTP Associates
Mike Lyons	HS2
Simon Diggle and John Cole	Highways England
Roger Dickinson, Lee Ratcliffe and Liz Baldwin	Network Rail and the Wessex Capacity Alliance

The interviews in the UK were part of a series of interviews conducted by Ali, Ola, Nils, Olav Torp (Associate Professor at the Department of Civil and Transport Engineering) and Bjørn Anderson (Professor at the Department of Production and Quality Engineering) around Europe as part of their research into possible contract models for the Ferry-Free E39 project. Ali is fully funded by the NPRA, while the rest are funded by both the NPRA and NTNU.

The interviews were structured around the interest in the following questions:

- What "innovative" contract models are used?
 - In particular, what contracts are used for infrastructure or mega construction projects?
- Why are they used?
- What are the experiences with them?
- What will happen in the future?

Where possible, answers relating to specific projects were sought.

During the interviews, it was possible to tell that some of the practitioners (in the UK), being new to alliancing, were learning as they go. This meant that they were not often clear on what they meant or why things were the way they are. In one case, to highlight the confusion around the topic, one of the interviewees was discussing partnering when asked about their experiences with alliancing. This highlighted the relevance of this study. Being a face-to-face interview made it possible to recognise this confusion and address it straight away to ensure the correct information was being received.

One limitation of the interview process was that only a small number of practitioners could be interviewed in the UK. PMs working on large infrastructure projects are very busy and have restricted availability.

As the interviews were conducted in collaboration with other researchers, the whole time spent with each participant could not be allocated to addressing the research questions of this report.

2.2.2 Finland

An interview was conducted with Vison Alliance Partners Oy in Helsinki, Finland in February 2016. This interview came from a recommendation from Jim Ross. Jim was one of the Australian practitioners who was contacted to participate in the Australian interview series. Jim's company, PCI Group, was involved with setting up Finland's first alliance (Ross et al., 2014) and he recommended that I get in touch with Vison to discuss their experience with alliancing in Finland.

A face-to-face interview was conducted between myself, Rami Tuokko, Miika Ronkainen and Anders Nordström. The semi-structured interview followed the structure of the interview guide attached in APPENDIX C – Interview Guide. As the interview guide was designed for both project owners (POs) and non-owner participants (NOPs), each interview was tailored to the

background and experience of the interviewees using the interview guide as exactly that, a guide.

2.2.3 Australia

Twenty-seven semi-structured interviews were undertaken face-to-face with key industry professional in Australia. Due to the timing of this interview series in relation to the overall study, the interview questions were formulated in line with the first two research questions (see APPENDIX C – Interview Guide). The interviews ran over a period of three weeks during March and April 2016, and they were conducted in Perth, Sydney, Brisbane, Melbourne and Canberra. The interviewees were contacted based on their experience with alliances. Respondents were chosen among project managers and contract specialists, mostly from client side (government), as in the Australian infrastructure industry, it is the government organisations that own the projects. In addition, a number of respondents from contractors (8), consultants (3), and academia (1) were included to gain a full industry perspective on the current state of alliancing.

All the interviews were conducted by myself and I was joined by Ali Hosseini for the interviews that were conducted in Sydney, Brisbane and Melbourne.

Table 2 contains the list of interview participants and relevant details. It should be noted that a number of the participants have had experience with alliances while sitting on both sides of the fence, i.e. as both NOP and PO, and worked for different companies in the process. Table 2 contains just the information most relevant to this study. The table is arranged in no particular order.

2.2.4 Summary

Participation in the interview series was voluntary and the responses confidential. Where citations from the interviews are used, no participant can be identified.

The interviews proved valuable as they made a great starting point for developing the tables of elements and characteristics. They also provided insight into how practitioners view alliancing and whether this backs up the thoughts found in the literature.

A key strength is that during an interview, it is possible to clarify questions, expand on answers and to delve much deeper into a particular topic of interest.

Table 2 - Participants in the Australian Interview Series

Participant	Company	PO or NPO	Case Project
Ray Hezkial	Icon Water	PO	Cotter Dam
Ross Abraham	Previously RMS	PO	Seacliff Bridge
Peter Trueman	Multiple	PO, NPO	
Peter Letts	RMS	PO	CBD Alliance
Jim Ross, Holly Dinh, and Jim Dingwall	PCI Group	Consultant	
Richard Moorewood	AECOM	NPO	
Steve How Lum	Transport Main Roads	PO	
Ian Allan	RMS	PO	Lawson Alliance
Paul Goldsmith	Formerly RMS	PO	Ballina Bypass
Peter Wellings	Formerly RMS	PO	
George M	Vic Roads	PO	
Frank De Santis	Vic Roads	PO	Springvale Rd Rail Alliance
Peter Chatburn	Formerly THIESS	NPO	Hunter Expressway
Adrian Pearse	Lend Lease	NPO	Inner west busway
Tim Hanh	RMS	PO	
Warren Stalder	Formerly RMS	PO	Anzac Bridge
Ian Matthews	EIG, formerly RMS	NPO, PO	Windsor Rd
James Gregory, Alan Clegg, Kate Champman	CPB Contractors	NPO	Gateway Alliance
Michael Leach	Public Transport Authority	PO	City Bus Port Alliance
Ross Hamilton, Andrew Cartlidge	Public Transport Authority	PO	Perth City Rail Link Alliance
Mark Hazebroek	Main Rds	PO	Karratha Tom Price
Derek Walker	Professor at RMIT	Academia	

2.3 Case Studies

This study involved two sets of case studies. The first set formed part of the pilot study and the second set was developed out of the Finnish and Australian Interview Series. These will be discussed in detail in the following sections.

2.3.1 Questionnaire

The methodology from the case projects that developed out of the pilot study is presented here. Case studies were chosen as a means to verify the results of the literature for the first primary research question. Documenting whether real-life project alliances do in fact contain the elements that have been identified by the research is an important step in validating the results. It was determined to be beyond the scope of this study to undertake a significant number of

case studies. However, a trial survey was undertaken in the pilot study in order to test the proposed methodology, which was to be expanded upon for the master thesis.

Contact was made with the New South Wales (NSW) Roads and Maritime Services (RMS), who are the equivalent of the NPRA for the state of NSW in Australia, in order to get into contact with a number of project managers (PMs) who have been involved with large infrastructure alliance projects. RMS was chosen as this is the author's former workplace and they have conducted a large number of alliance projects within NSW. Contact was initially made with Tony Letts, General Manager of Project Delivery, in order to get permission to contact RMS PMs in relation to specific alliance projects. Tony also provided the names and contact details of four PMs who have been involved with large alliance projects. An email was sent to each of the four PMs to ask if they would be happy to fill out a short questionnaire regarding their alliance project. Three PMs responded and each were happy to help.

A questionnaire, made up of questions to identify the project, and the initial table of alliancing elements identified by the literature was then emailed to the PMs (The questionnaire is attached in Appendix B). This was designed to develop the case studies.

The PMs were asked to tick the elements that were a part of their alliance project. In addition, they were asked to tick, for each element, whether they thought it is unique to alliancing. At the end, they were given the opportunity to write down any elements that had not been identified in the list that they thought should be included. Due to the timing of the case studies in relation to the rest of the study, and the fact that it was a trial, the questionnaire focused solely on the first research question.

Three PMs completed the survey resulting in three case studies: The Lawrence Hargrave Alliance, the Lawson Alliance and the Hunter Expressway Alliance (See Table 3). Each PM indicated whether the listed element was part of their alliance and whether they thought the element was unique to alliancing. The results for the elements included in the case-study projects are tabulated in Table 10 in Findings and Discussion.

The biggest limitation in this case was distance. This meant that the option of in-person interviews was out of the question at this stage of the research process. This limited the amount of information that could be conveyed through the questionnaire in order to develop the case studies.

Table 3 - Details of Case Study Projects from the Pilot Study

Alliance	Value (AUD)	Number of Participants	Duration (Years)
Lawrence Hargrave Alliance	\$52M	4	2
Lawson Alliance	\$220M	3	3
Hunter Expressway Alliance	\$825M	4	4

The intention was there to have the Australian PMs identify the elements that they considered to be unique to alliancing, but based on the returned questionnaires, it was evident that the intention was not communicated clearly enough (This is discussed further in Findings and Discussion). This has identified one of the drawbacks of a written questionnaire; it is difficult to determine whether the recipient has understood the written text in the way that the author has intended. Despite the limitations, the assumptions made here are that each contact has understood clearly what was asked of them in the rest of the questionnaire and that their responses are representative of real facts. If questionnaires are required for future work, a background of the study would be provided and more care would be taken to ensure the intention of the questionnaire is communicated more clearly.

2.3.2 Case Projects from Interview Series

The selection of multiple-case design was performed in order to check for replication, as described by Yin (2013). Data from fourteen Australian alliance projects was collected during the interview series. Fourteen of the twenty-two interviews were case specific and the remaining eight were general in nature. To ensure that we were gaining reliable information, we chose projects where the practitioners had played a significant role in the alliance. In addition, a limitation of a project value of greater than \$50M AUD was chosen to ensure that each project was considered a large infrastructure project. The case projects that were analysed varied in size from \$52M up to \$1B AUD.

Table 4 - Details of Case Study Projects from the Interview Series

Project	Value (M AUD)	Number of Parties	Duration (years)
Lawrence Hargrave Alliance	\$52	4	2
Anzac Bridge Upgrade	\$61	4	3
Karatha Tom Price Stage 2	\$80	4	2
Windsor Rd Alliance	\$105	4	1.5
Springvale Rd Rail Alliance	\$120	6	< 1
Sydney CBD Alliance	\$150	2	2.5
Inner West Busway / Vic Rd	\$155	4	4.5
Lawson Alliance	\$220	3	4
Perth Busport Alliance	\$250	3	3
Perth City Link Rail Alliance	\$339	3	2
Cotter Dam Enlargement	\$410	4	4
Ballina Bypass Alliance	\$640	5	5
Hunter Expressway Alliance	\$825	4	4
Gateway WA	\$1,000	6	4

3 LITERATURE STUDY

Thirty-four articles published within the last 15 years were studied in order to gain insight into what makes an alliance an alliance and why they are chosen as the PDM for certain projects. These included journal articles and conference papers from Australia (19), the Netherlands (3), Hong Kong (3), the UK (1), the USA (1), Finland (1), and Norway (1), one Australian Government funded study, one Australian industry publication, one Australian road authority fact-sheet and two Australian Government publications.

This chapter begins with an introduction and very brief overview of the history of alliancing before delving into current definitions of alliancing. Following, is an insight into the disambiguation between alliancing and other forms of contracting, and a look at the present state of alliancing around the world. Furthermore, this chapter presents the elements identified from the literature as being key elements of alliancing along with identified project characteristics. The study concludes with an identification of the success factors and barriers to alliancing, current and future trends, and the benefits of choosing alliancing.

3.1 Introduction

Alliancing has developed out of the need and want to improve on, and overcome, the adversarial nature and negative impacts associated with the more traditional forms of project delivery, namely design-bid-build (DBB) and design and construct (D&C) contracts (*Walker et al., 2015, Laan et al., 2011*). It often falls under the umbrella of relationship contracting (*Walker et al., 2013a, Henneveld, 2006*), however, now in recent years, it is beginning to be placed into its own unique category (*Chen et al., 2010, Lahdenperä, 2012*).

Alliancing is a collaboration between the client, service providers and contractors where they share and manage the risks of the project together (*Chen et al., 2010, Lloyd-walker et al., 2014*). All parties' expectations and commercial arrangements are aligned with the project outcomes and the project is driven by a best-for-project mindset where all parties either win together, or lose together (*Walker et al., 2013a, Chen et al., 2012*). The contract is designed around a non-adversarial legal and commercial framework with all disputes and conflicts resolved from within the alliance (*Henneveld, 2006, Lloyd-walker et al., 2014*).

This type of project delivery can lead to improved project outcomes and value for money, in part due to the increased level of integration and cooperation between planners, design teams, contractors and operators (*Love et al., 2010, Walker and Lloyd-Walker, 2016*).

3.2 History of Alliancing

Research during the 1980's highlighted the developing endemic of claims and disputes in the construction industry (Ross, 2003). This adversarial behaviour was brought about by the competitive nature and arms-length approach of traditional contracts (Laan et al., 2011). The industry started to then move towards relationship based contracting arrangements which called for more trust and collaboration between the parties (Henneveld, 2006).

The concept of alliancing originated out of the North Sea during the early 1990's (Sakal, 2005). Circumstances during that time in the offshore industry required a development in contracting strategies in order for the industry to survive. The success in the North Sea encouraged the companies involved, during the late 1990's, to introduce the alliancing principles into their onshore activities (Scheublin, 2001). The concept was then adopted by the construction industry and, in large part, by the Australian infrastructure sector (Ross, 2009), where, over the past two decades, it has developed into alliancing as we know it today.

Detailed information on the history of alliancing can be found in the following sources (Ross, 2009, Sakal, 2005).

3.3 Current Definitions of Alliancing

The most widely accept definition of alliancing in literature comes from Australia from the Department of Finance and Treasury Victoria (*Department of Treasury and Finance, 2010*) who describes alliancing as:

“... a method of procuring ... [where] All parties are required to work together in good faith, acting with integrity and making best-for-project decisions. Working as an integrated, collaborative team, they make unanimous decisions on all key project delivery issues. Alliance agreements are premised on joint management of risk for project delivery. All parties jointly manage that risk within the terms of an ‘alliance agreement’, and share the outcomes of the project” (p.9).

The majority of studied literature after 2010 has made reference to this definition when discussing alliancing and do not contribute anything of significance in addition to that mentioned above (Walker et al., 2015, Chen et al., 2012, Lahdenperä, 2012, Walker et al., 2013a).

The above definition more recently became defined in Australia at a national level with the publication of the National Alliance Contracting Policy and Guidelines (*Department of Infrastructure and Transport, 2011*). This was since updated in 2015 and kept the same definition (*Department of Infrastructure and Transport, 2015*). This shows that there is consistency within the Australian Government of what alliancing is. However, this guide does not provide a clear breakdown of the tangible elements that define alliancing.

Some literature includes definitions that the author feels the industry is moving away from. Such definitions include alliancing under the relationship-contracting umbrella, as opposed to defining it in a category of its own. Other definitions compare it too closely to partnering (*Scheublin, 2001*), which can lead to the confusion that this research is attempting to prevent. These points are explored more in depth in the next section covering the disambiguation of alliancing.

3.4 Disambiguation

In the early days of alliancing, project alliances (PA) shared many more similarities with project partnering (PP) than is the case today. PA and PP used to be used almost interchangeably before PA evolved over time down its own path and away from PP (*Ingirige and Sexton, 2006*). Though still today, PP and PA do share similar elements, such as they both aim to improve cooperation, they both have a target cost with bonus/malus (in PA known as pain/gain), and employ an open-book approach (*Haugseth, 2014*). The biggest difference today, is that PP is not a standalone contract strategy and is generally adopted over the top of traditional contracts such as D&C (*Lahdenperä, 2012, Yeung et al., 2007*), whereas PA is a built-for-purpose, stand-alone contract strategy. Furthermore, partnering does not adopt the alliancing principle of win-win/lose-lose in the same way that alliancing does; in PP the partners remain independent within the partnership and thus there is the possibility for partners to lose while others win and vice versa (*Chen et al., 2012, Yeung et al., 2007, Hauck et al., 2004, Lloyd-walker et al., 2014*).

Integrated Project Delivery (IPD) is a method used mostly in the United States of America that has many similarities to alliancing, with one major difference being that IPD incorporates a number of lean construction elements (*Raisbeck et al., 2010, Lahdenperä, 2012*). IPD's use is mostly concentrated in America, yet the principles of lean are more prevalent worldwide. Alliancing is often considered at the top end of collaborative and relational contracting (*Ross, 2003*) and is more widely distributed across the globe (*Ingirige and Sexton, 2006, Chen et al.,*

2012). In addition, IPD and Alliancing have often been used for different types of projects (Lahdenperä, 2012). One view is that IPD is created by combining the alliancing governance system with the lean construction operating system (Raisbeck et al., 2010). The key differences between IPD and alliancing will not be explored further in this paper but can be found in the studies of Lahdenperä (2012) and Raisbeck et al. (2010).

3.5 Alliancing Around the World

Alliancing is still in the process of becoming a method used on a global scale. Chen et al. (2012) have shown that the vast majority of literature on alliancing originates from Australia and the UK with 39% and 23% respectively, 19% from Hong Kong, 6% originates from both the USA and the Netherlands, 4% from Sweden and just 1% each from China and Norway. The results confirm that Australia is at the leading edge of alliancing and that the rest of the world is only just starting to catch on. This also helps to explain why the majority of the literature coming out of other countries often base their research on the example set by the Australian construction industry (Walker et al., 2013a).

Australia is the country that has taken alliancing from its infant stage and developed it into the world-class project delivery method as it is known today, and in doing so, has become the world's most experienced country when it applies to using alliances to deliver infrastructure projects (Walker et al., 2015). Billions of dollars' worth of infrastructure projects have been delivered in Australia and, as of 2010, the number of construction and infrastructure projects delivered by alliancing in Australia is estimated at 300, with a total worth of around 90 billion dollars (AUD) (Chen et al., 2010).

Alliancing has secured its place in Australian infrastructure delivery in recent years after a number of State and Territories have issued alliancing procurement guidelines. In addition, alliancing has been adopted into the national Building and Construction Procurement Guide (Austroads, 2014) and the Australia Government has published the National Alliance Contracting Guidelines: Guide to Alliance Contracting (Department of Infrastructure and Transport, 2011, Department of Infrastructure and Transport, 2015).

Mainland Europe has only recently begun experimenting with project alliances. For example, in 2001, only one alliance project was under construction in the Netherlands. The Dutch railroad authority was using the construction of a new track for NS infra as the country's pilot project for alliancing (Scheublin, 2001). Finland, who begun adopting alliancing in 2007, has experience with approximately 40 alliance projects. In addition, they have begun

experimenting with the model by adopting lean ideology into their alliance projects (*Petäjaniemi and Lahdenperä, 2012*). Finland's pilot alliance project, *Lielahiti-Kokemäki railway renovation (Liekki)*, was Europe's first public sector alliance project (*Nygård, 2014*) and its success led to the Finnish Transport Authority to continue using alliancing for additional projects (*Ross et al., 2014*).

Walker et al. (2013) have also identified that the limited availability and small number of the alliancing talent pool has restricted the capability of alliancing being rolled out across the globe. However, momentum is gathering for the concept of alliancing and, as more and more countries begin undertaking alliances, it will not be long before alliancing becomes a global success (*Ingirige and Sexton, 2006*).

3.6 Alliancing Elements

Determining what alliancing is through the literature was an involved process. Almost all of the literature on alliancing involved a small definition of alliancing in the introduction. These were collected and common themes were elicited. To delve deeper, the literature was carefully analysed to identify defining elements that were thought to be key to an alliance. These were collected and the number of times they were referenced in literature was recorded. Some elements were more easily identifiable than others were. For example, Figure 1 and Figure 2 show examples of the literature directly listing elements of an alliance. These examples provided a good starting point from which the list of defining elements could be expanded. It proved useful to start with recording anything that could be a defining element of an alliance and then to refine the list through cross-referencing and analysis of case studies.

The nature of the majority of academic literature is that it is often very specific and focused on one key part of a theme, subject or topic. The literature on alliancing follows this trend and focuses on just one or two particular aspects of an alliance, whether that be key success factors, achieving value-for-money or case studies on alliance implementation, with few articles providing a general overview. As such, the articles reviewed as part of this study would frequently mention key elements of alliances or project characteristics without defining or expanding upon them.

Table 5 shows the elements of an alliance as identified in the studied literature. They have been arranged by number of citations. Included is a preliminary indication, based on the literature review, of whether the element is unique to the alliance PDM. Following Table 5 are detailed descriptions of the elements identified by the literature. Some elements were better defined in

the literature than others were, and this is reflected by the level of detail of the descriptions. Key sources are included in the descriptions when the sources provided good explanations of the elements, not just mentioning them in passing. This can also help the reader if a further explanation is required; the reader can check the source to see the element discussed in context.

PARTNERING (NYSTRÖM, 2005)	ALLIANCING (YEUNG ET AL., 2007)
<ul style="list-style-type: none"> • Trust • Mutual understanding 	<ul style="list-style-type: none"> • Two hard elements: <ul style="list-style-type: none"> ○ Formal contract ○ Real gain-share/pain-share arrangement • Three soft elements <ul style="list-style-type: none"> ○ Trust ○ Long-term commitment ○ Cooperation and communication

Figure 1 – Example of defining elements of alliancing from the literature (Chen et al., 2012)

Project alliancing	
Department of Treasury and Finance (2010d)	Yeung et al. (2007)
Key features <ul style="list-style-type: none"> • Risk and opportunity sharing • Commitment to ‘no disputes’ • ‘Best for project’ unanimous decision-making processes • ‘No fault—no blame’ culture • ‘Good faith’ • Transparency expressed as open book documentation and reporting • A joint management structure 	Hard/contractual elements <ul style="list-style-type: none"> • Formal contract • Real gain-share/pain-share Soft/relationship-based elements <ul style="list-style-type: none"> • Trust • Long-term commitment • Cooperation and communication Other elements <ul style="list-style-type: none"> • <i>Win-win philosophy</i> • <i>Equity</i> • <i>Agreed problem resolution methods</i> • <i>Common goals and objectives</i> • <i>Continuous improvements</i> • <i>Alliancing workshops</i> • <i>Early selection of contractors</i>

Figure 2 – Example of defining elements of alliancing from the literature (Lahdenperä, 2012)

Table 5 – Elements of an Alliance – Results from the Literature

Elements of an Alliance	References	Only Alliancing ?	Total
Pain/ Gain share	1,3,4,6,7,8,9,10,12,14,15,16,18,20,27,29,31,37,41,50,58,60,61,		23
Open Book Approach	1,6,7,8,9,12,14,15,16,18,20,21,27,29,37,41,50,58,60,61,62, 74		22
Risk/ Reward Sharing	4,5,6,8,9,12,14,18,20,21,26,27,28,29,37,41,50,60,61,62	Possibly	20
No Dispute Clause/ No Blame/ No Fault Mentality	1,6,7,9,10,12,14,15,16,20,26,29,37,41,50,58,61,62,74	Yes	19
Alliance Leadership Team (ALT) (Board)	1,5,6,9,10,12,16,18,20,21,29,37,41,50,60	Yes	15
Alignment of Client and Commercial Participants Objectives	6,9,10,12,14,18,20,26,28,27,29,37,50,58		14
Auditing	1,6,9,15,16,18,20,21,27,29,37,50,58,61		14
Integrated Project Team	9,12,14,16,18,20,21,26,29,37,41,50,61,62		14
Unanimous Decision Making	1,6,7,9,10,16,20,29,37,41,50,58,61,62	Possibly	14
Target Outturn Cost (TOC)	1,5,6,9,10,14,18,20,21,27,41,50,61		13
Virtual Organisation	5,6,9,14,15,18,20,21,27,29,37,41,50	Yes	13
Alliance Management Team (AMT)	1,5,6,9,10,12,16,20,37,41,50,60	Yes	12
Incentivized Cost-Reimbursement	4,5,9,10,15,16,18,21,26,41,50		11
Colocation of Alliance Team	4,7,10,14,16,18,29,37,43,50	Possibly	10
Alliancing Workshops	1,7,12,14,16,18,27,37,50	Yes	9
Fee to cover Corporate Overheads and profit	1,9,18,20,21,27,37,41,50		9
Formal Contract	3,6,7,18,26,27,37,50		8
Minimum Reimbursement of Direct Costs	1,9,15,16,20,29,41,50		8
Dispute Resolution Kept Within Alliance	6,7,9,20,29,37		6
Key Result Areas	1,9,10,20,50,58		6
Three Limbed Contract	1,6,9,20,41,50	Possibly	6
Joint Responsibility	9,18,27,37,50	Possibly	5
Can be Price Competitive	7,8,9,50		4
Relationship Development	7,12,29,50	Possibly	4
Alliance Facilitator	9,37,50	Yes	3
Alliance Uniform and Stationary (Branding)	5,12,50	Yes	3
Collaborative Problem-Solving and Decision-Making	6,9,10		3
Common Goals	9,18,50		3
No Latent Condition Clauses	5,9,50	Possibly	3
Single Alliance Culture	5,37,50	Yes	3
Early Involvement of Alliance Partners	3,14		2
Internet Based Information Management System	37,43		2
Built from the Ground Up	37	Possibly	1

3.6.1 Pain/ Gain share

Painshare and gainshare are essential components of an alliance and this was the most cited element in the literature study. All participants share in the profits and losses of the project and ensure that no single participant is held accountable for financial performance (*Laan et al., 2011*). This helps to reinforce the mindset of we all win, or we all lose (*Chen et al., 2010*). The pain/gain forms part of the incentive arrangements and is measure of how the project performs against the Target Outturn Cost (TOC) (*Walker et al., 2013*). If the project is delivered under the target price, the NOPs share in the savings, whereas if the project is delivered above the target price, the participants lose a proportional amount of their overhead and profit (*Cocks et al., 2011*). This is detailed further under three-limbed contract.

3.6.2 Open-Book Approach

A key component of alliancing, but not unique to alliancing, is the open-book approach which equates to the disclosure of financial information among all participants (*Rowlinson et al., 2006, Chen et al., 2010*). This approach helps to reinforce the *everyone's working on the same team* mindset and helps to provide accurate and real time information on the financial performance of the project. An open-book approach gives the participants a sense of security and trust that the system cannot be cheated (*Walker et al., 2013b*).

This approach is a major benefit for clients who, through this method, get an insight into the real cost of construction (*Henneveld, 2006*). As most clients outsource the majority of their work through traditional contracts, they often lose track of the cost of undertaking various construction activities.

3.6.3 Risk/ Reward Sharing

In an alliance agreement, all parties share the risk and reward, which provides a strong motivation to work collaboratively and reinforces the *we're all in this together* mindset (*Love et al., 2010, Chen et al., 2010*). Operating hand in hand with the no-blame culture, risk sharing ensures that all participants work together to overcome any challenges that may arise during the delivery of the project (*Henneveld, 2006, Lloyd-walker et al., 2014*).

3.6.4 No Dispute Clause/ No Blame, No Fault Mentality

The alliance agreement is structured so that everyone is playing on the same team. A key component on this is the development of a no blame culture often backed up by a no dispute clause in the alliance agreement (*Chen et al., 2010, Lloyd-walker et al., 2014*). The commercial drivers and the integrity of the participants, combined with the requirement of consensus

decision making, ensures that all disputes (except wilful default) are handled internally within the alliance, which eliminates the expensive and lengthy court battles often associated with traditional contracting methods (Ross, 2003, Walker et al., 2015).

3.6.5 Alliance Leadership Team (ALT)

The Alliance Leadership Team (ALT), otherwise known as the alliance board, is made up of an equal number of representatives (senior executive managers) from each party (Chen et al., 2010) and is formed precisely for the purpose of the alliance (Mills et al., 2011). The ALT provides strategic leadership and governance for the alliance, meets monthly, and makes all decisions unanimously with best-for-project outcomes (Henneveld, 2006, Cocks et al., 2011).

3.6.6 Alignment of Client and Commercial Participants' Objectives

The structure of the alliance and a number of the elements mentioned previously create a situation where the client and commercial participants' objectives are aligned (Rowlinson et al., 2006, Jefferies et al., 2014). That is, that the business goals of each party is aligned with the alliance and the outcomes of the project (Henneveld, 2006).

3.6.7 Auditing

To establish correct values of overheads and profit for the NOPs, audits are undertaken by independent auditors to assess the typical overhead and profit margins for each NOP (Henneveld, 2006, Cocks et al., 2011). Throughout the duration of the alliance, all transactions are conducted completely open book and are subject to audit (Chen et al., 2010, Ross, 2003).

Morwood et al. (2008) give a detailed description of the typical roles of the appointed auditor. "The auditor will usually:

- *conduct a confidential analysis of the participant's accounts to understand the Business As Usual (BAU) financial performance of projects similar to the alliance project*
- *confirm the direct cost rates for salary and other internal costs for both staff and contract employees and advise on a proposed methodology for calculating corporate overhead and profit to be allocated to the project*
- *produce an audit report identifying the historical financial results for the participants expressed as Limb 1 and Limb 2*
- *prepare a compensation audit plan for an ongoing program of audits to validate reimbursement of costs under the alliance."* (p. 30).

3.6.8 *Integrated Project Team*

An alliance team is an integrated project team, which means that people from all participants and disciplines work together in the one team, allowing for the sharing of expertise and resources (*Henneveld, 2006*). In order to make the ‘perfect’ team, each member is selected on a best-for-project basis, regardless of the company he or she works for.

3.6.9 *Unanimous Decision Making*

Within an alliance, each party gets an equal say in the decision process and all decisions must be made unanimously (*Chen et al., 2010, Henneveld, 2006, Ross, 2003*). Unanimous decision making is essential in an environment where risk and opportunity is shared (*Ross et al., 2014*).

3.6.10 *Target Outturn Cost (TOC)*

The TOC is an estimation based on market competition and actual production rates, for what it will cost for the alliance to deliver the agreed scope of work (*Henneveld, 2006, Ross, 2003*). It is subject to scrutiny by independent consultants to validate the estimate (*Lloyd-walker et al., 2014*). Sometimes mentioned is the direct cost target (DCT), which Cocks et al. (2011) defines as “*the cost of planning, designing, and constructing the work, excluding corporate overhead and profit for the non-owner participants*” (p. 204).

3.6.11 *Virtual Organisation*

An alliance operates as a virtual organisation (*Ross, 2009*) in the sense that all individuals from all parent organisations are, for the duration of the contract, employees of the alliance and it is the alliance that delivers the project (*Chen et al., 2010, Cocks et al., 2011*).

3.6.12 *Alliance Management Team (AMT)*

The Alliance Management Team (AMT), formed for the purpose of the alliance (*Mills et al., 2011*), handles the day-to-day management of the alliance (*Chen et al., 2010*). The members that make up the AMT are generally the managers of the different disciplines and teams within the alliance (*Cocks et al., 2011*).

3.6.13 *Incentivized Cost-Reimbursement*

In addition to pain/gain share, alliances include other forms of incentivized cost reimbursement. These can include incentives for non-cost factors such as innovation, quality, delivery time etc. and are factors that are important to the owner (*Walker et al., 2013a, Cocks et al., 2011*).

3.6.14 Co-location of Alliance Team

The co-location of the project team is another element that separates alliancing from other forms of project delivery. Although not a strict must-have, it is an element consistent with many successful alliance projects and is often identified in literature as a key success factor (*Laan et al., 2011, Walker, 2002*). It is implemented as a way of developing a single alliance culture and leads to effective communication and improved innovation in that members have close and immediate contact with each other. A condition often unavailable in traditional arrangements (*Walker et al., 2013a*).

3.6.15 Alliancing Workshops

Workshops are conducted in order to develop and maintain the alliance culture and the best-for-project mindset. They are often cross-team and cross-disciplinary to encourage collaboration and innovation (*Walker et al., 2015*).

3.6.16 Fee to cover Corporate Overheads

See limb 2 under Three-Limbed Contract below.

3.6.17 Formal Contract

The alliance contract, otherwise known as the alliance agreement, is a stand-alone contract that is not associated with any other contract type. The key principles of alliancing are explicit and contractual (*Walker et al., 2015*).

Henneveld (2006) provides a comprehensive overview of the formal contract element with their description of an alliance agreement:

“Alliances are characterised by the Legal and Commercial Framework created by the alliance agreement. The alliance agreement is a non-adversarial contract that is based on the principles of equity, trust respect, openness, no dispute and no blame. The nature of the alliance is defined in the alliance agreement. The legal and commercial framework embodied in the agreement enables open communication to occur between all parties, the joint management and mitigation of risk and contains provisions that eliminate the need or ability of the parties to resort to claim and counter claim behaviours. The commercial framework of project alliance agreements is structured in a way that assigns collective financial responsibility and liabilities to the parties.”(p.5)

3.6.18 Minimum Reimbursement of Direct Costs

The minimum reimbursement of direct costs also falls under the three-limbed contract, however, it is an important element that warrants its own section. As a minimum, all NOPs of an alliance are guaranteed to be reimbursed for all their actual direct costs (*Henneveld, 2006*). This rewards the NOPs for being part of the alliance and taking on a share of the project's risks and helps to maintain the culture of good faith.

3.6.19 Dispute Resolution Kept within the Alliance

With the exception of wilful default and insolvency, all issues and conflict are kept within the alliance and resolved on a unanimous basis with no recourse to litigation or arbitration (*Henneveld, 2006, Chen et al., 2010*).

3.6.20 Key Result Areas (KRAs)

See *Incentivised Cost Reimbursement* above and *Three-Limbed Contract* below.

3.6.21 Three-Limbed Contract

In recent times, alliance contracts have been structured around the three-limbed approach, where (*Walker et al., 2015, Ross, 2003*):

- Limb 1 consists of all the directly reimbursable costs including project-specific overheads
- Limb 2 is made up of the corporate overheads and profit for each NOP, determined by an independent auditor. This is placed 'at-risk' according to the pain/gain arrangement
- Limb 3 consists of the incentivised cost-reimbursement where all participants share in the pain/gain associated with how the alliance performs against the pre-arranged targets in cost and non-cost key result areas (KRAs).

Financially, the maximum risk, or most adverse situation, for the NOPs is that they receive compensation for limb 1 only (*Ross, 2003, Chen et al., 2010*).

3.6.22 Joint Responsibility

Each party, as a member of the alliance, has a joint responsibility to deliver the project outcomes and to overcome any obstacles along the way. This is reinforced by the contract terminology where obligations are expressed collectively, i.e. "the alliance shall..." as opposed to mentioning individual participants i.e. "the designer shall..." (*Ross, 2003*).

3.6.23 Can be Price Competitive

A price competitive alliance has been adopted in some cases as a method to demonstrate higher value-for-money by including the element of price competition. It is a process where two potential alliances develop the project definition and TOC side-by-side and the client selects the winning team to implement the project (*Love et al., 2010*).

3.6.24 Relationship Development

Due to the importance placed on the relationship of the parties within the alliance, alliances engage in active relationship development and maintenance (*Henneveld, 2006, Cocks et al., 2011*). Relationship development is a large part of maintaining the single alliance culture.

3.6.25 Alliance Facilitator

Although not an element that necessarily defines alliances, it is however, normal practice for alliances to engage the services of an alliance facilitator or alliance champion (*Ross, 2003, Morwood et al., 2008*). The alliance facilitator is there to provide advice, run workshops and promote the alliance culture. Alliance facilitators will remain until sufficient alliance competency is developed in the industry and companies gain enough alliancing expertise and establish their own in-house alliance facilitation skills (*Ross, 2003*).

3.6.26 Alliance Uniform and Stationary

As part of maintaining a Single Alliance Culture, alliances use their own alliance uniform and stationary, complete with the alliance's name and logo. It is usual practice to prohibit the use of any uniform or stationary that shows the name and logo of any of the parent companies (*Cocks et al., 2011*).

3.6.27 Collaborative Problem-Solving and Decision-Making

Collaborative problem solving and decision-making is a key characteristic of alliancing (*Walker et al., 2013a*). This emphasises that all parties work together to overcome problems that arise.

3.6.28 Common Goals

The alliance is structured in a way to ensure all parties are working towards a set of common goals (*Department of Infrastructure and Transport, 2011*).

3.6.29 No Latent Condition Clauses

A key element that separates alliances from traditional contracts is the absence of a latent conditions clause (*Infrastructure and Transport, 2011, Cocks et al., 2011*). A latent conditions

clause is not included in an alliance agreement as any impacts associated with latent conditions will have been taken account in the risk and contingency provisions when setting the TOC (*Infrastructure and Transport, 2011*).

3.6.30 Single Alliance Culture

A single alliance culture is one of the significant aspects of an alliance. All team members, regardless of their parent organisation, are part of the same team – the team of the alliance. This culture is reinforced through the colocation of the team, alliance and team-building workshops, alliance uniform and stationary complete with the alliance name and logo (*Cocks et al., 2011, Ross, 2003*).

3.6.31 Early Involvement of Partners

The early involvement of alliance partners refers to the fact that all parties participate in the defining of scope, in the calculation of the TOC and in the creation of the alliance agreement (*Chen et al., 2010, Love et al., 2010*). This is as opposed to traditional contracts where, generally, the client develops the scope and contract details before engaging a contractor or consultant.

3.6.32 Internet Based Information Management System

Alliances can make use of Internet Based Information Management Systems to ensure every member has access to the same programs and files. This point may not be a defining element of alliancing.

3.6.33 Built from the ground up

Alliances are built from the ground up for each project, in that they are independent of any previously established history between any of the participating parties (*Ross, 2003*).

3.7 Project Characteristics

Alliancing is not a form of project delivery method that is suitable for every infrastructure project (*Henneveld, 2006, Morwood et al., 2008*). Some projects, however, have key characteristics that make them highly suitable for the alliance method.

A preliminary list of the characteristics of a project identified in the literature study as being suitable for an alliance is shown in Table 6. They have been arranged in order of the number of articles that have attributed these project characteristics to the selection of an alliance.

Table 6 – Characteristics of a Project that Suit Alliancing Identified by the Literature Study

Project Characteristics	References	Total
Tight Time Constraint/ Need for early start	3,5,6,8,9,11,16,29,37,41,50,60,74	13
High Risk	3,6,5,8,9,11,16,37,50,58,60,74	12
High Complexity	3,6,11,13,16,20,29,37,41,50,60	11
Multiple/ Complex Stakeholders	3,6,11,13,14,16,29,37,41,50,60	11
Unclear/ Broad Scope/ Risk of Scope Change	1,3,8,11,13,16,20,37,41,50	10
Complex External Threats	3,6,11,16,37,41,60	7
High Uncertainty	1,3,9,16,50,58,74	7
Need for Innovation	8,12,20,29,50,60	6
Tight Cost Control	3,16,29,50	4
Environmental Challenges	14,16,50	3
Large Project/ High Cost	8,9,14	3
Need for Owner Involvement	11,37,41	3
Resource Shortages	8,50,74	3
Need for Flexibility	12,50	2
High Visibility	20	1
Special Requirements	3	1

Table 18 in Appendix A identifies the numbered references used in both Table 5 and Table 6.

Most often, the characteristics of a project are taken into consideration with many other factors when determining the choice of delivery method for a project. However, in some cases, the decision to use an alliance is based purely of one or two project characteristics. For example, Jefferies at al. (2014) highlights that “*The Queensland State Government, in the form of both their Public Works and Main Roads departments, use Alliance and Partnering arrangements as default contracts on projects with construction periods of over 12 months and/or with a dollar value of A\$10 million.*” (p.477).

Each project characteristic identified in Table 6 is described briefly below. It should be noted that a number of characteristics were identified in the literature as being suitable for alliancing however, the literature lacked explanations as to why. Where possible, explanations of why alliancing suits the particular characteristic is included. If there was mention of how the alliance elements address the characteristic, this was included too. Where explanations are lacking, key sources are provided for further reading. As part of the findings and discussion, section 4.2.1 *How do Alliance Elements Address the Identified Characteristics* provides more insight into why certain project characteristics are suitable to alliancing.

3.7.1 Tight Time Constraint/ Need for early start

Time pressure is a major reason for choosing alliancing (Chen et al., 2012). Alliancing allows multiple processes to occur simultaneously, for example, investigation, design, land

acquisition, approvals, materials sourcing, etc. (Cocks *et al.*, 2011), thus reducing the time to complete the project in addition to allowing the possibility for an early start. This makes alliancing particularly useful in emergency situations where time and flexibility is of the essence (Walker and Lloyd-Walker, 2016).

3.7.2 High Risk

High-risk projects are not well suited for traditional contract models as there is always the issue of who takes on the risk (Ross, 2009). The client is trying to pass the risk onto someone else and the contractors do not want to accept such high risk. Alliancing is ideal as the risk is shared amongst all participants and everyone is incentivised to work together to manage the risk (Walker *et al.*, 2015, Lloyd-walker *et al.*, 2014).

3.7.3 High Complexity

Projects with high complexity are recommended as being suitable projects for alliances (Ross, 2003, Chen *et al.*, 2012, Mills *et al.*, 2011).

3.7.4 Multiple/ Complex Stakeholders

Complex stakeholder issues is a project characteristic often recommended by government guidelines regarding when to use alliancing (Wood and Duffield, 2009, NSW Government, 2015).

3.7.5 Unclear Scope/ Risk of Scope Change

A large number of alliances have resulted from a project that has had an unclear or poorly defined scope (Walker *et al.*, 2013a, Love *et al.*, 2010). Alliancing is a suitable method to deal with such projects (Sakal, 2005) because all parties work together to define the scope and handle any changes that come about through the delivery of the project.

3.7.6 Complex External Threats

Complex external threats has been recognised as a characteristic of a project that can be addressed by alliancing (Chen *et al.*, 2010, Ross, 2003).

3.7.7 High Uncertainty

Alliances are suitable for projects with a high uncertainty (Lloyd-walker *et al.*, 2014). The characteristic of high uncertainty is very similar to the characteristic of *Unclear Scope* because of the way an alliance addresses each characteristic.

3.7.8 *Need for Innovation*

The nature of alliancing facilitates innovation, making it a top choice on projects that require high innovation to be completed successfully (*Chen et al., 2012, Henneveld, 2006*).

3.7.9 *Tight Cost Control*

Projects that require significant cost control can see alliancing as the preferred PDM (*Henneveld, 2006*).

3.7.10 *Environmental Challenges*

Alliancing is a method recommended for projects which exhibit significant environmental challenges (*NSW Government, 2015, Cocks et al., 2011, Jefferies et al., 2014*).

3.7.11 *Large Project/ High Cost*

Some government agencies, having recognised the benefits of alliancing, have made it a standard to use alliancing or partnering for large projects, for example, projects with durations over 12 months or values over A\$10M (*Jefferies et al., 2014*).

3.7.12 *Need for owner involvement*

The need for owner involvement is a project characteristic recommended by some government guidelines regarding when to use alliancing (*Wood and Duffield, 2009*).

3.7.13 *Resource Shortages*

A shortage of resources can be created during a time when it's a supplier's market, i.e. during an economic boom. Alliancing is an attractive form of PDM for contractors and designers as they are guaranteed their direct costs (*Henneveld, 2006*) and the choice to use an alliance can be governed by the need to attract good resources. Alliances are also a suitable means to keep key client side employees from being attracted to the private sector and to keep valuable experience within the organisation (*Walker and Lloyd-Walker, 2016*).

3.7.14 *Need for Flexibility*

This point relates very closely to the project characteristic of *Unclear Scope* based on the way an alliance addresses each characteristic.

3.7.15 *High Visibility*

This point was only mentioned by one article but refers to the owner choosing to enter into an alliance based on gaining extra visibility for the project.

3.7.16 Special Requirements

This point was only mentioned by one article and a clear description of what was meant by special requirements was not stated. However, given the vague title, it could potentially cover other characteristics as mentioned here such as complexity, innovation, need for owner for owner involvement, etc.

3.8 Success Factors and Barriers

Success factors and barriers give insight into what factors one must consider when selecting alliancing as the PDM or what to consider when choosing to enter into an alliance agreement.

3.8.1 Success Factors

By reviewing six papers, Jefferies et al. (2014) has identified 17 success factors from literature, and by analysing a case study, they identified five additional success factors. The full list of twenty-two success factors is shown in Table 7.

Rowlinson and Cheung (2005), through their study of success factors (which did not form part of the work by Jefferies et al. (2014)) identified the following factors for successful alliances: creativity, trust, commitment, interdependence, cooperation, open communication, goal alignment and joint problem solving. Despite being performed independently, their results of factors necessary to ensure the success of an alliance are in alignment. The explanation behind why each success factor is important is well documented by these two sources and thus will not be covered in this thesis.

Table 7 - Success Factors as Identified by the Literature (Jefferies et al., 2014)

Success Factors as Identified by Jefferies et al., (2014)	
Strong Commitment by Client and Senior Management	Trust Between Parties
Sound Relationship	Equity
Mutual Goals and Objectives	Joint Process Evaluation
Dispute Resolution Process	Cooperative Spirit
Flexibility and Adaptability	Tight Alliance Outline
Alliance Structure	Best People for Project
Facilitation	Commercial Incentives
Open Communication	Shared Knowledge
Stretch Targets	Integrated Alliance Office
Staging of Project and Stretch Targets	Establishing Project Specific KPIs
Facilitating On-Going Workshops That Include Site Personnel	Integration of a Web-Based Management Programme

The list by Jefferies et al. (2014) is quite extensive, however, the literature search did uncover some new success factors. Yeung et al. (2007) identified that having adequate resources is a

factor necessary for the success of an alliance and Ross (2009) states that success will be difficult to achieve if the alliance isn't selected for the right reasons. In addition, the search highlighted some success factors that were emphasised the most. The selection of the right people and having good leadership seem to be crucial success factors according to the literature (Sakal, 2005, Rowlinson and Cheung, 2005, Morwood et al., 2008).

3.8.2 Barriers

During the research, it became clear that alliancing is not the best-fitted PDM for all projects and a number of considerations should be taken into account when deciding whether to proceed with an alliance. These considerations can be seen as a barrier to introducing alliancing into a new country, industry or organisation. The literature study identified three main factors that should be considered when selecting an alliance as the preferred PDM. The factors shown in Table 8 are sorted by the number of times they appeared in the studied literature.

Table 8 - Factors to Consider when Choosing an Alliance

Factors to Consider when Choosing an Alliance	References
Maturity and Competence of Client and/or Industry	1,3,4,10,16,31,37,50,62,74
Cost to Establish	1,3,8,9,10,16,37
Resource Availability of Project Participants	1,3,9,27,37,50,74

A brief explanation of each factors follows.

Maturity and Competence of the Industry

Alliancing is an advanced form of relational contracting and thus requires competent organisations with particular knowledge, skills and attributes (Walker et al., 2015, Ross, 2003). If an industry has had little experience with relational contracting then it can create difficulties for clients to find suitable alliance partners (Ross, 2003).

A culture shift is required in order for the traditional mindset to transition into a mindset suitable for alliancing (Ross et al., 2014). This includes everything from client-contractor relationships to working methods (Ross, 2003, Laan et al., 2011). It can also be the case that organisations who are used to having all the power over a project, such as construction managers, can feel that they lose a certain level of control (Scheublin, 2001).

Cost to Establish

The experience in the literature is that alliances are only worthwhile for large projects (Scheublin, 2001). This is due in part to the fact they have high establishment costs (Walker et

al., 2015). A client must be aware of this and decide whether the benefits of using an alliance outweigh the high investment cost.

Resource Availability of Project Participants

As noted as a success factor, alliances require the commitment of senior staff from all involved parties (*Chen et al.*, 2012). This commitment needs to be supported by senior management (*Ross*, 2003). Both clients and non-owner participants need to consider this when deciding whether to enter into an alliance agreement. This forms a barrier to the alliance method if an organisation does not have capacity to commit senior resources.

The client must consider that there is a high degree of hands-on involvement required of them due to the nature of the integrated project team (*Walker et al.*, 2013a).

3.9 Current and Future Trends

Although it has not been specifically covered in the literature, a number of trends can be elicited from the literature regarding alliancing. One is the increasing adoption of alliancing, and other collaborative type contracts, in the construction industry (*Walker and Lloyd-Walker*, 2016, *Ingrige and Sexton*, 2006, *Laan et al.*, 2011). This trend goes further in that there is an increasing adoption of alliancing, and other collaborative type contracts, around the world, particularly within Europe (*Ross et al.*, 2014).

When we look at the experience in Australia, we can see that there is a declining trend in the use of alliances for public infrastructure projects (*Ross et al.*, 2014). It seems that alliancing is past its peak. However, a good side effect of the alliancing trend in Australia is that the lessons learned, the improved relationships between clients and contractors, the collaborative mindsets, and the new approach to working within a project and doing business, has transferred across the industry and has improved the performance of other PDMs (*Lloyd-walker et al.*, 2014, *Ross et al.*, 2014).

In Australia, it appears that clients are now adopting new PDMs that try to replicate the benefits of alliances (*Ross et al.*, 2014). Part of the reason for the decline in the use of alliancing seems to stem from the introduction of tighter government regulations in regards to proving value for money in alliance projects, particularly where the NOPS were selected without price competition (i.e. a pure alliance) (*Ross et al.*, 2014, *Mills et al.*, 2011).

3.10 Benefits of Choosing Alliancing

During the process of researching the project characteristics that make alliances a suitable PDM, it became evident that there are reasons other than the characteristics of the project that motivate a PO to begin an alliance. It was determined that these motivations often stem from a perceived benefit of the alliancing model. Therefore, Table 9 was created from the perceived benefits of the alliancing model found in the literature. It is sorted in order of the number of articles that refer to the benefit.

As this did not form part of the intended research and was included as an extra outcome of the research, detailed descriptions of each benefit will not be presented here. The benefits can help to understand why alliancing is chosen to address certain project characteristics.

Table 9 - Benefits of Choosing an Alliance

Reasons to Choose Alliancing	Reference	Total
Increased Innovation	1,3,5,6,9,10,12,14,15,16,20,29,31,37,48,50,58,61,74	19
Learning Benefits (incl. Shared Knowledge and Skill Transfer)	1,2,3,5,12,16,37,48,58,62,74	11
Avoid Disputes/litigation	3,5,6,8,9,10,14,50,58,62	10
Greater Flexibility	1,3,9,10,12,15,29,37,60,74	10
Shares Risk and Responsibility (incl. reduce/manage)	1,3,4,5,6,9,14,15,62,74	10
Early Commencement/Delivery	3,5,6,9,14,16,37,50	8
Increased Performance	7,8,9,14,15,37,50	7
Promote Inter-Organisational Cooperation/Collaboration	3,9,14,31,50,58,62	7
Reduce Cost / Cost Effective	3,5,10,12,14,16,37	7
Improved Outcomes	5,6,16,20,50,58	6
Added Value	1,2,3,6,50	5
Improved Relationships	5,20,37,74	4
Best Practice or Better Management of HSE and Community Issues	37,50,60	3
Increased Efficiency	3,6,16	3
More Effective Management of Stakeholder Issues	37,50,60	3
Open Communication	14,50,74	3
Resource Sharing	1,2,12	3
Concurrent Engineering	3,5	2
Contractor Has More Certainty for Cost Reimbursement	16,37	2
Drive Cultural Change	50,74	2
Focus on Solutions	9,74	2
High Quality	3,16	2
Increased Collaboration	20,50	2
More Control and Input for Owner	1,74	2
Retain Key Staff	50,74	2
Sustainable Development	27,50	2
Early Involvement of Contractor	60	1
Equality	14	1
Improved Management of Uncertainty	10	1
Improved Workers Work-Life Balance	3	1
Whole of Life Cost Approach	5	1

4 FINDINGS AND DISCUSSION

This section will identify the findings from the interviews in the UK, Finland and Australia, and discuss them in relation to the findings from the literature study and case studies.

4.1 What Makes an Alliance an Alliance?

4.1.1 What Elements Make Up an Alliance?

A preliminary list of elements identified by the literature study formed the basis of the questionnaire case study. Three PMs identified the elements that were present in their respective alliances and the results are shown in Table 10 (Table 10 shows 31 elements while Table 5 shows 33, this was due to the timing of sending out the preliminary list).

Table 10 – Questionnaire Case Study Results

Elements of an Alliance	Lawrence Hargrave Alliance	Lawson Alliance	Hunter Expressway Alliance
Formal Contract (Standalone contract, built for purpose)	X	X	X
No Dispute Clause/ No Blame No Fault Mentality	X	X	X
Pain/ Gain share	X	X	X
Open Book Approach	X	X	X
Unanimous decision making	X	X	X
Broad/ undefined Scope	X	X	X
Early Involvement of Alliance Partners	X	-	X
Incentivized Cost-Reimbursement	X	X	X
Minimum Reimbursement of Direct Costs	X	X	X
Direct Cost Target (Target Outturn Cost TOC)	X	X	X
Fee to cover Corporate Overheads	X	X	X
No Latent Condition Clauses	X	X	X
Risk/ Reward Sharing	X	X	X
Alignment of Client and Commercial Participants Objectives	X	X	X
Common Goals	X	X	X
Joint Responsibility	X	X	X
Alliancing Workshops	X	X	X
Alliance Board	X	X	X
Alliance Management Team	X	X	X
Integrated Project Team (Selected on a Best-for-project basis)	X	X	X
Virtual Organisation	X	X	X
Team Building Activities	X	X	X
Colocation of Alliance Team	X	Partly	X
Single Alliance Culture	X	X	X
Alliance Uniform and Stationary	X	X	X
Alliance Facilitator	X	X	- *1
Auditing	X	X	X
Built from the ground up	X	- *2	X
Internet Based Information Management System	X	X	X
Can be Price Competitive	X	X	X
Dispute Resolution kept within alliance	X	X	X

*1 The alliance used a commercial advisor and an Alliance Team Coach

*2 The contact was unsure what was meant by this element

The results, albeit based on a small number of cases, helped to validate the elements identified in the literature. All elements were present in at least two of the three cases, with twenty-seven of the total thirty-one being present in all three.

The next step in the process of identifying the elements of an alliance was to analyse the results of the interviews in the UK. To determine what alliancing is from the practitioner’s point of view, questions such as “*How do you define alliancing?*” and “*What do you think are the key elements of an alliance?*” were asked to the participants during the interviews. Breaking down alliancing into elements proved to be the best way to determine exactly what an alliance is. Table 11 below contains a number of elements that were identified by practitioners as being a key part of alliances in the UK.

Table 11 - Alliance Elements Identified by the Interviews in the UK

Alliance Elements Identified by the Interviews in the UK
Early Involvement, early in the design process.
Selection by Value
Common Processes and Tools (BIM standards)
Pain/Gain Shared Amongst All Parties
No Blame Clause
Equality Amongst Participants (1 voting member from each participant, all decisions unanimous)
Risk and Opportunity Sharing
Integrity
Good Faith
Fixed Amount for Overhead and Profit (around 3-4% of target cost), Reimburse Direct Costs
Alliance Auditor (determines normal costs and profit for each party. First reports to client, then to alliance)
Open Book Arrangement
Integration (one location, one brand, one culture, no functional silos)
Collective Accountability
Decisions are “Best for Alliance”
Incentivised Non Cost Key Result Areas (KRA)

Of the sixteen elements identified during the interviews, twelve were also identified by the literature. *Integrity* and *Faith* were not included in the elements found in the literature. They are deemed as ‘soft’ elements, and as per the limitations, fall out of the scope of this study. *Selection by Value* was not included in the list from the literature as, during the study, it was determined that selection by value relates to the selection process and does not define alliancing itself. *Decisions are “Best for Alliance”* was not identified as its own point by the literature study, because, on closer inspection it was seen to be incorporated into the elements *Collaborative Problem-Solving and Decision-Making*, *Single Alliance Culture* and *Unanimous Decision Making*.

Tables 5 and 11 present the preliminary lists of elements that identify alliancing and Table 10 helps to validate the elements. A further analysis was required in order to reduce and combine

the lists so that they contained the most relevant elements. Each piece of literature was analysed again to check for references made for each identified element and a closer look at the definitions of each element provided a starting point for refining the list. It was possible to see which elements were related and could be combined, and which elements were not necessarily 'defining' elements, and could be considered unimportant for the purpose of this study.

The further analysis resulted in the following points of note. *Joint Responsibility* can be seen as a result of the structure of an alliance, for example, *Risk and Reward Sharing* creates a situation where each party has to work together to manage the risk, and this implies joint responsibility. *Early Involvement of Alliance Partners* is a result of other key alliance elements. All parties are involved early in that they all participate in the defining of scope, in the calculation of the TOC and in the creation of the alliance agreement. An *Internet Based Information Management System* can be seen as a tool used by an alliance, or any other PDMs for that matter. *Collaborative Problem Solving and Decision-Making* was deemed to go hand-in-hand with *Unanimous Decision Making* and thus the two elements could be combined under the name of the latter.

Common Goals can be seen to relate to *Risk and Reward Sharing*, *Key Result Areas*, *Alignment of Client and Commercial Participants' Objectives* and *Incentivised Cost-Reimbursement* as they all work together to create a situation of all parties working towards a set of common goals. *Built from the Ground Up* was a point of confusion in the case study, was only highlighted in one piece of literature and was not mentioned in the interviews. The principle of *Built from the Ground Up* could be incorporated in the element *Formal, Stand-Alone Contract*.

No Latent Condition Clauses is an element that can be seen as a component of *Risk and Reward Sharing*. The *No Dispute Clause/ No Blame, No Fault Mentality* is a combination of hard and soft elements. Therefore, just the hard side should be included as a result in this study. In addition, the *No Dispute Clause* is a similar element to *Disputes Resolution Kept within the Alliance*.

The description of a *Three-Limbed Contract* ties in with the identified elements *Incentivised Cost-Reimbursement*, *Minimum Reimbursement of Direct Costs*, *Target Outturn Cost* and *Fee to Cover Corporate Overheads*.

Finally, the *Single Alliance Culture* is a result of an alliance implementing the elements of *Alliancing Workshops, Relationship Development, Alliance Facilitator* and *Alliance Uniform and Stationary*.

The refined list of elements, which resulted from the literature study and the findings from the UK interviews, became part of the interview guide for the interviews conducted in Finland and Australia. The list of elements was used, in the interviews that were case specific, to crosscheck the elements that were present in the case projects. The elements present in each case study were collected and the results are presented Table 12. The first 14 projects are Australian and the 15th project is the Finnish pilot alliance project.

Table 12 - Elements Present in the Case Projects

Elements of an Alliance \ Project	Lawrence Hargrave Alliance	Anzac Bridge Upgrade	Karatha Tom Price Stg. 2	Windsor Rd Alliance	Springvale Rd Rail Alliance	Sydney CBD Alliance	Inner West Busway / Vic Rd	Lawson Alliance	Perth Busport Alliance	Perth City Link Rail Alliance	Cotter Dam Enlargement	Ballina Bypass Alliance	Hunter Expressway Alliance	Gateway WA	Liekke
Formal, stand-alone Contract	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Virtual Organisation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pain/ Gain share	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Risk/ Reward Sharing	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• No Latent Condition Clauses	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Alignment of Client and Commercial Participants Objectives	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Three Limbed Contract	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Incentivized Cost-Reimbursement	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Minimum Reimbursement of Direct Costs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Target Outturn Cost (TOC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

• Fee to cover Corporate Overheads and profit	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
No Dispute Clause/ No Blame, No Fault Mentality	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Dispute Resolution kept within alliance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Open Book Approach	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Auditing	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Alliance Leadership Team (ALT) (Alliance Board)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Alliance Management Team (AMT)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Unanimous Decision Making	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Integrated Project Team (incl. client)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Colocation of Alliance Team	x	x	x	x	*	x	x	x	x	x	x	x	x	x	x
Single Alliance Culture	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Alliancing Workshops	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Relationship Development	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Alliance Facilitator	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
• Alliance Uniform and Stationary	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*Partial

It can be seen that each element was present in every project, with the exception of *Colocation of Alliance Team* which was only partially present in one of the projects. It appears, from this sample of projects, that the structure of alliancing within Australia is very consistent. Another point to note is that the Finnish pilot alliance project also had every element present. This may not come off as a surprise however, seeing as they adopted the “Australian” model for their pilot project.

As part of the questionnaire, the practitioners were asked if they could identify any additional key elements that were not shown in the above list. This process did not uncover any new elements, which provides some confirmation that the list of elements is quite comprehensive.

4.1.2 *Elements Unique to Alliancing*

The second part of the pilot study questionnaire was designed to determine which elements the selected PMs consider unique to alliancing. The intention was there, however, based on the returned questionnaires, it was evident that the intention was not communicated clearly enough. In the instance of this questionnaire, the three PMs ticked every element as being unique to alliances, which is not the case in reality (and I am sure the PMs would agree). For example, traditional PDMs use formal stand-alone contracts and partnering makes use of auditing, thus showing that these elements are not unique to alliancing. In view of this, these results are considered not reliable enough to draw conclusions from. In addition, elements unique to alliancing was not included in the UK interviews due to the timing of the interviews in relation to the rest of the study. Therefore, the initial results of what elements are unique to alliancing is based on the studied literature, the Australian interview series and the author's own experience.

The literature search identified a number of elements that can be identified as being unique to alliancing. Firstly, the majority of elements that contain the word alliance in their title are considered to be to unique to alliancing. This is with the exception of *Alliancing Workshops*. The intention of alliancing workshops is to develop the culture of the team. Such workshops exist in partnering arrangements to developed the partnering mindset and therefore it is not unique to alliancing. Secondly, the elements *Virtual Organisation*, *No Latent Conditions Clauses*, *Three-Limbed Contract* and *No Dispute Clause* are considered unique to alliancing. They have not appeared in the studied literature to be referenced to other PDMs. It should be noted that a comprehensive literature study was not performed on other PDMs and thus these results are not necessarily a 100% accurate representation of reality. The remaining elements have been, to some degree, mentioned in the literature in relation to other PDMs. For example, the work of Haugseth (2014) has shown that partnering can include such elements as *Colocation of Team*, *Target Cost with Bonus/Malus* and *Open-Book Economy*.

During the Australian interview series, in particular the interviews that involved the discussion of the case projects, the participants were asked to identify whether they thought a particular element was unique to the alliancing PDM. The results from the responses of 14 interviews are presented in Table 13. For the remaining interviews, despite not going through the table of elements, a number of elements were mentioned as being unique to alliancing during the general discussions. These were collected and the number of mentions appear in the second-

to-last column. The total number of times an element was mentioned, from both the case studies and the remaining interviews, is shown in the last column of Table 13.

Table 13 - Elements Unique to Alliancing as Identified by Australia Practitioners

Elements of an Alliance	Indicated as being unique to alliancing by the interviewees														#	Total	
Formal, Stand-Alone Contract																	0
Virtual Organisation			x				x	x						x		4	
Pain/ Gain Share			x					x		x					2	5	
Risk/ Reward Sharing	x							x		x					3	6	
• No Latent Condition Clauses			x				x			x				x	1	5	
Alignment of Client and Commercial Participants Objectives						x		x						x	1	4	
Three Limbed Contract		x	x			x		x						x	1	6	
• Incentivized Cost-Reimbursement		x	x				x	x						x		5	
• Minimum Reimbursement of Direct Costs		x	x	x				x	x					x		6	
• Target Outturn Cost (TOC)		x		x				x	x					x		5	
• Fee to Cover Corporate Overheads and Profit		x		x				x	x					x		5	
No Dispute Clause/ No Blame, No Fault Mentality								x	x		x			x	x	2	7
• Dispute Resolution Kept Within Alliance								x	x					x		3	
Open Book Approach		x	x	x				x	x					x	1	7	
Auditing				x	x			x	x					x		5	
Alliance Leadership Team (ALT) (Alliance Board)	x	x		x	x				x							5	
Alliance Management Team (AMT)	x	x		x	x				x							5	
Unanimous Decision Making		x		x	x			x	x					x	x	1	8
Integrated Project Team (including client)		x		x					x					x		2	6
• Colocation of Alliance Team		x		x	x				x		x			x		1	7
Single Alliance Culture		x		x			x	x	x							1	6
• Alliancing Workshops		x		x	x	x	x	x	x							6	
• Relationship Development		x		x			x*	x	x							5	
• Alliance Facilitator		x		x			x	x	x							5	
• Alliance Uniform and Stationary		x		x	x	x	x	x	x					x		1	8

This column indicates the number of times a particular element was mentioned as being unique to alliancing in the interviews that were not case specific.

What can be seen in Table 13 is that there is a lot of inconsistency amongst the practitioners as to what elements are unique to alliancing. The elements that got the most mentions were *No Dispute Clause*, *Open Book Approach*, *Unanimous Decision Making*, *Colocation of Team* and

Alliance Uniform and Stationary. Of the elements considered unique based on the literature, all were mentioned to some extent by some of the interviewees. Though what is also interesting is that the elements that were considered not to be unique to alliance based on the literature, were also mentioned to be unique by some of the interviewees.

Based on the findings from the interviews, what appears to be the biggest cause for the inconsistency of identifying the unique elements stems from the practitioners' experience and background. For example, if a practitioner had only worked on D&C projects prior to working in an alliance, they might be lead to believe that the majority of the alliancing elements are unique to alliancing, as they do not appear in D&C projects. Other practitioners may have worked in different partnering projects, and the elements used in these particular partnering projects (given that there is no consistency with partnering elements (*Hosseini et al., 2016b*)) will determine what they believe to be unique to alliancing. Some practitioners are actively working on new and innovative contracts that are based on the alliancing model, thus they consider none of the elements unique. As stated by one of the participants – *“Most of the alliance elements are now found in Delivery Partner.”* (Participant 9).

The most likely case, is that no single element is unique to alliancing, but it is the unique combination of elements that really makes the alliancing model unique in the world of PDMs. One participant, who stated, *“The unique combination of all the elements are what make an alliance, not the individual elements”* (Participant 10), seconded this finding.

Although not directly related to a unique element, but more as something unique to the alliancing experience, an interesting point was highlighted by one of the participants who mentioned: *“Everyone gets a better understanding of all the parties' drivers. Contractors and consultants have said that they never really understood some of the client perspectives, and because you have those discussions all together in an alliance everyone gets to understand that and why you would want to do certain things and why you've gone down a particular path.”* (Participant 4). This could also be considered as one of the benefits of alliancing.

4.2 Characteristics of a Project That Make it Suitable for Alliancing

Walker and Lloyd-Walker (2016) describe an alliance decision model that identifies that there are both external pressures and internal logic that go into the decision for deciding to choose alliancing, as shown in Figure 3.

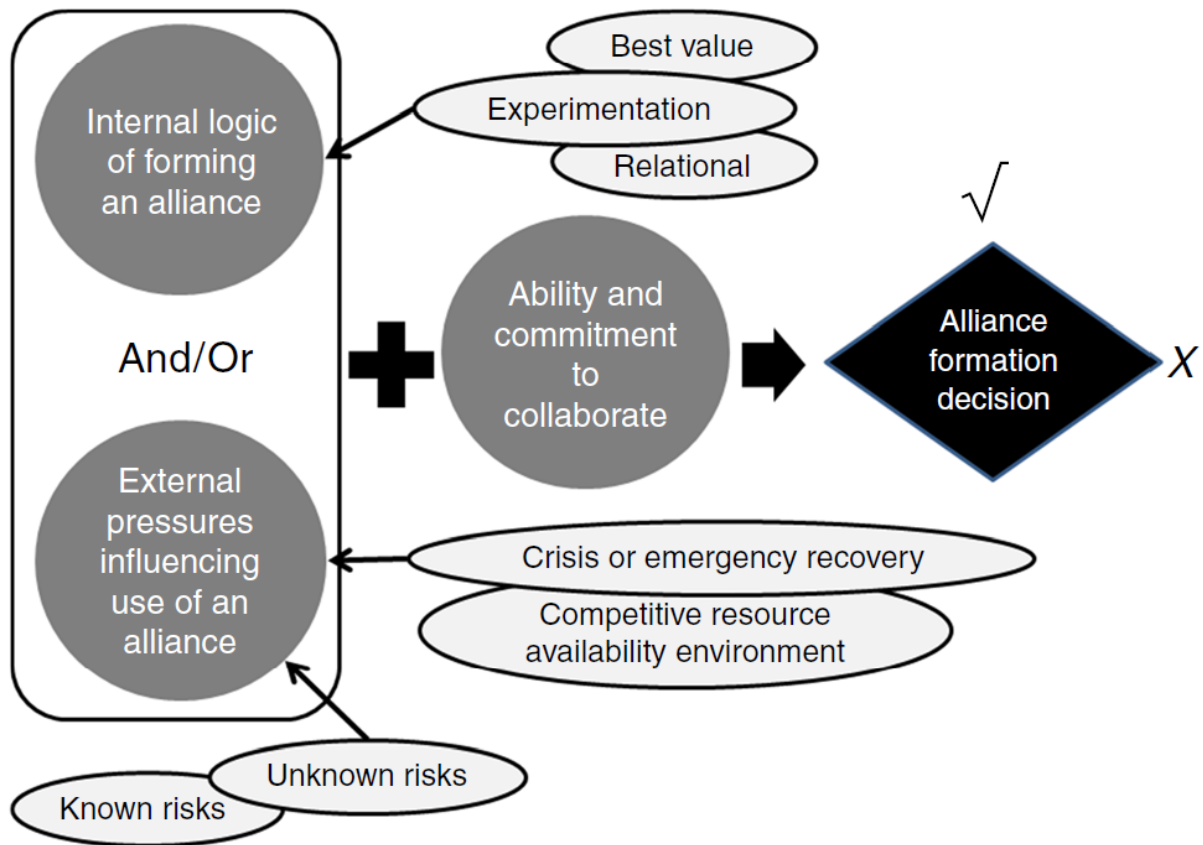


Figure 3 – Alliance decision model (Walker and Lloyd-Walker, 2016 p.87)

For the purpose of this research, focus has been placed on the characteristics of a project that influence the choice of an alliance. According to the model, project characteristics falls into the external pressures influencing the use of an alliance. To provide another view on this, Hosseini et al. (2016a) show that there are three categories of factors that influence the selection of a PDM in general, client objectives (can be considered as internal factors), project characteristics, and external environment (can be considered as external factors). The focus of this research is to consider the project characteristics, and it is outside the scope of this study to consider the internal and external factors in detail.

It can often be the case that the nature of the project will dictate the choice of PDM. For example, a project may have a very tight timeframe that can only be achieved if all parties are involved from the very beginning. This way, certain aspects of planning, design and execution can happen concurrently. Such a situation lends itself to alliancing. That being said, alliancing is not a form of project delivery method that is suitable for every infrastructure project (Henneveld, 2006). Some projects however, have key characteristics that make them highly suitable for the alliance method.

A review of the characteristics identified by both the literature and the interviews was undertaken. Each characteristic was analysed for uniqueness; where similarities were identified between characteristics, they were combined. In addition, the characteristics were judged by the weight placed on them in the literature and interviews, and the number of times they were cited by different sources.

A number of the characteristics can be combined based on their similarity. For example, if a project has the *Need for Flexibility* or has *High Uncertainty*, when it applies to how alliancing addresses this issue, it is very similar to the project having an *under-defined scope* or having a *Risk of Scope Change*. In all these cases, every participant works together to solve the issues as they arise and they do this by maintaining a high degree of flexibility in the process. Special Requirements was mentioned briefly by just one source, so with limited information on this characteristic, it is not considered as being relevant to this study. However, it was noted that it could potentially cover other characteristics as mentioned here, such as complexity, innovation, need for owner for owner involvement, etc., depending on the view of the PO.

The UK interviews showed that a number of different drivers have been identified for choosing alliancing in the UK. Alliances have been the preferred PDM when the project has one or more characteristics listed in Table 14. This is quite consistent with the results from the literature review in that seven of the eight characteristics identified by the interviews appear in Table 6.

Table 14 - Project Characteristics Suitable for Alliance as Identified by the UK Interviews

Project Characteristics Suitable for Alliance as Identified by the Interviews in the UK
High Complexity
High Value
Need for Highly Technical Solutions
Need for Innovative Solutions
High Uncertainty
Set New Completion Targets
Multiple Interfaces
Large Number of Stakeholders

The results from the literature and the UK interviews were combined to form a table of characteristics that were used in the case specific interviews in Australia. The table can be found in APPENDIX C – Interview Guide.

The Australian interviews identified a number of different drivers that have influenced the selection of alliancing in Australia. Alliances have been the preferred PDM when the project has one or more characteristics from the list in Table 15. This is quite consistent with the results

from the literature review in that eleven of the sixteen characteristics identified by the interviews appear in Table 6.

Table 15 - Project Characteristics Suitable for Alliance as Identified by Thirteen Australian Alliance Projects

Characteristic	Number of Case Projects Influenced*
Tight Time Constraint/ Need for Early Start	9
Multiple/ Complex Stakeholders	7
High Risk	8
High Complexity	6
Unclear/ Broad Scope/ Risk of Scope Change	10
Complex External Threats	1
Large Project/ High Cost	4
Need for Innovation	4
Tight Cost Control	4
Environmental Challenges	3
Need for Owner Involvement	9
Multiple Interfaces	7
Market Situation (External Factor)	
Client Organisation (Internal Factors)	2
Other: Reputation (Internal Factors)	1
Other: Political Commitment (External Factor)	1

*Where a characteristic was identified by the practitioner as partly contributing to the selection we have counted it in the number of mentions.

While going through the table of characteristics with the interviewees in Australia, they were asked if any additional reasons for why the client went with an alliance. This identified two new characteristics to the list: *Reputation* and *Political Commitment*. However, it is noted that *Reputation* should be identified, along with the characteristic of *Client Organisation*, as being internal factors, as they are internal logic of the organisation and not necessarily project characteristics. Following the same logic, *Market Situation* and *Political Commitment* can be identified as being external factors that influence PDM selection, not project characteristics. They have been included here to show that they were considerations during the selection process, however, as they are not project characteristics they will not be considered in detail.

The results in Table 15 show the three most referred to project characteristics to be *Unclear/Broad Scope/ Risk of Scope Change*, *Tight Time Constraint/ Need for an Early Start*, and *Need for Owner Involvement*. Other notable mentions are *Multiple/ Complex Stakeholders*, *High Risk*, *High Complexity* and *Multiple Interfaces*.

The findings that resulted from the interview question “6. Which characteristics of a project make it suitable for alliancing?” show that there was a general consensus among the participants that projects that are high risk, complex, and/or uncertain are best suited to an alliance. One participant highlighted that alliances are not suitable for straightforward projects stating “(I) would go alliance every single time for the most high risk and important projects if

you had the right competent staff. Don't do alliances for routine work.” (Participant 2). Other characteristics mentioned were tight timeframes, multiple interfaces, need for owner involvement and complex stakeholder issues.

When comparing the findings from the Australian interviews with the findings from literature, it can be seen that the literature does not reflect the reality when it comes to recognising the *Need for Owner Involvement* and *Multiple Interfaces* as being project characteristics suitable for the alliancing method. Despite influencing nine and seven projects respectively, these characteristics were only identified by three and zero publications respectively. However, overall, the results from the interviews do show alignment with the results from the literature study, thus helping to confirm the findings of this research.

It should be noted that, one reason why some characteristics are mentioned more than others in the literature, is many publications build from the work presented in previous publications. Thus, a particular publication that mentions a certain characteristic can influence the publications that come after it, multiplying the number of mentions of that characteristic. It was outside the scope of this thesis to take an in depth look at this and therefore can be suggested as an opportunity for further work.

4.2.1 How do Alliance Elements Address the Identified Characteristics

The structure of alliances lend themselves very well to addressing the issues created by the identified project characteristics. The *shared risk* and *pain/gain* arrangements combined with the *alignment of client and commercial participants' objectives* creates an entity that is very adept to dealing with projects that are *high risk* or have *high levels of uncertainty*. When problems arise, it is in the best interest of all the parties to find the best-for-project outcome, and find it quickly. In addition these elements work together to enable the alliance to deal effectively with complex external events.

The elements mentioned above, combined with *unanimous decision-making*, *no dispute clause* and *open book* help to ensure the win-win principle of alliancing necessary to deal effectively with the issues that arise.

The fact that all parties become involved in the project from the very beginning creates an environment where innovation can thrive. All options can be considered and explored for their merits. Many different perspectives all working together in the early phase can lead to very innovative solutions. This was recognised by many of the interview practitioners as being a key benefit to the alliancing method. “[Alliances] generate innovation, can change standards,

[and put you] in a better position to generate this because you have got experts together, good people, it's a positive work environment and you can throw in extra resources if you need to get these outcomes. This doesn't happen in other forms of contracting, there is a lot more negative tension, in D+C in particular, it's us and them." (Participant 11). "A lot of risk mitigation is done when developing the design with all the participants. *[It creates a] promotion of/breeding ground for innovation [and] continuous improvement.*" (Participant 18).

This arrangement of concurrent engineering creates an environment where normally successive stages can run in parallel. For example, the contractor can begin with the early works while the designers are finalising the design and the client is working on planning permissions and community consultation. This reduces the duration of the project significantly and allows for an early start. Many interviewees stated this as a reason for their project being delivered ahead of time.

In some cases, alliances were chosen for a project due to the tight cost control needed. For example, some projects were given the problem, and a budget, and told to find the best solution that addresses the problem and fits the budget. Alliances have a certain freedom to vary solutions on the go, as they are not locked into a pre-design. Combine this with the fact that it is in the best interest of all parties to find the best solution, meet the incentivised KRA's, and reduce the project cost in order for them to make money, makes alliancing well suited to dealing with tight cost control.

The *integrated project team* is crucial for allowing alliances to deal with *complex stakeholder issues*. Having the most suitable person for the job in each position means that you can manage the issues very effectively. For example, as identified by one of the practitioners, often the client has well established community consultation systems and networks. Often contractors do not have such systems and networks in place. Thus, it makes sense to have key client personal in the relevant position within the alliance. The *integrated project team* becomes very useful when there is a *need for owner involvement*, as the client is imbedded in the team for the entire duration of the project and can maintain a level of influence over the project outcomes.

4.3 Success Factors and Barriers to Alliancing

The series of interviews proved to be a great way to identify both the success factors and barriers to alliancing, and to check to ensure the literature is relevant to the current experiences.

4.3.1 Success Factors

Jefferies et al. (2014) and Rowlinson and Cheung (2005) both identify a number of success factors that seem to be standard practice for the alliance model. They are essentially woven into the fabric of the Australian alliance model. Because of this, it could be said that some of the success factors mentioned by Jefferies et al. (2014) and Rowlinson and Cheung (2005) should no longer be identified as critical success factors. Yes, it is true that if they are not present then the success of the project is jeopardised, but if they are not present, then the strategy could not identify itself as an alliance, at least not by the Australia model standards. For example, every alliance project that was discussed during the interview series had mutual goals and objectives, an alliance structure, had a best for project selection process for staff, used an alliance facilitator, had commercial incentives, used an integrated project team with co-location, had established project specific KPI's, and facilitated workshops throughout the entire length of the project. That makes seven out of the twenty-two success factors identified by Jefferies et al. (2014) as being well-established norms. In fact, each of these points could be considered among the elements that make an alliance what it is today.

Another point to note is, of all the projects discussed, not one had a formal dispute resolution process that involved resolution outside of the alliance environment. Each alliance had a no-dispute clause and the requirement that all disputes be handled internally within the alliance.

The success factors mentioned by the majority of practitioners during the Australian interview series were ensuring that the alliance is chosen for the right reasons, and that the right people are chosen to work within the alliance. It was of the opinion of most of the interviewees that if you have these two aspects in place, then you will achieve success. A number of times it was mentioned that one of the reasons why particular alliances were unsuccessful, is that alliancing was selected for the wrong reason and that the project was not suited to an alliance. Some particularly relevant quotes from the interviews include:

“Alliances will give you the best results of any project system you can ever come across on one condition: you have to have the right people. If you have the right people they will make even a bad system work. The alliance system will give you the best possible outcome.” (Participant 2).

“You need people who are running projects from the client side who have status, knowledge and respect. When running alliances, as a client, you need senior experienced people to sit on the ALT and will take the time to be involved, not just go to the meetings once a month and

read the minutes of the previous meeting. The success of alliances is have a team of people at this level who is engaged, wanting to be engaged, wanting to have ownership of the project and have the ability to work with the client, and together to build it. Alliances can be good, but it's the commercial model for the alliances that is the thing that makes it different.” (Participant 7).

“You shouldn't just do it because it's fashionable or you've done one, it worked, and now you want to do it again.” (Participant 17).

“It takes the right people in the team to make it a success. Not just the contract.” (Participant 18).

“The contract model only doesn't create success. You need the right people. An alliance does influence behaviour though.” (Participant 22)

“As a contract strategy they're fine. Horses for horses. They have their purpose but they shouldn't replace D+C's or PPPs. You should be careful about the aims and objectives of the project. There are different purposes to use alliances. Need to consider whether you want to take on some of the risks or keep them at arm's length. Also depends on whether you can adequately define what it is you want to do. You should always be an informed client. The need for an innovative solution alone is not enough of a reason to go into an alliance.” (Participant 23).

Another factor that was mentioned a significant number of times was the competence and commitment from the client. Many participants believe that to ensure success you need commitment from the highest levels within the client organisation. One participant stated, *“[you] must have technically and relationally competent clients [to be successful]. You don't need to be personally experienced with alliances but you do need senior people who are willing to commit themselves to it and who are willing to go and do the research and talk to practitioners. You need to identify who in the client organisation has the technical competence, the relational competence and the ability to work with people (people from the same organisation need to be aligned). Need courage and humility. Then you can have a successful alliance.”* (Participant 2).

In addition, all parties need to commit to the alliance culture of collaboration. *“Maturity of the team on both sides is important. The alliance culture stuff needs to be done, despite whether it's written into the contractor or not.”* (Participant 13)

These findings align well with Walker and Lloyd-Walker (2016)'s alliance decision model (Figure 3), which shows that you need both the right motivation, as well as the *Ability and Commitment to Collaborate* before selecting to proceed with an alliance.

Overall, when considering both the literature and the interview findings, the best place to start to ensure the success of an alliance, is to perform a thorough evaluation of the project in relation to various PDMs to determine if alliancing is the best choice for the project. Following this, an assessment should be carried out to determine if there is sufficient capability and resources on the client side to commit to an alliance, and care should be taken to select the right people to work within the alliance, those who are committed to collaboration, the alliance, and its principles. Following this process, in combination with the structure and principles of alliancing, appears to be a recipe for the successful delivery of an alliance project.

4.3.2 Barriers

The Australian interview series confirmed the barriers identified by the literature study and identified a number of additional barriers and points of concern. A key barrier identified by respondents is the increased pressure from Government for clients to demonstrate value for money when selecting the alliance form of procurement. It has been the case that, the majority of alliances in Australia were delivered as “pure” alliances, whereby the non-owner participants were selected on merit and not on a cost basis. This lack of a price competitive tender process, it seems, is part of the cause for concern for the Government and treasury in Australia as to whether alliances deliver value for money. This was reflected in the response of one of the participants stating, “[you need] support from government and treasury and be able to demonstrate value for money. Value for money [can be] demonstrated through the competitive selection process. In a pure alliance, you need to demonstrate value for money.” (Participant 23).

Perhaps there is little cause for concern though, as another key point of the findings was the answer to the question “*Could the same level of success have been achieved if this project was delivered by another form of PDM?*”. In all cases the respondents answered either “no, not at all”, or “no, not to the same extent”. Among the reasons why not, were “*the project would have ended in dispute and we’d still be in the courts*”, “*the project would have most likely been delivered one year late instead of one year early*”, and “*we [the client] would have been hit with a number of large variations*”. It appears that the value for money is there, but it is difficult to demonstrate to the Government without the aspect of the price competition component of

traditional contracts, because the Government and treasury can always ask “how do you know it couldn’t have been delivered cheaper by another party?”.

The three commonly mentioned barriers to alliancing that were identified by the literature were all raised as points of concern in the Australian interview series. In relation to *Cost to Establish*, one participant stated, “*Alliances cost money, the alliance engine, the overhead on the client side, and the whole process to run, it costs money, and it costs people as in the senior ALT members to be there and have time.*” (Participant 7).

The barrier *Maturity and Competence of Client and/or Industry* is very much related to some of the points made in the previous section on Success Factors, where it was stated that in order to run a successful alliance, you need mature and competent clients. This is interesting when compared to the findings identified in Section 4.5 Benefits of Choosing Alliancing. There it is shown that a large benefit of alliancing is the fact that it has matured and increased the competence (in relation to collaboration) of the industry in Australia. Perhaps this barrier can be overcome by applying the identified success factors of using the right people who are committed to the alliance culture of collaboration.

To expand on the barrier of *Resource Availability of Project Participants*, one of the interview respondents raised the following regarding the commitment to the alliance from the client. They make this point while referring to the success of an alliance from which they performed a number of roles including being the senior representative of the client:

“This alliance had unqualified commitment from the highest levels of the Client. Many others received commitment in words only. When critical decisions were needed, the Client was too busy. This is a breach of faith. Alliances are really successful when they are done right – I mean REALLY successful, but they are really hard to make them run right. They cannot be run by half-hearted or incompetent clients. The things that make Alliance run well are clearly documented and well known, so there is no excuse for having an unsuccessful one.” (Participant 2).

Despite not being covered as its own topic in the literature, the barriers to alliancing appear to be consistent in the literature and in practice. It seems this topic could benefit from further research, however, for those companies, industries and countries who are considering adopting alliancing, the findings presented here are a good place to start. A thorough understanding of the issues presented here will help new players make an informed choice when adopting alliancing.

4.4 Current and Future Trends

The literature has identified that there is an increasing trend in the adoption of alliancing, and other collaborative contracts around the world. This trend has really started to gain traction in recent times within Europe. To expand upon this, a look into how the UK and Finland started using alliancing is presented in the sections below. These findings are of interest as it gives some perspective as to the motivation behind adopting the alliancing method.

Following this, a look into the current and future trends of alliancing based on the Australian experience is covered. As Australia is considered to be setting the trend in terms of the use of alliances, it is an interesting place to look to predict whether other countries follow the same trend or set their own. As an offshoot of this section on trends, a current, and possibly future trend of combining alliancing and lean construction is identified and presented in the author's paper *Project Alliances and Lean Construction Principles* (Young et al., 2016b), which can be found in Part 2.

4.4.1 How the UK Started Using Alliancing

An interesting outcome of the interviews in the UK was their view on how and why alliancing began. Like the literature states, it seems that, according to the interviewees, the UK also started to move towards using alliances to overcome some of the pitfalls of traditional contracting, especially those associated with the adversarial environment and excessive claims. The views of the practitioners interviewed in the UK were that traditional ways have failed; they look attractive and easy, however, (it is their understanding that) only 50% are on budget and delivered on time. They believe that this approach incentivises the wrong thing. Contractors cannot deliver the job for the price they bid *and* make money. People often use traditional contracts as a shield, and always fall back on them. They bid low and claim high. This approach does not always deliver a good product and ends up being quite expensive for the client.

The interviewed UK practitioners also believe that during the 90's, partnering in construction fell apart because of projects relying on intrinsic motivation and incentives. The UK discovered that this does not work in the real world. They learned that you need the contract to back it up, i.e. you need "hard" processes in combination with the "soft" processes. In their experience, partnering has the problem of combining a collaborative relationship with a win-lose contract (Partnering umbrella contract over a traditional DBB or D&C). As soon as the relationship comes under strain, the parties revert to business as usual. Thus, the UK began moving away

from umbrella overarching contracts that gave the feel of collaboration and moved into using the Victorian (Australian) Alliance model.

The interviewed practitioners believe that it is still very traditional in the UK, however, the trend seems to be moving away from straight traditional contracts to either partnering or alliance contracts. They stated that at present, only 20% of contracts in the UK are some form of collaborative contract but they are moving towards a goal of 50%. They are looking towards the Australian models because to them it is the most attractive and mature. Australians have understood the principle of alliancing and it has now become cultural.

These findings provide an interesting insight into the mindset of experience UK practitioners. Such findings will prove useful when undertaking the future work identified in Chapter 6.

4.4.2 How Finland Started Using Alliancing

The findings from the literature and the interview in Finland has given some insight into how Finland began to use alliances. The process first began about 10 years ago when Lauri Merikallio went to Berkeley to study. There he met Professor Glenn Ballard and they kept in touch. Laurie, along with Antti Piirainen, founded Vison in 2012 with the idea to change the construction industry, to implement new procurement methods.

The pilot project, Lielähti-Kokemäki railway renovation (Liekki), became an alliance after Lauri and others visited Australia to meet Jim Ross (Considered the father of the Australian pure alliance model). This convinced them to try alliancing. The idea was there to do an alliance, and the Liekke project proved to be a suitable project to use as a pilot.

Currently Vison is involved in approximately 40 integrated project delivery projects (from these projects over 20 projects are considered to be pure alliances). They use a combination of Alliancing and Integrated Project Delivery. Almost all of the projects are public projects with a couple of private alliances.

Alliances have proven to be a very effective PDM with many clients beginning to use alliances to delivery their projects.

Vison believes that the time is right in Finland and that Alliancing will continue to be a success. It has become a phenomenon in the last 2 years with a lot of projects being delivered using an alliancing model. Clients have begun creating their own alliances without the help of Vison's consultation. In Finland, the focus is on smaller projects, with some projects as low as 6M Euro (Construction projects are smaller in general in Finland than compared to projects in Australia).

4.4.3 Australia

The findings from the interviews show that, in Australia as a whole, alliances are not being used as much as they once were, or as one participant put it, “*it is in severe decline*”. This is for a number of reasons, mainly a combination of changes in government requirements, the introduction of new PDMs, and a reduction in Australia’s infrastructure boom.

However, the most referred to reason seems to stem from the changes in the government (especially treasury) that have implemented stricter “rules” when it comes to using an alliance to deliver a public infrastructure project. It seems that a minority of alliances gave the overall alliancing model a bad name with the state treasury departments. This was due to a number of alliances where the projects were delivered far below the TOC and the contractor walked away with a large profit. This gave off the impression that alliances were too “soft” and it’s too easy for the NOPs to walk away with a lot of profit.

It was suggested that treasury were not fond of alliances because:

- Alliances don’t have a fixed price (they use a target cost), so it is difficult for treasury to determine their budget when they are not sure how much the project will cost. This is compared to a traditional contract where the contractor is to deliver a project for a fixed price.
- It is difficult to prove that you have a reliable TOC, especially with “pure alliances” where the NOPs are selected without a price component. I.e. there is no price competition like there is with traditional contracts.
- It is difficult to prove that the client has gotten value for money.

One participant summed it up quite nicely: “*Australia took on alliancing very strongly, probably from about 10 years ago (2006). Really peaked at about 5 or 6 years ago, they were doing a lot of their high risk projects by alliances. The government made a decision a few years ago questioning value for money and they brought out some treasury guidelines associated with alliancing. This really halted alliancing for them, especially across NSW. They now only use alliances on exception.*” (Participant 8).

What was particularly interesting was that, despite the majority of practitioners agreeing with the above conclusions regarding alliances, they believe that the requirements miss the point. “*The decisions are coming from economists outside the process in treasury saying that they’re*

not satisfied, whereas the engineering teams say that we actually were and we think it was right.” (Participant 8).

All the participants agreed that alliancing is a very good model, when it is used for the right reasons. *“Alliancing hasn’t fallen off because of the model but because of the way it was misused/abused.”* (Participant 10). This was also demonstrated by the responses (in the case project interviews) to the question *“Could the same success have been delivered using another PDM?”*. Every answer to this question was no. This demonstrates that the practitioners do believe in the alliancing model and that it deserves its place amongst a client’s PDM toolkit.

To expand on the point made regarding the introduction of new PDMs, it seems that alliances are in a decline when you look at things from a pure “label” point of view. A number of participants stated that, due to the alliancing trend, and the stricter regulations regarding alliances, client organisations are introducing new models. These models, when looked at closely, very much resemble alliances in many ways, but go by another label. This was seen as a way to get around the restrictions put in place that were specific to alliancing.

The trend does not appear to be Australia wide, with the practitioners in Western Australia (WA) stating that alliancing is still in an increasing trend there. *“(We are) not aware of a decline in alliances. All (our) alliances are an outstanding success.”* (Participants 18,19,20,22, 23). *“Alliances are getting bigger and better”* (Participant 24). The clients in WA do tend to steer away from “pure alliances” by using competitive alliances, in order to demonstrate value for money by including some price competition when selecting the NOPs.

The interview series highlighted that there is so much more to the trend of alliancing in Australia that it could warrant its own master thesis, however, for the purpose of this study, I am really only brushing the surface.

4.5 Benefits of Choosing Alliancing

As mentioned early, alliancing came about as an alternative method to the traditional contracts that were susceptible to opportunistic behaviour (*Walker et al., 2015*). A number of the obvious key reasons to choose alliancing stem from this development, i.e. reduced opportunistic behaviour, elimination of resources tied up in litigation, more cooperative approach to problem solving etc. The process of reviewing the literature and interviews identified many more reasons to choose alliancing, some less obvious than others. For example, the UK practitioners have started seeing the value of early contractor involvement and have identified that alliancing

is a great way to get implement this. Early contractor involvement has been recognised as a key success factor for many projects and is something that traditional contracts do not really cater for.

It became evident during this research that there was more to alliances than just delivering complex and risky projects well. A number of benefits can be associated with the alliancing model. Table 9 shows a number of benefits that were directly mentioned in the literature study. In addition, the findings from the Australian interview series highlights a number of benefits of alliances. One participant noted *“Everyone gets a better understanding of all the parties’ drivers. Contractors and consultants have said that they never really understood some of the client perspectives, and because you have those discussions all together in an alliance everyone gets to understand that and why you would want to do certain things and why you’ve gone down a particular path.”* (Participant 4). The benefit of learning more about the processes and drivers of the other actors involved in projects (owners, contractors and designers) was further highlighted by Participant 8 who stated:

“[Alliances] helped improved our understanding and relationships with our contractors. It helped us to get a better understanding of how they operate and how they price their work and how they run their business. We thought we knew how that worked until we went through the alliance process. We realised how they operate and manage risk, how hard contractors have it or how hard we can make it for them. On the other side, the contractors got inside into various influences that the client has to work under. Reporting up to minster level, managing community expectations, those things. They got insight into the pressures that the client works under. When everyone starts putting their heads together all of a sudden, you start making some good inroads. Now we have much closer relationships with industry, and it also started to breakdown some of the adversary that can occur on other contracts. The process of working together in the alliances has led to some long term improvements – even in traditional contracts.”

The last sentence of the above quote highlights one very interesting finding of the study, that is, that the experiences and learning from alliancing has led to improvements in other contract strategies. Thirteen of the Australian interview participants mentioned this point. Another participant stated: *“Collaboration is getting better even in D&Cs now. ECI has started in the building space but is coming into the infrastructure space. The alliance trend helped develop*

the industry and mature it. Made it more collaborative. The collaboration across any form of contract has been improved because of alliances.” (Participant 14).

It seems that the biggest benefit to come out of alliancing, is the impact it has had on moving the industry out of the traditional mindset and into a collaborative and relational mindset. The experience gained from the alliancing boom in Australia has created an environment in the infrastructure industry where clients, consultants and contractors are more inclined to work together for the benefit of the project, regardless of the contract strategy. It is the belief of many of the interview participants that the alliancing boom was the necessary impetus for this change to occur.

As benefits of using an alliance was not an intended outcome of this paper, just the preliminary findings have been shown. For example, for the findings in Table 9, just the direct mentions of the particular benefit were recorded. The list would be much bigger, and include many more citations, if one was also to infer the benefits from the text.

5 CONCLUSION

This thesis supplements the existing body of knowledge by answering the questions:

1. What makes an alliance an alliance?
 - What elements make up an alliance?
 - What elements are unique to alliancing?
2. What characteristics of a project make it suitable for alliancing?
 - How do alliance elements address these characteristics?
3. What are the key success factors and barriers when choosing alliancing?
4. Are there any indications as to the current and future trends of alliancing?

Due to its relatively new breakthrough into the world of large infrastructure delivery, alliancing is still finding its place amongst the more established project delivery methods. This development has been increasing rapidly since alliancing's birth in the 80's. The rapid development has led to much confusion surrounding alliancing, in particular, what separates it from other relational or collaborative contracts. It seems that the body of knowledge has not yet fully addressed this confusion. This study provides results that help to fill the identified gaps in the body of knowledge.

Based on the literature study, interviews, and case studies conducted as part of this research, this study has determined what makes an alliance an alliance by identifying a list of elements that make up an alliance and recognising the elements unique to the alliancing PDM. Table 16 contains the final list of twenty-five elements that make an alliance an alliance.

Throughout the analysis, a number of elements were identified as being related, yet deemed important enough to secure their own place. This is represented by the use of dot-points to show when an element/s relates to one of the fourteen 'parent' elements. All the attributes in Table 16 either define alliancing or are key elements that make up an alliance, and have been confirmed by the Finnish case study and the fourteen Australian case studies.

When it comes to the elements that are unique to alliancing, the situation is not so clear-cut. Perhaps a few years ago, before the emergence of new PDMs that came about due to the experiences with alliances, many of the elements could have been said to be unique. However, today, Australia is seeing an increase in innovative and relational PDMs that have adopted many elements used in alliances. What could be said is that what separates alliancing from other PDMs is the unique combination of all the elements listed in Table 16.

Table 16 – Elements That Make an Alliance an Alliance

Elements of an Alliance
Formal, stand-alone Contract
Virtual Organisation
Pain/ Gain share
Risk/ Reward Sharing
<ul style="list-style-type: none"> No Latent Condition Clauses
Alignment of Client and Commercial Participants Objectives
Three Limbed Contract
<ul style="list-style-type: none"> Incentivized Cost-Reimbursement Minimum Reimbursement of Direct Costs Target Outturn Cost (TOC) Fee to cover Corporate Overheads and profit
No Dispute Clause/ No Blame, No Fault Mentality
<ul style="list-style-type: none"> Dispute Resolution kept within alliance
Open Book Approach
Auditing
Alliance Leadership Team (ALT) (Alliance Board)
Alliance Management Team (AMT)
Unanimous Decision Making
Integrated Project Team
<ul style="list-style-type: none"> Colocation of Alliance Team
Single Alliance Culture
<ul style="list-style-type: none"> Alliancing Workshops Relationship Development Alliance Facilitator Alliance Uniform and Stationary

The insights gained, from the findings of the literature review and the interviews, into what makes an alliance an alliance has led to the creation of the author’s own definition of an alliance based on “hard” elements. An alliance can be defined as follows:

An alliance is the creation of a unique virtual, integrated organisation consisting of the client and all major parties involved in the planning, design and delivery of a project. It is built on a stand-alone contract with a three-limbed structure where risk is shared among all the participants under a financial pain/gain arrangement. The alliance is governed by an alliance leadership team (ALT/board) consisting of equal representation of each participant and the project is managed by an alliance management team (AMT). All financial transactions are open-book and subject to audit and all decisions and disputes are resolved within the alliance on a unanimous best-for-project basis.

In addition to determining what makes an alliance an alliance, this research has identified twelve characteristics of a project that make it suitable for alliancing. Based on the literature

studied, and the results from the interview series, it can be concluded that alliancing is a very effective PDM, which is suitable for projects with particular characteristics, provided it is selected for the right reasons. Table 17 contains the final list of project characteristics based on the results of the methods contained within this report.

Table 17 - Project Characteristics Suitable for Alliancing

Project Characteristics
Tight Time Constraint/ Need for early start
Multiple/ Complex Stakeholders
High Risk
High Complexity
Unclear/ Broad Scope/ Risk of Scope Change
Complex External Threats
Large Project/ High Cost
Need for Innovation
Tight Cost Control
Environmental Challenges
Need for owner involvement
Multiple Interfaces

Where a project identifies one or more characteristics shown in Table 17, an alliance can be highly considered during the selection process for the project’s delivery method.

By looking closely at the elements of an alliance, it was shown how they address the identified project characteristics. For example, the integrated project team drives innovation and gives the owner more control within the project. The win-win culture created by the combination of a number of alliance elements enables the alliance to handle complex or high-risk projects and projects with great uncertainty.

By comparing the success factors identified in the literature with the case projects, it was concluded that a number of success factors appear to be now outdated. The bar has been raised so that these factors are now engrained into the model. The established research into success factors is still very important as it helps show industries new to alliancing why each element has its place in the model. It also provides a launching platform for how the model could be improved.

The research has led to the conclusion that the number one factor to having a successful alliance is choosing alliancing for the right projects and the right reasons. This makes it so crucial to have an understanding of the characteristics of projects that indicate that an alliance might be the best option. In addition to this, to ensure success once the decision to go ahead with an

alliance has been made, the right people who are fully capable and committed to the principles of alliances need to be selected.

Limited work has been performed in the area of barriers to alliancing in the literature. However, the insights gained from the literature study were backed up by the findings from the interviews. This research has identified a number of key barriers they may inhibit the choice of an alliance as the preferred project delivery method. The barriers include the *maturity and competence of client and/or industry*, the high *cost to establish*, and the *resource availability* of the project participants.

Having an understanding of the success factors and barriers to alliancing, combined with knowing when to select alliancing, will enable practitioners to make better informed decisions regarding the adoption of alliancing into new industries and countries.

A look into the trends of alliancing has revealed that alliancing, along with other forms of collaborative PDMs, are gaining traction around the world, and many of the countries who have begun adopting alliancing, particularly the UK and Finland, have looked to the experience of Australia. The findings show that there is an inclining trend in the use of alliancing in Western Australia, however, there is a declining trend when looking at Australia as a whole. Despite the decline in the use of alliances, there has been an increase in the introduction of new, collaborative forms of PDMs, which have stemmed from the alliancing experience. In addition to this, another interesting observation that has resulted from the alliancing boom in Australia is that, in the opinion of many practitioners within the industry, the experience with alliancing has led to an overall increase in collaboration and good relationships within the infrastructure industry. The industry has matured out of the traditional, adversarial mindset and these improvements can be seen in the other forms of PDMs.

Based on the results of this study, a conclusion of, what makes an alliance an alliance and what characteristics of a project make it suitable for alliancing, is reached. Success factors and barriers have been identified and the trends in the use of the model have been explored. These findings will help assist those academics and practitioners who are new to the alliancing method, understand what alliancing is, when to use it, what to consider, and how to make it successful.

The conclusions are based largely on the Australian experience, however, the lessons learned are transferable to other countries. Continued research into this area can build upon this conclusion to ensure that the identified research gap is fully addressed.

6 FURTHER WORK

The first departure point for further work would be to improve and build upon this study by addressing the identified limitations of this study. This study could be improved by drawing results from a larger number of both academic and industry publications. Additionally, further interviews could be undertaken to expand, confirm, and/or challenge the findings presented here. Furthermore, this study focused on the “hard” tangible elements of alliancing. To build upon these results, further work could be undertaken to include all the “soft” elements of alliancing.

During the study, it became clear that to make a definitive conclusion on what elements are unique to alliancing would require an extensive study into all forms of project delivery methods. Due to the time restrictions of this report, such an extensive study could not be undertaken. Therefore, the results of what elements are unique to alliancing were indicative and based on the literature on alliancing selected for this study and the findings from the interviews. Further work could be performed in this area to compare alliancing against all other infrastructure PDMs to determine the elements unique to alliancing.

This study also highlighted a number of other departure points for further work. The findings highlighted that there are many new PDMs being developed in Australia, and around the world, in the area of collaborative or relational PDMs, many of which stem from the alliancing model. The body of knowledge could benefit from research into these new models. One of the participants, in relation to the Australian alliancing experience, highlighted the importance of involving academia into emerging fields. *“Australia began studying alliances after it was so successful and then became controversial. So it was difficult to study after the event. Many studies performed were deeply flawed. A much more intelligent collaboration between academia right from the start and consistently involved would have allowed much better knowledge and intelligent data from the actual experiences with some academic rigour.”*

Having an understanding of the success factors and barriers to alliancing, combined with knowing when to select alliancing, will enable practitioners to make better informed decisions regarding the adoption of alliancing into new industries and countries. However, the body of knowledge could benefit from further research in this area. The industry could benefit from more work within the area of success factors to identify new “stretch” success factors that are a step above current standard practice. In addition, work should be done to identify success factors specifically for implementing alliancing in a new, immature industry.

In relation to the trends in alliancing, the findings highlighted that this is not such a straightforward topic to study, particularly the trend of alliancing in Australia. It is recommended that further work be done to conduct an in depth look into the trend of alliancing within the Australian context. One point of departure could be to determine whether the view held by treasury is justified in practice, as the impression from the practitioners is that alliances are a great PDM that should be utilised for the right projects. The outcome of this work could be combined with the results of a further study into the benefits of alliancing, not just to the client and NOPs but also to the industry as a whole.

To build on from the study presented in the conference paper Project Alliances and Lean Construction Principles in Part 2, another conference paper is being written that compares the operating systems of alliancing and Lean Construction (LC). The intention is to show if and how alliancing could learn from the operating system of LC and vice versa. The draft conference paper is also attached in Part 2. The intention is to submit the paper for presentation at the 2017 IGLC conference.

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PART 2 – RESEARCH ARTICLES

Article 1:

The Characteristics of Australian Infrastructure Alliance Projects

YOUNG, B. K., HOSSEINI, A. & LÆDRE, O. 2016. The Characteristics of Australian Infrastructure Alliance Projects. Energy Procedia, 833-844.

Article 2:

Project Alliances and Lean Construction Principles

YOUNG, B. K., HOSSEINI, A. & LÆDRE, O. 2016. Project Alliances and Lean Construction Principles. 24th Annual Conference of the International Group for Lean Construction. Boston, USA.

Article 3:

Project Alliances and Lean Construction Principles: A Review of Operating Systems

YOUNG, B. K., HOSSEINI, A. & LÆDRE, O. 2016b. Project Alliances and Lean Construction Principles. Draft – Unpublished

The Characteristics of Australian Infrastructure Alliance Projects

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Abstract

The alliance contract method is a relatively new project delivery method that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. The result of it being so new is that it is still unclear around the world as to when to utilise alliancing. The purpose of this research is to determine a list of project characteristics that identify when an alliance would be a suitable project delivery method. In addition, it identifies how alliancing addresses these characteristics and discusses a number of success factors and barriers.

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Keywords: Alliancing; Infrastructure; Australia; Project Delivery Methods; Contract; Success Factors; Barriers

1. Introduction

The alliance contract method is a relatively new project delivery method (PDM) that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. In recent years, alliancing has been receiving worldwide attention with more and more countries exploring its use. Having originated in the UK, it has become a booming success in Australia. The success in Australia has shown by example that there are alternative methods to delivering projects in order to move away from the often-adversarial, traditional project delivery methods. As projects become larger and more complicated, and the pressure from various stakeholders increases, alliancing is proving itself as being able to deal with these ambitious targets.

Jefferies, et al. [1] p466 have identified that “*there is a clear gap in Project Alliancing, particularly with regards to identifying factors for its successful implementation in the Australian construction industry*”. As countries and industries with no alliancing experience, and in particular, limited to no experience with relational contracting, begin adopting alliancing, they will no doubt face a number of challenges. To help overcome these challenges practitioners will need to be educated in the factors that make alliancing successful.

As the adoption of alliancing in the construction industry has started becoming more prevalent worldwide, knowledge of when alliancing is appropriate could be valuable to practitioners looking at implementing non-traditional forms of contracting. Many countries, particularly in Europe, have recently started adopting alliancing. In addition, Finland, who started using alliancing in 2007, has begun experimenting with the model by adopting lean ideology into their alliance projects [2]. A clear understanding of the current state of alliancing could potentially lead to the creation of improved project delivery models.

The body of knowledge is missing a clear summary of how a project’s characteristics influence the choice to deliver the project using an alliance. The purpose of this research is firstly to determine a list of project characteristics that identify when an alliance would be a suitable project delivery method. Secondly, building on the first point, by identifying the way in which the elements of an alliance contribute to addressing the issues

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associated with the identified project characteristics. This combination will help to remove the ambiguity in this area and aid practitioners in determining whether an alliance could be an appropriate way to deliver their infrastructure projects. Thirdly, this research aims to determine the current success factors and barriers that exist for alliance contracting.

To supplement the body of knowledge, the following research questions have been identified:

1. What characteristics of a project make it suitable for alliancing?
2. How do alliance elements address these characteristics?
3. What are the key success factors and barriers when choosing alliancing?

By addressing these research questions, this study will provide a means for those less experienced with alliance to recognise projects that are suitable for the alliancing PDM. It will provide them with an understanding as to how the model addresses these projects, will give them an insight into how to ensure success, and offer some points of concern when considering whether to choose alliancing.

2. Research methods

The research questions were addressed by performing a literature and document study. The results from this study were compared with the results of a series of interviews with Australian practitioners.

A literature study, following the prescription of [3], was undertaken to develop the theoretical background for alliancing. A combination of both journal articles and conference papers was used to gain a broad perspective of the current views of the topic. A document study was performed on a number of key government and industry publications covering alliancing, for example *The National Alliancing Contracting Guidelines* [4] and *Alliancing: A Participant's Guide* [5]. This was undertaken in order to pick up the government and industry perspective on alliancing and to supplement the academic perspective. Thus, the two studies allow us to gain insight into both the theoretical and practical aspects of alliancing.

As part of a larger study on the experiences of Australian infrastructure alliances, twenty-seven semi-structured interviews were undertaken face-to-face with key industry professional in Australia. The interview questions were formulated in line with the three research questions. The interviews ran over a period of three weeks during March and April 2016. Interviewees were contacted based on their experience with alliances. Respondents were chosen among project managers and contract specialists, mostly from client side (government), as in the Australian infrastructure industry, it is the government organisations that own the projects. In addition, a number of respondents from contractors (8), consultants (3), and academia (1) were included to gain a full industry perspective on the current state of alliancing.

The selection of multiple-case design was done in order to check for replication, as described by Yin [6]. Data from thirteen alliance projects was collected during the interview series. Fourteen of the twenty-two interviews were case specific and the remaining eight were general in nature. To ensure that we were gaining reliable information, we chose projects where the practitioners had played a significant role in the alliance. In addition, a limitation of a project value of greater than \$50M AUD was chosen to ensure that each project was considered a large infrastructure project. The case projects that were analysed varied in size from \$52M up to \$1B AUD.

Using a combination of a literature study and document study is an effective way to gain a theoretical insight into alliancing. With the theoretical background in place, interviews were performed to gain practical insight. The combination of theoretical and practical insight helped to verify that the findings from literature are representative of the current reality, and highlighted where the literature is lacking in capturing the current state of alliancing in Australia.

The results from the case projects represent the experiences of practitioners and are limited by their memories. They provided us answers to the best of their knowledge. Where possible, facts were cross-checked against project documentation. This discussion presents the authors' interpretation of the studied literature and interviews.

3. Theoretical framework

Alliancing has developed out of the need and want to improve on, and overcome, the adversarial nature and negative impacts associated with the more traditional forms of project delivery, namely design-bid-build (DBB) and design and construct (D&C) contracts [7, 8]. It often falls under the umbrella of relationship contracting [9, 10], however, now in recent years, it is beginning to be placed into its own unique category [11, 12].

Alliancing is a collaboration between the client, service providers and contractors where they share and manage the risks of the project together [11]. All parties' expectations and commercial arrangements are aligned with the

project outcomes and the project is driven by a best-for-project mindset where all parties either win together, or lose together [10, 13]. The contract is designed around a non-adversarial legal and commercial framework with all disputes and conflicts resolved from within the alliance [9].

This type of project delivery can lead to improved project outcomes and value for money, in part due to the increased level of integration and cooperation between planners, design teams, contractors and operators [14].

The current most widely accept definition of alliancing comes from the Department of Finance and Treasury Victoria [15 p9] who describe alliancing as:

“... a method of procuring ... [where] All parties are required to work together in good faith, acting with integrity and making best-for-project decisions. Working as an integrated, collaborative team, they make unanimous decisions on all key project delivery issues. Alliance agreements are premised on joint management of risk for project delivery. All parties jointly manage that risk within the terms of an ‘alliance agreement’, and share the outcomes of the project”.

The majority of studied literature after 2010 has made reference to this definition when discussing alliancing and does not contribute anything of significance in addition to that mentioned above [8, 10, 12, 13].

3.1. Project characteristics

Alliancing is not a form of project delivery method that is suitable for every infrastructure project [9]. Some projects however, have key characteristics that make them highly suitable for the alliance method.

A preliminary list of the characteristics of a project identified in the literature study as being suitable for an alliance is shown in Table 1. They have been arranged in order of the number of articles that have attributed these project characteristics to the selection of an alliance.

Most often, the characteristics of a project are taken into consideration with many other factors when determining the choice of delivery method for a project. However, in some cases, the decision to use an alliance is based purely on one or two project characteristics. For example, Jefferies, et al. [1 p477] highlights that *“The Queensland State Government, in the form of both their Public Works and Main Roads departments, use Alliance and Partnering arrangements as default contracts on projects with construction periods of over 12 months and/or with a dollar value of A\$10 million.”.*

Each project characteristic identified in Table 1 is described briefly below. It should be noted that a number of characteristics were identified in the literature as being suitable for alliancing however, the literature lacked explanations as to why. Where possible, explanations of why alliancing suits the particular characteristic is included.

Table 1. Characteristics of a Project that Suit Alliancing Identified from the Literature

Project Characteristics	References
Tight Time Constraint/ Need for early start	[4, 9, 11, 13, 14, 16-19]
Multiple/ Complex Stakeholders	[1, 11, 13, 17-20]
High Risk	[4, 11, 13, 14, 16-19]
High Complexity	[9, 11, 13, 17-20]
Unclear/ Broad Scope/ Risk of Scope Change	[8, 13, 14, 17-20]
Complex External Threats	[11, 13, 17-19]
High Uncertainty	[4, 8, 13, 18]
Large Project/ High Cost	[1, 4, 14]
Need for Innovation	[9, 14, 21]
Tight Cost Control	[9, 13, 18]
Environmental Challenges	[1, 18]
Need for owner involvement	[17, 19]

Need for Flexibility	[21]
Special Requirements	[13]
Resource Shortages	[14]

Time pressure is a major reason for choosing alliancing [13]. Alliancing allows multiple processes to occur simultaneously, for example, investigation, design, land acquisition, approvals, materials sourcing, etc. [16], thus reducing the time to complete the project in addition to allowing the possibility for an early start. **Multiple/Complex stakeholder** issues is a project characteristic often recommended by government guidelines regarding when to use alliancing [17, 18]. **High-risk** projects are not well suited for traditional contract models as there is always the issue of who takes on the risk. The client is trying to pass the risk onto someone else and the contractors do not want to accept such high risk. Alliancing is ideal as the risk is shared amongst all participants and everyone is incentivised to work together to manage the risk [8]. Projects with **high complexity** are recommended as being suitable projects for alliances [13, 22]. **Unclear Scope/ Risk of Scope Change**. A large number of alliances have resulted from a project that has had an unclear or poorly defined scope [10, 14]. Alliancing is a suitable method to deal with such projects because all parties work together to define the scope and handle any changes that come about through the delivery of the project. **Complex external threats** has been recognised as a characteristic of a project that can be addressed by alliancing [11, 22]. The characteristic of **high uncertainty** is very similar to the characteristic of Unclear Scope because of the way an alliance addresses each characteristic. **Large Project/ High Cost**. Some government agencies, having recognised the benefits of alliancing, have made it a standard to use alliancing or partnering for large projects, for example, projects with durations over 12 months or values over A\$10M [1]. **Need for Innovation**. The nature of alliancing facilitates innovation making it a top choice on projects that require high innovation to be completed successfully [9, 13]. **Tight Cost Control**. Projects that require significant cost control often see alliancing as the preferred PDM [9]. **Environmental Challenges**. Alliancing is a method recommended for projects that exhibit significant environmental challenges [1, 16, 18]. **The need for owner involvement** is another project characteristic often recommended by government guidelines regarding when to use alliancing [17]. **Need for Flexibility**. This point relates very closely to the project characteristic of Unclear Scope based on the way an alliance addresses each characteristic. **Special Requirements**. This point was only mentioned by one article and a clear description of what was meant by special requirements was not stated. **Resource Shortages**. This point was only mentioned by one article and a clear description of what was meant by resources shortages was not stated.

3.2. Alliance elements

Determining the key elements of alliancing through the literature was an involved process. Almost all of the literature on alliancing, in the introduction, involved a small definition of alliancing. These were collected and common themes were elicited. To delve deeper, the literature was carefully analysed to identify defining elements that were thought to be key to an alliance.

Lahdenperä [12] identified a number of defining elements of alliancing, which are shown in Table 2.

Beginning with the elements identified by Lahdenperä [12] we concluded on a number of key elements from the literature that were of interest to this study. The elements include open book, integrated project team, pain/gain-share, aligned client and commercial participants objectives, no-disputes clause, unanimous decision making and incentivised cost reimbursement.

Open-Book Approach. A key component of alliancing, but not unique to alliancing, is the open-book approach which equates to the disclosure of financial information among all participants [11, 21]. This approach helps to reinforce the *everyone is working on the same team* mindset and helps to provide accurate and real time information on the financial performance of the project.

This approach is a major benefit for clients who, through this method, get an insight into the real cost of construction [9]. As most clients outsource the majority of their work through traditional contracts, they often lose track of the actual cost of undertaking various construction activities.

An alliance team is an **integrated project team**, which means that people from all disciplines and parent companies are working together in the one team allowing for the sharing of expertise and resources [9]. In order to make the ‘perfect’ team, each member is selected on a best-for-project basis, regardless of the company he or she works for.

The integrated project team is part of the concept of the virtual organisation. An alliance operates as a virtual organisation in the sense that all individuals from all parent organisations are, for all intents and purposes over the duration of the contract, employees of the alliance and it is the alliance that delivers the project [11, 16].

The co-location of the project team is a mechanism for realising the full effects of an integrated project team. Although not a strict must-have, it is an element consistent with many successful alliance projects and is often identified in literature as a key success factor [7, 23]. It is implemented as a way of developing a single alliance culture and leads to effective communication and improved innovation in that members have close and immediate contact with each other. A condition often unavailable in traditional arrangements [10].

Painshare and gainshare are essential components of an alliance and this was the most cited element in the literature study. All participants share in the profits and losses of the project and ensure that no single participant is held accountable for financial performance [7]. This helps to reinforce the mindset of *we all win, or we all lose* [11]. The pain/gain forms part of the incentive arrangements and is a measure of how the project performs against the Target Outrun Cost (TOC)[10]. If the project is delivered under the target price, the Non-Owner Participants (NOP) share in the savings, whereas if the project is delivered above the target price, the participants lose a proportional amount of their overhead and profit [16]. This is detailed further under three-limbed contract.

In recent times, alliance contracts have been structured around the three-limbed approach, where [8, 22]:

- Limb 1 consists of all the directly reimbursable costs including project-specific overheads
- Limb 2 is made up of the corporate overheads and profit for each NOP, determined by an independent auditor. This is placed ‘at-risk’ according to the pain/gain arrangement
- Limb 3 consists of the incentivised cost-reimbursement where all participants share in the pain/gain associated with how the alliance performs against pre-arranged targets in cost and non-cost key result areas (KRAs).

Financially, the maximum risk, or most adverse situation, for the NOPs is that they receive compensation for Limb 1 only [11, 22].

Pain/gain-share is a result of the risk sharing arrangements in alliancing. In an alliance agreement, all parties share the risk and reward, which provides a strong motivation to work collaboratively and reinforces the *we’re all in this together* mindset [11, 14]. Operating hand in hand with the no-blame culture, risk sharing ensures that all participants work together to overcome any challenges that may arise during the delivery of the project [9].

Alignment of Client and Commercial Participants’ Objectives. The structure of the alliance and a number of the elements mentioned previously create a situation where the client and commercial participants’ objectives

Table 2. Example of defining elements of alliancing from the literature

Project alliancing	
Department of Treasury and Finance (2010d)	Yeung <i>et al.</i> (2007)
Key features	Hard/contractual elements
<ul style="list-style-type: none"> • Risk and opportunity sharing • Commitment to ‘no disputes’ • ‘Best for project’ unanimous decision-making processes • ‘No fault—no blame’ culture • ‘Good faith’ • Transparency expressed as open book documentation and reporting • A joint management structure 	<ul style="list-style-type: none"> • Formal contract • Real gain-share/pain-share
	Soft/relationship-based elements
	<ul style="list-style-type: none"> • Trust • Long-term commitment • Cooperation and communication
	Other elements
	<ul style="list-style-type: none"> • Win-win philosophy • Equity • Agreed problem resolution methods • Common goals and objectives • Continuous improvements • Alliancing workshops • Early selection of contractors

are aligned [1, 21]. That is, that the business goals of each party is aligned with the alliance and the outcomes of the project [9].

No Dispute Clause. The alliance agreement is structured so that everyone is working on the same team. A key component of this is the development of a no blame culture often backed up by a no dispute clause in the alliance agreement [11]. The commercial drivers and the integrity of the participants, combined with the requirement of consensus decision making, ensures that all disputes are handled internally within the alliance. This eliminates the expensive and lengthy court battles often associated with traditional contracting methods [8, 22]. With the exception of wilful default and insolvency, all issues and conflict are kept within the alliance and resolved on a unanimous basis with no recourse to litigation or arbitration [9, 11].

Unanimous Decision Making. Within an alliance, each party gets an equal say in the decision process and all decisions must be made unanimously [9, 11, 22]. Collaborative problem solving and decision-making is a key characteristic of alliancing [10]. This emphasises that all parties work together to overcome problems that arise.

Incentivized Cost-Reimbursement. In addition to pain/gain share, alliances include other forms of incentivized cost reimbursement. These can include incentives for non-cost factors such as innovation, quality, delivery time etc. and are factors that are important to the owner [10, 16].

3.3. Success factors and barriers

Success factors and barriers give insight into what factors one must consider when selecting alliancing as the PDM or when choosing to enter into an alliance agreement.

By reviewing six papers, Jefferies, et al. [1] has identified 17 success factors from literature, and by analysing a case study, they identified five additional success factors. The full list of twenty-two success factors is shown in Table 3:

Table 3. Success Factors as identified by the literature

Strong commitment by client and senior management	Trust between parties
Sound relationship	Equity
Mutual goals and objectives	Joint process evaluation
Dispute resolution process	Cooperative spirit
Flexibility and adaptability	Tight alliance outline
Alliance structure	Best people for project
Facilitation	Commercial incentives
Open communication	Shared knowledge
Stretch targets	Integrated Alliance office
Staging of project and stretch targets	Establishing project specific KPIs
Facilitating on-going workshops that include site personnel	Integration of a web-based management programme

The list by Jefferies, et al. [1] is quite extensive. Our literature search did not uncover any new unique success factors. However, the search did highlight some success factors that were emphasised the most. The selection of the right people and having a good leader seems to be a crucial success factor according to the literature [24, 25].

Rowlinson and Cheung [25], through their study of success factors (which did not form part of the work by Jefferies, et al. [1]) identified the following factors for successful alliances: creativity, trust, commitment, interdependence, cooperation, open communication, goal alignment and joint problem solving. Despite being performed independently, their results of factors necessary to ensure the success of an alliance are in alignment. The explanation behind why each success factor is important is well documented and thus will not be covered in this paper.

During the research, it became clear that alliancing is not the best-fitted PDM for all projects and a number of considerations should be taken into account when deciding whether to proceed with an alliance. These

considerations can be seen as a barrier to introducing alliancing into a new country, industry or organisation. The literature study identified six factors that should be considered when selecting an alliance as the preferred PDM. The factors shown in Table 4 are sorted by the number of times they appeared in the studied literature.

Table 4. Factors to Consider when Choosing an Alliance

Factors to Consider when Choosing an Alliance	References
Cost to Establish	[4, 8, 10, 13, 14, 18, 19]
Maturity and Competence of the Industry	[7, 8, 10, 13, 18, 19, 26]
Resource Availability of Project Participants	[4, 10, 13, 19]

As an extensive study of the barriers to alliancing has not been undertaken, a brief explanation of each factors follows.

Cost to Establish. The experience in the literature is that alliances are only worthwhile for large projects [26]. This is due in part to the fact they have high establishment costs [8]. A client must be aware of this and decide whether the benefits of using an alliance outweighs the high investment cost.

Maturity and Competence of the Industry. Alliancing is an advanced form of relational contracting and thus requires competent organisations with particular knowledge, skills and attributes [8, 22]. If an industry has had little experience with relational contracting then it can create difficulties for clients to find suitable alliance partners [22].

A culture shift is required in order for the traditional mindset to transition into a mindset suitable for alliancing. This includes everything from client-contractor relationships to working methods [7, 22]. It can also be the case that organisations who are used to having all the power over a project, such as construction managers, can feel that they lose a certain level of control [26].

Resource Availability of Project Participants. As noted as a success factor, alliances require the commitment of senior staff from all involved parties [13]. This commitment needs to be supported by senior management [22]. Both clients and non-owner participants need to consider this when deciding whether to enter into an alliance agreement. This forms a barrier to the alliance method if an organisation does not have capacity to commit senior resources.

The client must consider that there is a high degree of hands-on involvement required of them due to the nature of the integrated project team [10].

4. Findings and discussion

This section will identify the findings from the interviews and discuss them in relation to the findings from the literature study and case studies.

4.1. Characteristics of a Project That Make it Suitable for Alliancing

Often, the nature of the project will dictate the choice of PDM. For example, a project may have a very tight timeframe that can only be achieved if all parties are involved from the very beginning. Such a situation lends itself to alliancing as certain aspects of planning, design and execution can happen concurrently. That being said, alliancing is not a form of project delivery method that is suitable for every infrastructure project [9]. Some projects however, have key characteristics that make them highly suitable for the alliance method.

A review of the characteristics identified by both the literature and the interviews was undertaken. Each characteristic was analysed for uniqueness; where similarities were identified between characteristics, they were combined. In addition, the characteristics were judged by the weight placed on them in the literature and interviews, and the number of times they were cited by different sources.

A number of the characteristics can be combined based on their similarity. For example, if a project has the Need for Flexibility or has High Uncertainty, when it applies to how alliancing addresses this issue, it is very similar to the project having an under-defined scope or having a Risk of Scope Change. In all these cases, every participant works together to solve the issues as they arise and they do this by maintaining a high degree of flexibility in the process. Special Requirements and Resource Shortages were mentioned briefly by just one source each, so with limited information on each characteristic, they are not considered as being relevant to this study.

The interviews identified a number of different drivers that have influenced the selection of alliancing in Australia. Alliances have been the preferred PDM when the project has one or more characteristics from the list in Table 5. This is quite consistent with the results from the literature review in that eleven of the sixteen characteristics identified by the interviews appear in Table 1.

Table 5. Project characteristics suitable for alliance as identified by thirteen Australian alliance projects

Characteristic	Number of Projects Influenced*
Tight Time Constraint/ Need for early start	9
Multiple/ Complex Stakeholders	7
High Risk	8
High Complexity	6
Unclear/ Broad Scope/ Risk of Scope Change	10
Complex External Threats	1
Large Project/ High Cost	4
Need for Innovation	4
Tight Cost Control	4
Environmental Challenges	3
Need for owner involvement	9
Multiple Interfaces	7
Market Situation	
Client Organisation	2
Other: Reputation	1
Other: Political Commitment	1

*Where a characteristic was identified by the practitioner as partly contributing to the selection we have counted it in the number of mentions.

4.2. How do Alliance Elements Address the Identified Characteristics

The structure of alliances lend themselves very well to addressing the issues created by the identified project characteristics. The shared risk and pain/gain arrangements combined with the alignment of client and commercial participants' objectives creates an entity that is very adept to dealing with projects that are high risk or have high levels of uncertainty. When problems arise, it is in the best interest of all the parties to find the best-for-project outcome, and find it quickly. In addition these elements work together to enable the alliance to deal effectively with complex external events.

The elements mentioned above, combined with unanimous decision-making, no dispute clause and open book help to ensure the win-win principle of alliancing necessary to deal effectively with the issues that arise.

The fact that all parties become involved in the project from the very beginning creates an environment where innovation can thrive. All options can be considered and explored for their merits. Many different perspectives all working together in the early phase can lead to very innovative solutions. This was recognised by many of the interview practitioners as being a key benefit to the alliancing method.

This arrangement of concurrent engineering creates an environment where normally successive stages can run in parallel. For example, the contractor can begin with the early works while the designers are finalising the design and the client is working on planning permissions and community consultation. This reduces the duration of the project significantly and allows for an early start. Many interviewees stated this as a reason for their project being delivered ahead of time.

In some cases, alliances were chosen for a project due to the tight cost control needed. For example, some projects were given the problem, and a budget, and told to find the best solution that addresses the problem and fits the budget. Alliances have a certain freedom to vary solutions on the go, as they are not locked into a pre-design. Combine this with the fact that it is in the best interest of all parties to find the best solution, meet the incentivised KRA's, and reduce the project cost in order for them to make money, makes alliancing well suited to dealing with tight cost control.

The integrated project team is crucial for allowing alliances to deal with complex stakeholder issues. Having the most suitable person for the job in each position means that you can manage the issues very effectively. For example, as identified by one of the practitioners, often the client has well established community consultation systems and networks. Often contractors do not have such systems and networks in place. Thus, it makes sense to have key client personal in the relevant position within the alliance. The integrated project team becomes very useful when there is a need for owner involvement, as the client is imbedded in the team for the entire duration of the project and can maintain a level of influence over the project outcomes.

4.3. Success Factors and Barriers to Alliancing

The series of interviews proved to be a great way to identify both the success factors and barriers to alliancing, and to check to ensure the literature is relevant to the current experiences.

The success factors mentioned by the majority of practitioners during the interview series were ensuring that alliance is chosen for the right reasons, and that the right people are chosen to work within the alliance. It was of the opinion of most of the interviewees that if you have these two aspects in place, then you will achieve success. A number of times it was mentioned that one of the reasons why particular alliances were unsuccessful is that alliancing was selected for the wrong reason and that the project was not suited to an alliance.

Jefferies, et al. [1] and Rowlinson and Cheung [25] both identify a number of success factors that seem to be standard practice for the alliance model. They are essentially woven into the fabric of the Australian alliance model. Because of this, we believe that some of the success factors mentioned by Jefferies, et al. [1] and Rowlinson and Cheung [25] should no longer be identified as success factors. Yes, it is true that if they are not present then the success of the project is jeopardised, but if they are not present, then the strategy could not identify itself as an alliance, at least not by the Australia model standards. For example, every alliance project that we discussed during the interview series had mutual goals and objectives, an alliance structure, had a best for project selection process for staff, used an alliance facilitator, had commercial incentives, used an integrated project team with co-location, had established project specific KPI's, and facilitated workshops throughout the entire length of the project. That makes seven out of the twenty-two success factors identified by Jefferies, et al. [1] as being well-established norms. In fact, each of these points could be considered among the elements that make an alliance what it is today.

Another point to note is, of all the projects discussed, not one had a formal dispute resolution process. Each alliance had a no-dispute clause and the requirement that all disputes be handled internally within the alliance.

The interview series confirmed the barriers identified by the literature study and identified a number of additional barriers and points of concern. A key barrier identified by respondents is the increased pressure from Government for clients to demonstrate value for money when selecting the alliance form of procurement. It has been the case that, the majority of alliances in Australia were delivered as "pure" alliances, whereby the non-owner participants were selected on merit and not on a cost basis. This lack of a price competitive tender process, it seems, is part of the cause for concern for the Government and treasury in Australia as to whether alliances deliver value for money. Perhaps there is little cause for concern though, as another key point of the findings was the answer to the question "*Could the same level of success have been achieved if this project was delivered by another form of PDM?*". In all cases the respondents answered either "no, not at all", or "no, not to the same extent". Among the reasons why not were "*the project would have ended in dispute and we'd still be in the courts*", "*the project would have most likely been delivered one year late instead of one year early*", and "*we [the client] would have been hit with a number of large variations*". It seems the value for money is there but it is difficult to demonstrate.

To expand on the barrier of Resource Availability of Project Participants, one of the interview respondents raised the following regarding the commitment to the alliance from the client. He makes this point while referring to the success of an alliance from which he performed a number of roles including being the senior representative of the client:

"This alliance had unqualified commitment from the highest levels of the Client. Many others received commitment in words only. When critical decisions were needed, the Client was too busy. This is a breach of faith. Alliances are really successful when they are done right – I mean REALLY successful, but they are really hard to

make them run right. They cannot be run by half-hearted or incompetent clients. The things that make Alliance run well are clearly documented and well known, so there is no excuse for having an unsuccessful one.”

5. Conclusion

This paper supplements the existing body of knowledge by answering the questions: what characteristics of a project make it suitable for alliancing?, how do alliance elements address these characteristics? and finally, what are the key success factors and barriers when choosing alliancing?. Due to its relatively new breakthrough into the world of large infrastructure delivery, alliancing is still finding its place amongst the more established project delivery methods. This development has been increasing rapidly since alliancing’s birth in the 80’s. Based on the literature studied, and the results from the interview series, we can conclude that alliancing is a very effective PDM, which is suitable for projects with particular characteristics, provided it is selected for the right reasons.

This research has identified twelve characteristics of a project that make it suitable for alliancing. Table 6 contains the final list of project characteristics based on the results of the methods contained within this report.

Table 6. Project Characteristics Suitable for Alliancing

Project Characteristics	
Tight Time Constraint/ Need for early start	Large Project/ High Cost
Multiple/ Complex Stakeholders	Need for Innovation
High Risk	Tight Cost Control
High Complexity	Environmental Challenges
Unclear/ Broad Scope/ Risk of Scope Change	Need for owner involvement
Complex External Threats	Multiple Interfaces

Where a project identifies one or more characteristics shown in Table 6, an alliance can be highly considered during the selection process for the project’s delivery method. By looking closely at the elements of an alliance, we show how they address the identified project characteristics. For example, the integrated project team drives innovation and gives the owner more control within the project. The win-win culture created by the combination of a number of alliance elements enables the alliance to handle complex or high-risk projects and projects with great uncertainty.

By comparing the success factors identified in the literature with the case projects, we have concluded that a number of success factors seem to be now outdated. The bar has been raised so that these factors are now engrained into the model. However, the established research into success factors is still very important as it helps show industries new to alliancing why each element has its place in the model. It also provides a launching platform for how the model could be improved.

The research has lead us to conclude that the number one factor to having a successful alliance is choosing alliancing for the right projects and the right reasons. This makes it so crucial to have an understanding of the characteristics of projects that indicate an alliance might be the best option.

The conclusions are based largely on the Australian experience, but we believe that the lessons learned are transferable to other countries. Having an understanding of the success factors and barriers to alliancing, combined with knowing when to select alliancing, will enable practitioners to make better informed decisions regarding the adoption of alliancing into new industries and countries.

Limited work has been performed in the area of barriers to alliancing. Our preliminary research has identified a number of key barriers they may inhibit the choice of an alliance as the preferred project delivery method. The body of knowledge could benefit from further research in this area. The industry could benefit from more work within the area of success barriers to identify new “stretch” success factors that are a step above current standard practice. In addition, work should be done to identify success factors specifically for implementing alliancing in a new, immature industry.

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Project Alliances and Lean Construction Principles

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ABSTRACT

There is a trend in the construction industry of adopting more and more relational type contracting methods, for example, project alliancing. In addition to this trend, there is increasing adoption of the lean construction principles. This paper explores the inherent relationship between project alliancing and lean construction in an attempt to highlight the similarities between this project delivery method and the lean methodology.

Based on the literature studied and the performed interviews, this study shows that alliancing does in fact inherently align with some key lean construction principles. Particularly in the area of customer focus, culture and people, waste elimination, and continuous improvement. An understanding of how and where alliancing aligns with lean can lead to a better insight into how the model can be improved. Such knowledge could be useful to practitioners looking at incorporating more efficiencies into the alliancing model by introducing lean concepts

KEYWORDS

Alliancing, Lean Construction, Project Delivery Method, Contract, Value.

INTRODUCTION

Project Alliancing (PA) is a relatively new project delivery method (PDM) that has started becoming popular in recent decades as an alternative to both traditional and other forms of relational contracts. In recent years, alliancing has been receiving worldwide attention with more and more countries exploring its use. Having originated in the UK (Manley 2002), it has become a booming success in Australia. The success in Australia has shown the industry that there are methods to delivering projects alternative to the often-adversarial, traditional project delivery methods.

Lean construction is a project management methodology that has adopted principles of lean that originate from the manufacturing and production industry (Ballard et al. 2007; Howell 1999; Locatelli et al. 2013). Lean construction is considered a philosophy or paradigm of managing construction projects and not a stand-alone contractual PDM (Ballard and Howell 2004).

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Alves and Tsao (2007), through their study of IGLC papers from 2000 – 2006, identified that there has been a lack of research among the IGLC community in the area of relational contracting. They suggested that researchers “*strive to understand how to implement relational contracting, measure its outcomes, and explain project results to help provide guidance to owners that are interested in working towards lean project delivery.*” (Alves and Tsao 2007, 57). Ten years later, there is still a gap in the literature comparing alliancing and lean construction. This paper addresses this issue by providing insight into the relationship between the alliancing project delivery method and lean project delivery.

As the adoption of both alliancing and lean principles in the construction industry has started becoming more prevalent, knowledge of the lean principles inherent in alliancing could be valuable to practitioners looking at adopting lean project delivery. Many countries, particularly in Europe, have started adopting alliancing. In addition, Finland, who adopted alliancing in 2007, has begun experimenting with adopting lean ideology into their alliance projects (Petäjaniemi and Lahdenperä 2012). A clear understanding of the current similarities between alliancing and lean could help improve this adoption and could potentially lead to the creation of improved project delivery models.

Integrated Project Delivery (IPD) is a method used mostly in the United States of America that has many similarities to alliancing, with one major difference being that IPD incorporates a number of lean construction elements (Lahdenperä 2012; Raisbeck et al. 2010). IPD’s use is mostly concentrated in America, yet the principles of lean are more prevalent worldwide. Alliancing is often considered at the top end of collaborative and relational contracting (Ross 2003) and is more widely distributed across the globe (Chen et al. 2012; Ingirige and Sexton 2006). In addition, IPD and Alliancing have often been used for different types of projects (Lahdenperä 2012). The key differences between IPD and alliancing will not be explored further in this paper but can be found in the study by Lahdenperä (2012).

To address the identified research gap, the following research question was formulated:

- Does the alliancing project delivery method inherently align with the principles of lean construction?

By addressing this, the report aims to provide a reference point going forward, for both academics and practitioners, to help understand the inherent relationship between PA and lean construction.

METHOD

The research question was addressed by performing a literature and document study. In addition, results from a series of semi-structured interviews were used. The literature study, following the prescription of Blumberg et al. (2014), was undertaken to develop the theoretical background for both lean construction and PA. This was the primary source of information on lean and was key to gaining insight into lean principles. A combination of both journal articles and conference papers was used to get a broad perspective of the current views of the topics. A document study was performed on a number of key government and industry publications covering PA, for example, The National Alliancing Contracting Guidelines (DoIRD 2015) and Alliancing: A Participant’s Guide (Morwood et al. 2008). This was performed in order to pick up the Australian government and industry perspective on alliancing. Thus, the document study allowed us to gain insight into both the theoretical and practical aspects of alliancing.

As part of a larger study on the experience of Australian infrastructure alliances, twenty-seven semi-structured interviews were undertaken face-to-face with key industry professionals in Australia. The interview questions were formulated in line with the research question, which considered if the alliancing project delivery method inherently aligns with the principles of

lean construction. The interviews ran over a period of three weeks during March and April 2016. Interviewees were contacted based on their experience with alliances. Respondents were chosen among project managers and contract specialists, mostly from client side (government) as the research was exploring when and why alliances are selected. In addition, a number of respondents from contractors (8), consultants (3), and professors (1) were included to get a full industry perspective on the current state of alliancing.

Using a combination of the literature study and document study gave a theoretical insight into alliancing. This insight made it easier to infer the ways that alliancing aligns with lean principles. With the theoretical background in place, interviews were performed to gain practical insight. The combination of theoretical and practical insight helped to analyse how the elements of PA align with the identified principles of lean construction.

THEORETICAL BACKGROUND

In order to draw conclusions on the similarities and differences between PA and lean construction principles, an exploration of the current theory on each topic has been undertaken.

Alliancing

Alliancing has developed out of the need and want to improve on, and overcome, the adversarial nature and negative impacts associated with the more traditional forms of project delivery, namely design-bid-build (DBB) and design and construct (D&C) contracts (Laan et al. 2011; Walker et al. 2015). It often falls under the umbrella of relationship contracting (Henneveld 2006; Walker et al. 2013), however, now in recent years, it is beginning to be placed into its own unique category (Chen et al. 2010; Lahdenperä 2012). Moreover, Sakal (2005) states that *“It’s important to note that Project Alliancing is more than just a contract; it’s a new approach to conducting business and constructing projects that’s a dramatic departure from traditional contracting practices - where trust is in short supply and antagonism runs rampant”*.

Alliancing is a collaboration between the client, service providers and contractors where they share and manage the risks of the project together (Chen et al. 2010). All parties’ expectations and commercial arrangements are aligned with the project outcomes and the project is driven by a best-for-project mindset, where all parties either win together, or lose together (Chen et al. 2012; Sakal 2005; Walker et al. 2013). The contract is designed around a non-adversarial legal and commercial framework with all disputes and conflicts resolved from within the alliance (Henneveld 2006). This type of project delivery can lead to improved project outcomes and value for money, in part due to the increased level of integration and cooperation between planners, design teams, contractors and operators (Love et al. 2010).

The current most widely accept definition of alliancing comes from the Department of Finance and Treasury Victoria (Victoria 2010, 9) who describe alliancing as:

“... a method of procuring ... [where] All parties are required to work together in good faith, acting with integrity and making best-for-project decisions. Working as an integrated, collaborative team, they make unanimous decisions on all key project delivery issues. Alliance agreements are premised on joint management of risk for project delivery. All parties jointly manage that risk within the terms of an ‘alliance agreement’, and share the outcomes of the project”.

Some of the key alliance elements noted from the literature and interviews include open book, integrated project team, aligned client and commercial participants objectives, unanimous decision making and incentivised cost reimbursement.

Lean Construction

The success of lean as a management philosophy in manufacturing has inspired the adoption into other industries, and particularly into the construction industry. An exploration of the established view of lean construction was undertaken to get insight into its principles. Both lean and the development of lean construction are well described in literature [Lean: (Ballard et al. 2001; Diekmann et al. 2004; Krafcik 1988; Liker 2004) and Lean construction: (Howell and Ballard 1998; Howell 1999; Koskela 1992; Picchi 2001)]. Therefore, this will not be covered in the paper.

Lean principles have been adopted into the construction industry from the manufacturing industry. Lean construction is the management of construction using these principles. According to Howell (1999, 4) there are four points that separate lean construction from traditional practice. *“Lean construction:*

- *has a clear set of objectives for the delivery process,*
- *is aimed at maximizing performance for the customer at the project level,*
- *designs concurrently product and process, and*
- *applies production control throughout the life of the project.”*

To take it one step further, we look at the definition of lean construction by Diekmann et al. (2004, iii):

“Lean construction is the continuous process of eliminating waste, meeting or exceeding all customer requirements, focusing on the entire value stream and pursuing perfection in the execution of a constructed project”.

In addition to the definition, Diekmann et al., (2004) established five main principles of lean that are relevant to the construction industry:

- Customer focus
- Culture/people
- Workplace standardization
- Waste elimination
- Continuous improvement/built-in quality

We note that the principles of lean construction are not as extensive as the principles of lean. For example, Liker (2004) identifies 14 principles of lean. To summarise, lean construction is based around maximising value for the customer and minimising waste (Ballard and Howell 2003; Howell 1999; Locatelli et al. 2013).

As well as being based on key principles, lean construction benefits from the use of a number of tools that facilitate these principles. Such tools are presented by Salem et al. (2005) and include Last Planner, Visualisation and Daily Huddle Meetings.

Reasons for adopting lean vary but the results speak for themselves. The work by Locatelli et al (2013) has identified shorter delivery time and higher project performance as being the most common benefits of using lean construction. Ballard and Howell (2003, 132) state that *“Even partial implementations have yielded substantial improvements in the value generated for clients, users and producers”.*

FINDINGS AND DISCUSSION

We have chosen to use the five principles identified by Diekmann et al. (2004) to represent the key principles of lean construction. This section will explore the principles of lean and look into what extent project alliancing inherently aligns with each principle. The discussion

presents the authors' interpretation of the studied literature and interviews. We begin by comparing lean construction and alliances with traditional practice before focusing on the five main principles of lean relevant to the construction industry.

Lean Construction and Alliances Compared with Traditional Practice

By looking at each of the four points identified by Howell (1999, 4) that separate lean construction from traditional practice, we can see that alliancing aligns closely with lean construction.

Alliancing *has a clear set of objectives for the delivery process*, all of which are well documented in the alliance agreement. They are also regularly communicated to the team through various mechanisms that maintain the single alliance culture. At the project level, alliances *aim to maximise the performance for the customer*. They do this by developing a number of Key Result Areas identified by the client and incentivising them to drive performance. The commercial arrangement also drives this behaviour. All parties are aligned; what is best for project is also best for all parties. Thus, when a non-owner participant (NOP) works to maximise their outcome, this in turn should maximise the outcome for the client. A key aspect of alliances is the integrated team from the very beginning of the project. This allows alliances to *design both product and process concurrently*. Identified by many of the interview participants, as being a key benefit of alliances, is that normally sequential processes can run in parallel. The last point is where the comparison deviates. Alliancing has not been known to *apply production control* to the extent outlined in lean construction.

Lean construction is stated as being practical and beneficial to projects that are quick, uncertain and complex (Howell and Ballard 1998). One of the key findings from the Australian interviews was that the top three reasons why alliances are chosen as the project delivery method are that the project had 1. a tight timeframe and/or need for an early start, 2. had high uncertainty, and/or 3. was very complex in nature. We believe that this is an important finding because it verifies that PA and lean construction are two approaches to addressing the problems associated with quick, uncertain and complex projects.

Customer Focus

Alliancing, by nature, is a very customer-centric model. The inclusion of the client in the integrated team ensures that the client is imbedded in the team for the duration of the contract. This allows the client to maintain a large amount of control throughout the entire process. Combined with the open book approach, this also gives the opportunity for the Non-Owner Participants to develop a greater understanding of the customer, what they want, need and value as well as their motives, policies, constraints etc. On the other hand, the client gains valuable insights into the way consultants and contractors operate. This goes a long way to helping the alliance satisfy the customer.

Alliances aligns with this principle of lean as alliances are largely driven by value-for-money. Based on the findings from the interviews, most clients are aware that alliances can be expensive to establish, but choose them for certain projects as they often deliver better value for money than traditional contracts. Clients "pay" for it in that they must be able to commit high-level resources and senior people to achieve the best outcome and value. The Client/customer defines what they value and applies incentivised Key Results Areas (KRA) to drive behaviours to achieve the identified areas of value. Given the track record of most alliances, alliances deliver quality results the first time. They often reduce or eliminate re-work. A large part of this is due to the fact that the client is imbedded in the team.

Culture/People

Alliances have particular team and personal selection processes. People are selected for roles within the alliance on a best for project basis. People are respected for the knowledge and skills that they can contribute to the project, regardless of their parent company. Locatelli et al. (2013) state that team member training is the most important investment when considering lean construction implementation. This aligns quite well with the results from the Australian interviews where the most mentioned key success factor for PAs is the team. Hence why most PAs follow strict team member selection processes.

During the start-up of the alliance a lot of work is put into developing a single alliance team culture. Alliance workshops and team building activities are performed on a regular basis and because a large emphasis is placed on team culture these activities are continued throughout the life of the project.

Workplace Standardisation

At this stage, our research has uncovered little evidence of workplace standardisation in alliance projects. It seems that alliancing lacks an established set of processes and procedures that resembles that found in lean construction, for example, the 5S tool (sort, straighten, sweep, standardize and systematize) (Salem et al. 2005).

Waste Elimination

For all the types of waste identified in lean construction (Hines and Taylor 2000), we believe that PA can minimise or eliminate waiting, defects and inappropriate processing. We also believe it can reduce waste caused by variation and the disengagement of people.

Waiting is addressed by the concurrent engineering processes inherent in PAs. Defects and extra processing are often reduced due to the higher quality and performance associated with alliance projects. Variations are minimised or eliminated due to the fact that all parties, including the client, are all part of the one team and any issues that arise are dealt with right away. The results of the interview series in Australia identified that alliances address the disengagement of people. The majority of people interviewed favoured working on an alliancing project over any other form of contract. Provided the right people are selected to work on the alliance team moral and engagement is kept at a high. Expanding on the previous point, waste is eliminated as the right people are often being used for the right positions, regardless of parent company. This ensures efficient use of resources and eliminates doubling up of resources.

Ballard and Howell (2003,128) estimate that *“as high as 50% of design time is spent on needless (negative) iteration”*. Although no comparable statistic has been found for Alliancing, it would appear that it would be considerably lower when it comes to alliances. Alliances have everybody together, and in the same room, from day one. This means that all parties have an input into the design process. The client can immediately eliminate designs that do not comply with their wishes. In addition, the contractor can identify when designs are not practical and highlight where efficiencies in scheduling, construction methods, material etc. This immediate feedback means that needless designs are not progressed and design rework is minimised.

Continuous Improvement and the Strive for Perfection

Alliances encourage open dialogue between all members and decisions are required to be made as best for project. This can lead to moving outside of traditional specifications and requirements associated with traditional contracts. Alliances can accommodate scope change and deal with changes and issues as they arise. In addition, alliances are always challenging the schedule to see how to improve it along the way or to mitigate delays. The commercial and

legal framework of alliances facilitates this by removing issues associated with variations. The alliance mindset is to deal with challenges and setbacks as a team.

Alliances have a no blame culture. Lessons learned are distributed throughout the alliance on a regular basis. Everyone is on the same team. Guided by standards but are able to challenge them when necessary. Alliances commit to developing and sustaining an alliance culture that respects the principles of the alliance.

In the view of those interviewed, alliances often deliver “state-of-the-art” results and outcomes as they have a large focus on delivering results. Incentivised cost reimbursement is one way to facilitate this, particularly in non-cost areas as safety, quality, environment etc. All decisions made are best for project. The client can up skill their employees by exposing them to different aspects of the industry by embedding them in the alliance.

CONCLUSION

Based on the literature studied and the performed interviews, this study shows that alliancing does in fact inherently align with some key lean construction principles, particularly in the four areas of customer focus, culture and people, waste elimination, and continuous improvement. The research lacked sufficient evidence of alignment in the fifth area of workplace standardisation. To give a visual representation of the alignment between PA and lean construction we refer to the lean construction triangle in Figure 1. There is sufficient evidence for PA alignment with the organisation and commercial sides of the triangle. Alliancing aligns with the principle of customer focus, a key element of the commercial side of the triangle. On the organisational side, we have shown the alignment in the areas of culture/people, waste elimination and continuous improvement.

A key difference between PA and lean construction appears in the operating system. Alliancing lacks the workplace standardisation and the use of lean construction tools identified with lean construction. Further research into this area could determine whether alliancing would benefit from directly incorporating the principle of workplace standardisation and/or the lean construction tools.

An understanding of how and where alliancing aligns with lean construction can lead to a better insight into how the model can be improved. Such knowledge could be useful to practitioners looking at incorporating lean principles and tools into the alliancing model; such is the case in Finland. It could also prove useful to those looking at developing improved collaborative contracting models. This study does not claim that alliancing is a lean project delivery method, but rather that it inherently contains qualities of lean. To sum up; alliancing can be the starting point for an owner interested in the lean project delivery system, as it aligns with many of the lean construction principles.

This paper aims to generate future research and discussion around the relationship between lean construction and alliancing. For example, an in depth look into comparable cases of lean construction and alliance projects could lead to a better understanding of the similarities

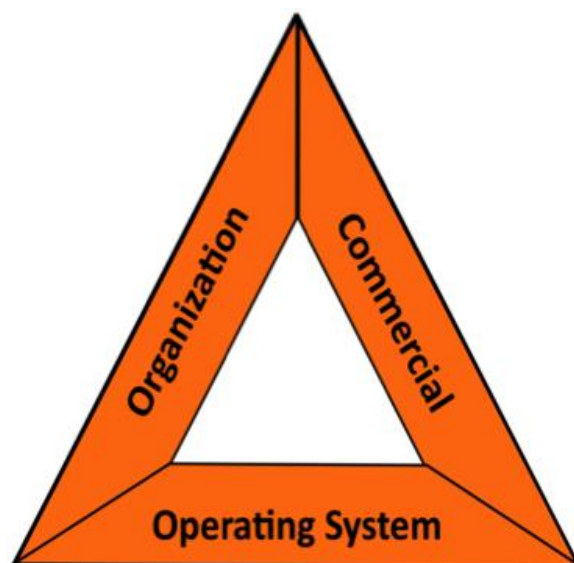


Figure 1: The Lean Construction Triangle
(Lean Construction Institute)

between the structure, process and performance of both methods. In addition, as the clients continue demanding projects with improved outcomes, higher efficiencies, less cost and less waste, the development on new project delivery methods incorporating lean principles could be an answer.

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Project Alliances and Lean Construction Principles: A review of Operating Systems

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Abstract: As the adoption of both alliancing and lean in the construction industry has started becoming more prevalent, knowledge of the lean principles inherent in alliancing could be valuable to practitioners looking at adopting lean project delivery. This paper contributes to addressing this issue by providing insight into the relationship between the alliancing project delivery method and lean project delivery at an operating system level. A large driver of alliancing is to deliver value for money to the client, so it comes as a surprise that, to this date, alliancing it yet to fully capitalise on the lean construction operating system to drive the pursuit of maximum value. The inclusion of a lean operating system does would not require any major changes to the existing structure of a standard project alliancing agreement. Alliancing could essentially remain the same, structurally and commercially, while incorporating lean construction methods and tools into its operating system. This is made possible due to the inherent alignment between alliancing and the lean construction principles in the organisational and commercial domains.

Keywords: Alliancing, Lean Construction, Operating System, Project Delivery Method, Contract, Value.

INTRODUCTION

Alves and Tsao (2007), through their study of IGLC papers from 2000 – 2006, identified that there has been a lack of research among the IGLC community in the area of relational contracting. They suggested that researchers “*strive to understand how to implement relational contracting, measure its outcomes, and explain project results to help provide guidance to owners that are interested in working towards lean project delivery.*” (Alves and Tsao 2007, 57). Ten years later, there is still a gap in the literature comparing project alliancing (PA) and lean construction (LC). This paper contributes to addressing this issue by providing insight into the relationship between the alliancing project delivery method and lean project delivery at an operating system level. It builds upon a previous paper presented at the IGLC conference in 2016 (Young et al. 2016b).

This previous work by the authors showed that alliancing does in fact inherently align with some key lean construction principles, particularly in four of the five LC principles identified by Diekmann et al. (2004), namely customer focus, culture and people, waste elimination, and continuous improvement. The research at that time lacked sufficient findings to show an alignment in the fifth principle of workplace standardisation. To give a visual representation of the alignment between PA and LC we refer to the lean construction triangle in Figure 1.

There is sufficient evidence for PA and LC alignment concerning the organisation and commercial sides of the triangle. Alliancing aligns with the principle of customer focus, a key element of the commercial side of the triangle. On the organisational side, we have shown the alignment in the areas of culture/people, waste elimination and continuous improvement. The research uncovered insufficient evidence to comment on the alignment between operating system side of the triangle and is therefore the departure point for this paper.

There is a view that while despite not being inspired by alliancing, Integrated Project Delivery (IPD) can be seen as being a combination of the alliancing contract and governance system with a lean construction operating system (Raisbeck et al. 2010). This is an interesting point considering that IPD developed independently of alliancing yet resembles a combination of PA and LC. What would the potential outcomes be if PA and LC were combined intentionally? The fact that there is an inherent alignment between the organisational and commercial domains shows that such a combination is plausible, while the existence of IPD shows that it is possible.

The initial findings identified that a possible key difference between PA and LC appears in the operating system. Alliancing seems to lack the workplace standardisation and the use of lean construction tools identified with lean construction. This paper will expand on this point by focusing in on the operating system side of the triangle. To provide a clear focus, the following research questions were identified:

- How are the operating systems of project alliancing and lean construction identified in the literature?
- What the similarities and differences between the two?
- Is there potential for the two systems to learn from each other?

Thomsen et al. (2009) uses the same triangle to represent the three domains of all project delivery systems. Domains that must be in alignment and balanced to ensure that the delivery system is coherent and optimal. Using this as a departure point, the paper begins by exploring the balance and alignment between these three domains for both project alliancing and lean construction. Once a high-level understanding of each of these methods is established, a deeper exploration will be taken into their operating systems. This exploration will then form the basis for the comparison between the PA and LC operating systems, noting any key differences and similarities between the two. Finally, conclusions will be drawn and recommendations made for further research.

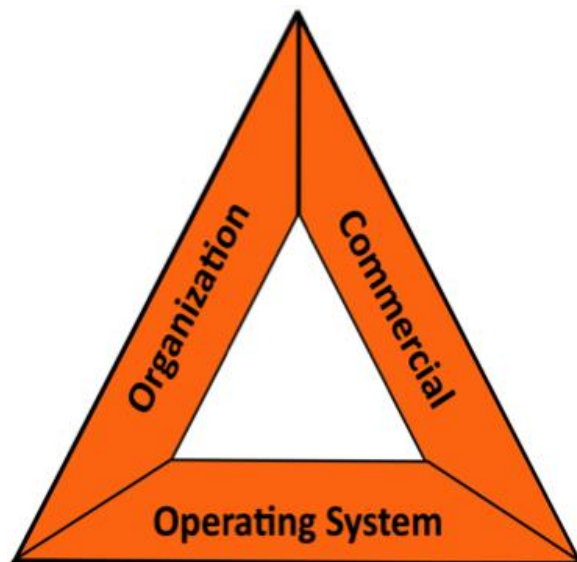


Figure 1: The Lean Construction Triangle (Lean Construction Institute and (Thomsen et al. 2009))

METHOD

To answer the research questions, a methodology similar to that of the previous study was followed. Namely, a literature and document study was undertaken following the prescription of Blumberg et al. (2014). To gain insight into both the academic and practical aspects of the operating systems, findings from both journal articles and conference papers are used in combination with findings from government and industry publications.

Where applicable, findings may be drawn from an interview series undertaken in Australia in early 2016. This interview series was conducted to gain insight into the current state of Australian infrastructure alliances and a detailed description of the study can be found in Young et al. (2016a).

THEORETICAL BACKGROUND

In order to draw conclusions on the similarities and differences between the PA and lean construction operating systems, an exploration of the current theory on each topic has been undertaken. As the adoption of both alliancing and lean in the construction industry has started becoming more prevalent, knowledge of the lean principles inherent in alliancing could be valuable to practitioners looking at adopting lean project delivery. Many countries, particularly in Europe, have started adopting alliancing in recent years. In addition, Finland, who adopted alliancing in 2007, has begun experimenting with adopting lean ideology into their alliance projects (Petäjaniemi and Lahdenperä 2012). The authors will explore the practical findings based on the outcome of this combination of lean and alliancing in Finland in later publications once enough projects have finished to provide significant findings. A clear understanding of the current similarities between alliancing and lean from a theoretical view could help improve this adoption and could potentially lead to the creation of improved project delivery models.

Those with experience with collaborative contract models, particularly in the United States of America, may ask why this research is necessary when Integrated Project Delivery exists. The authors believe that there is a justification for such research. IPD is a method used mostly in the USA that has many similarities to alliancing, with one major difference being that IPD incorporates a number of lean construction elements (Lahdenperä 2012; Raisbeck et al. 2010). IPD's use is mostly concentrated in America, yet the principles of lean are more prevalent worldwide. Alliancing is often considered at the top end of collaborative and relational contracting (Ross 2003) and is more widely distributed across the globe (Chen et al. 2012; Ingirige and Sexton 2006). In addition, IPD and Alliancing have often been used for different types of projects (Lahdenperä 2012). The authors believe that there is sufficient difference between alliancing and IPD to warrant such a study, and as such, a full exploration into the differences between IPD and alliancing will not be explored further in this paper but can be found in the studies by Lahdenperä (2012) and Raisbeck et al. (2010).

Alliancing

Alliancing is a collaboration between the client, service providers and contractors where they share and manage the risks of the project together (Chen et al. 2010). All parties' expectations and commercial arrangements are aligned with the project outcomes and the project is driven by a best-for-project mindset, where all parties either win together, or lose together (Chen et al. 2012; Sakal 2005; Walker et al. 2013). The contract is designed around a non-adversarial legal and commercial framework with all disputes and conflicts resolved from within the alliance (Henneveld 2006). This type of project delivery can lead to improved project outcomes and value for money, in part due to the increased level of integration and cooperation between planners, design teams, contractors and operators (Love et al. 2010).

Alliancing as a model is well addressed in the literature and thus will not be discussed in great detail here. For interest, another paper from the authors determined the most common characteristics of a project that may influence the decision to proceed with an alliance as the preferred PDM and provides an up to date look at the critical success factors and barriers to alliancing (Young et al. 2016a). *Alliancing: A Participant's Guide* is a detailed industry publication that addresses alliancing from the perspectives of both the owner and the non-owner participants (NOP) (Morwood et al. 2008) and the *Introduction to Project Alliancing* is a value piece of the alliancing body of knowledge (Ross 2003).

Project alliances are very suitable, and most often used for, projects that have tight timeframes, multiple or complex stakeholder issues, are uncertain, complex and/or high risk (Young et al. 2016a). The organisation domain of project alliancing focuses on a high level of team integration necessary to deal with such projects. Alliancing uses a fully integrated project

team that is co-located (in most cases) for the entire duration of the project. A board made up of equal representation of senior leaders from each party, and known as the alliance leadership team (ALT), governs the alliance (Department of Infrastructure and Transport 2015). The ALT makes decisions unanimously and handles all disputes (that cannot be handled at the management level) in house (with the exception of wilful default), reinforcing the high level of team integration. The level of integration experienced in alliancing is at such a level where an alliance essentially becomes a ‘virtual’ organisation.

The commercial domain of alliancing is made up of, in large part, the three limbed compensation model. In recent times, alliance contracts have been structured around the three-limbed approach, where (Ross 2003; Walker et al. 2015):

- Limb 1 consists of all the directly reimbursable costs including project-specific overheads
- Limb 2 is made up of the corporate overheads and profit for each NOP, determined by an independent auditor. This is placed ‘at-risk’ according to the pain/gain arrangement
- Limb 3 consists of the incentivised cost-reimbursement where all participants share in the pain/gain associated with how the alliance performs against pre-arranged targets in cost (e.g. the target outturn cost (TOC) and non-cost key result areas (KRAs)).

This three-limbed model creates a contractual alignment between all parties and provides the financial mechanisms that aligns the client and NOPs’ interests and objectives. (Could also mention auditing here).

The operating system of alliancing isn’t known to be associated with a specific set of tools in the way that LC is. In a general sense, alliancing can be seen to behave in a similar way that a design and construct (D&C) project would (Marosszeky and Ward 2010) by utilising traditional project management methods and tools. On a day-to-day level the alliance is ran by an alliance management team (AMT), whose responsibility is to work with the alliance manager to drive the operational project delivery (Morwood et al. 2008). The authors are yet to see any prescriptions in the literature explicitly dictating how to operate an alliance. The literature often deals with *what* to achieve, i.e. the clients value for money statement, delivery project objectives etc., but not *how* to achieve it. It seems that alliances do in fact rely on traditional project management (PM) methods and tools. Given the extent to which traditional PM methods and tools are prevalent in the construction industry, they will not be covered in detail here.

Lean Construction

Lean construction was born out of the success of the lean philosophy that developed in the manufacturing industry. Both lean and the development of lean construction are well described in literature [Lean: (Ballard et al. 2001; Diekmann et al. 2004; Krafcik 1988; Liker 2004) and Lean construction: (Howell and Ballard 1998; Howell 1999; Koskela 1992; Picchi 2001)]. Therefore, this will not be covered. This paper will instead focus on the way lean construction addresses and balances the three domains of the LC triangle.

Lean construction addresses the domain of project organisation through the promotion of an integrated organisation, the creation of cross-functional teams and the alignment of participants’ interests. Lean construction aims to break down the barriers between different organisations, and between the different functional silos that are present in most organisations. A large focus of this is to eliminate waste caused by both the separation of design and construction and the sequential nature of processes often found in traditional project delivery. The alignment of interests is achieved by combining the promotion of collaboration with a large focus on the achievement of the customers’ (both internal and external customers) value. This alignment extends not only to the alignment of different organisations objectives but also

to the alignment of employees to each other and their own organisations (Azari-Najafabadi et al. 2011).

A key part of the lean construction operating system is characterised by the use of tools. While a tool in and of itself cannot be described as lean construction, the application and use of tools in a project embodies lean construction if it eliminates waste and/or maximises value in the project. The same tools applied poorly could lead to the opposite effect by creating waste and not value (Thomsen et al. 2009). A number of tools have developed out of the lean community that have been employed in construction projects. These include, but are not limited to: Last Planner System™, increased Visualisation, 5S process, First Run Studies, Daily Huddle Meetings, fail safe for quality and safety, Plan-Do-Check-Act, A3 Reports, Value Stream Mapping and Target Value Design (Salem et al. 2005; Thomsen et al. 2009).

Addressing the commercial domain is not so straight forward seeing as lean construction is not considered as a typical project delivery contract strategy. The commercial domain has do to with the “*compensation method, contractual assignment of roles and responsibilities, and financial mechanisms which can result in alignment of interests within a project organization, if properly designed, etc.*” (Azari-Najafabadi et al. 2011, 428). The research has uncovered many ways that LC can lead to alignment of interests within a project but not in the specific commercial aspects of a compensation model or financial mechanisms.

FINDINGS AND DISCUSSION

The discussion presents the authors’ interpretation of the findings that have resulted from studying the literature. This discussion explores the operating systems of both project alliancing and lean construction in order to determine the similarities and differences between the two and to determine if there is any potential of lessons learned to be passed from one to the other and vice versa.

Alliancing is structured in such a way that it creates full alignment of the three domains. The shared risk and pain/gain arrangements combined with the alignment of client and commercial participants’ objectives creates an entity that is very adept to dealing with projects that are high risk or have high levels of uncertainty. This combined with unanimous decision-making, no dispute clause and open book help to ensure the win-win principle of alliancing necessary to deal effectively with the issues that arise. When problems arise, it is in the best interest of all the parties to find the best-for-project outcome, and find it quickly. The full integration of the organisational domain, combined the commercial aspects creates a situation where the emphasis of contract management in the typical sense is removed and full focus can be placed on the operation of the alliance.

It seems that, even with a good balance between the domains, alliancing hasn’t made any leaps forward in terms of revolutionising its operating system when compared to traditional project delivery. The success of alliancing seems to be due to the revolutions made in the organisational and commercial domains. Such a finding leads the authors to believe that alliancing could be greatly improved by focusing on its operating system.

Lean construction as a method of management seems to operate mostly in the organisational and operating system domains. Despite lacking in the typical sense of the commercial domain, LC maintains a high-level alignment between the other two domains. This alignment makes it particularly adaptable to being incorporated into a wide range of commercial models.

Considering both alliancing and LC from this perspective, we can see that they are highly compatible. They share many similarities in the organisation domain in that they both strive to achieve full integration to the effect that value is maximised for the owner. Alliancing has a fully functioning commercial domain that is inherently aligned with the principles of lean construction (Young et al. 2016b), thus making the alliancing and LC highly compatible in this

area. In the operating system domain, alliancing relies on traditional approaches to project management and does not have a specific set of prescribed methods and tools of its own. This creates a situation where a full LC operating system could be seamlessly introduced into an alliance without fundamentally changing the alliance itself.

The findings show that there is great potential for alliancing and LC to learn from each other. This has been shown practically in a sense where the adoption of alliance like governance and commercial aspects into lean construction created the IPD model. On the other hand, the alliancing model could benefit from LC, particularly its operating system, while still staying true to the structure and principles that make alliancing what it is today.

CONCLUSIONS

The following research questions were identified and addressed:

- How are the operating systems of project alliancing and lean construction identified in the literature?
- What the similarities and differences between the two?
- Is there potential for the two systems to learn from each other?

A large driver of alliancing is to deliver value for money to the client, so it comes as a surprise that, to this date, alliancing it yet to fully capitalise on the lean construction operating system to drive the pursuit of maximum value. Despite the presence of PDMs that resemble a combination of PA and LC, namely IPD, alliancing, in its own right, has solidified its place alongside such PDMs in the project delivery toolkit available to clients. The presence of IPD does not make alliancing obsolete and the inclusion of a LC operating system into standard PA does not necessarily become IPD either.

The inclusion of a lean operating system would not require any major changes to the existing structure of a standard project alliancing agreement. Alliancing could essentially remain the same, structurally and commercially, while incorporating lean construction methods and tools into its operating system. This is made possible due to the inherent alignment between alliancing and the lean construction principles in the organisational and commercial domains.

The authors aim to study the practical implications of this by reviewing the outcomes of a number of Finnish alliances that are in the process of experimenting with the inclusion of the lean construction philosophy, tools and methods. Based on these theoretical findings, the expectation is that this implantation will deliver positive results in addition to key lessons learned.

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PART 3 – APPENDICES

APPENDIX A – REFERENCES CORRESPONDING TO THE TABLES

Table 18 – Numbered Reference List for Tables 5 and 6

Paper	#	Authors
Performance of Project Alliancing in Australasia: A Digest of Infrastructure Development from 2008 to 2013	1	(Walker et al., 2015)
Alliances in construction: Investigating initiatives and barriers for long-term collaboration	2	(Ingirige and Sexton, 2006)
Overview of alliancing research and practice in the construction industry	3	(Chen et al., 2012)
Reducing opportunistic behaviour through a project alliance	4	(Laan et al., 2011)
Delivery of Low-Volume Road in Pilbara Region of Western Australia by Alliance Contracting	5	(Cocks et al., 2011)
Overview of the Australia-based Studies on Project Alliancing	6	(Chen et al., 2010)
Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery	7	(Lahdenperä, 2012)
Price Competitive Alliance Projects: Identification of Success Factors for Public Clients	8	(Love et al., 2010)
National Alliance Contracting Guidelines Guide to Alliance Contracting (including guidance note 3)	9	(Department of Infrastructure and Transport, 2011)
Longitudinal Study of Performance in Large Australasian Public Sector Infrastructure Alliances	10	(Walker et al., 2013a)
In Pursuit of Additional Value A benchmarking study into alliancing in the Australian Public Sector, Melbourne, Department of Treasury and Finance	11	(Wood and Duffield, 2009)
Alliancing in Australia - No-litigation contracts: A tautology?	12	(Rowlinson et al., 2006)
The Case for an Alliance	13	(Highway Engineering Australia, 2009)
Using a Case Study Approach to identify Critical Success Factors for Alliance Contracting	14	(Jefferies et al., 2014)
RMS and Alliance Contracts - Fact Sheet	15	Roads and Maritime Services
Procurement Methodology Guidelines for Construction	16	(NSW Government, 2015)
Project Alliancing at National Museum of Australia—Collaborative Process	18	(Hauck et al., 2004)
Project Alliancing: A Relational Contracting Mechanism for Dynamic Projects	20	(Sakal, 2005)

Project Alliancing vs Project Partnering: A Case Study of the Australian National Museum Project	21	(Walker, 2002)
A review of the Concepts and Definitions of Various forms of Relational Contracting	26	(Rowlinson and Cheung, 2004)
The definition of alliancing in construction as a Wittgenstein family-resemblance concept	27	(Yeung et al., 2007)
Conceptual Model of Partnering and Alliancing	28	(Anvuur and Kumaraswamy, 2007)
Alliance Contracting Removing the Boundaries for Infrastructure Delivery	29	(Henneveld, 2006)
Project alliance contract in The Netherlands	31	(Scheublin, 2001)
Introduction to project alliancing	37	(Ross, 2003)
Alliance Contracting in Australia- A brief introduction 2009	41	(Ross, 2009)
Optimising Contracting for Alliances in Infrastructure Projects	42	(Van den Berg and Kamminga, 2006)
Enthusiasm, commitment and project alliancing: an Australian experience	43	(Walker, 2002)
Alliancing: A Participant's Guide	50	(Morwood et al., 2008)
Enabling Construction Innovation – the role of a no-blame culture as a collaboration behavioural driver in project alliances	58	(Lloyd-walker et al., 2014)
Infrastructure Development Using Alliances- Lessons and Observations	60	(Mills et al., 2011)
Innovation through alliancing in a no-blame culture	61	(Walker et al., 2013b)
Overview of Collaborative Contracting	62	(Ross et al., 2014)
Partnering in Statsbygg	63	(Haugseth, 2014)

APPENDIX B – ALLIANCING IN LARGE INFRASTRUCTURE PROJECT QUESTIONNAIRE

1. Name of Project:
2. Your role in the project:
3. Size of project (\$):
4. Number of Alliance Parties:
5. Duration:
6. Table of elements (see next page):

The table over the page contains the identified elements. Could you please place a cross against the elements that were present in your alliance? In addition could you mark, based on your experience, whether the elements are only found in alliancing or not. Some space is left at the bottom if you think there are additional elements that can be added to the list.

Table 19 - Alliance Elements

Elements of an Alliance	Part of Project	Only Alliance?
Formal Alliance Contract (Standalone contract, built for purpose)		
No Dispute Clause		
No Blame/No Fault Mentality		
Pain/ Gain share		
Open Book Approach		
Unanimous decision making		
Early Involvement of Alliance Partners		
Incentivized Cost-Reimbursement		
Minimum Reimbursement of Direct Costs		
Direct Cost Target (Target Outturn Cost TOC)		
Fee to cover Corporate Overheads		
No Latent Condition Clauses		
Risk/ Reward Sharing		
Alignment of Client and Commercial Participants Objectives		
Common Goals		
Joint Responsibility		
Alliancing Workshops		
Alliance Board		
Alliance Management Team		
Integrated Project Team (Selected on a best-for-project basis)		
Virtual Organisation		
Team Building Activities		
Co-location of Alliance Team		
Single Alliance Culture		
Alliance Uniform and Stationary		
Alliance Facilitator		
Auditing		
Built from the ground up		
Internet Based Information Management System		
Dispute Resolution kept within alliance		

Can you identify any additional elements that can be added to the list?

-
-
-
-

Thank you for your time.

APPENDIX C – INTERVIEW GUIDE

Alliancing in Large Australian Infrastructure Projects

*Interviewee(s)

1. Minutes

Ask permission to record the interview

Intro (5 mins)

1. Introduction of those present
 - a. Name; Position; Company; Previous (if applicable); Experience with Alliancing; Name of Alliance Projects worked on

Discussion (with focus on questions relevant to participants' expertise) (20 mins)

Research Question 1)

2. What do you think are the most defining elements of an alliance?

3. What elements do you think are unique to the alliance delivery method?

Research Question 2)

4. When determining the contract strategy for a project, what factors do you consider?

5. At what point is alliancing considered as one of the options?

6. Which characteristics of a project make it suitable for alliancing?

Case Study (25 mins)

7. Discuss the interviewee's experience with particular alliance projects

8. Discuss the interviewee's experience with the selection of particular case alliance projects

Closing Remarks (10 mins)

9. Do you consider alliancing to be an effective project delivery method?

10. Do you see a declining trend in the use of alliances to deliver infrastructure projects?
 - a. If so, why?
 - b. If no, what will be used in its place?

Case Study Questionnaire

2. Project Details

Name of Project:

Your role(s) in the alliance:

Size of project (\$AUD):

Number of Parties:

Duration:

3. Discussion (with focus on questions relevant to participants' expertise)

1. Main characteristics that influenced the PDM selection?
2. Which other contract strategies were considered for this project?
3. Was the project considered a success (differentiate between project success and project management success)? Expand on why/why not.
4. If yes, what alliance elements contributed to the success?
5. Any other factors that influenced the success?
6. Did the contract strategy influence the outcome? Could the project have been delivered successfully by another contract method?
7. Complete table which will be presented during the meeting (to compare participants' thoughts against those we've found in the literature):

4. Project Details

Name of Project:

Elements of an Alliance	Present in Case Alliance Project?	Is this element Unique to Alliancing?*
Formal, stand-alone Contract		
Virtual Organisation		
Pain/ Gain share		
Risk/ Reward Sharing		
<ul style="list-style-type: none"> No Latent Condition Clauses 		
Alignment of Client and Commercial Participants Objectives		
Three Limbed Contract		
<ul style="list-style-type: none"> Incentivized Cost-Reimbursement Minimum Reimbursement of Direct Costs Target Outturn Cost (TOC) Fee to cover Corporate Overheads and profit 		
No Dispute Clause/ No Blame, No Fault Mentality		
<ul style="list-style-type: none"> Dispute Resolution kept within alliance 		
Open Book Approach		
Auditing		
Alliance Leadership Team (ALT) (Alliance Board)		
Alliance Management Team (AMT)		
Unanimous Decision Making		
Integrated Project Team		
<ul style="list-style-type: none"> Colocation of Alliance Team 		
Single Alliance Culture		
<ul style="list-style-type: none"> Alliancing Workshops Relationship Development Alliance Facilitator Alliance Uniform and Stationary 		

Others:

Project Characteristics	Influenced the PDM Selection?
Tight Time Constraint/ Need for early start	
Multiple/ Complex Stakeholders	
High Risk	
High Complexity	
Unclear/ Broad Scope/ Risk of Scope Change (Uncertainty)	
Complex External Threats	
Large Project/ High Cost	
Need for Innovation	
Tight Cost Control	
Environmental Challenges	
Need for owner involvement	
Multiple Interfaces	
Market Situation (what strategy do the tenderers prefer, and how to achieve competition among the tenderers, and are they occupied or do they have free capacity)	
Client organisation (what strategies are the client able to handle)	
Other:	
Other:	

APPENDIX D – CRITICAL EVALUATION OF LITERATURE

This section present an evaluation on a sample of the articles included in this report to give an indication of the process used throughout the study.

Methodology

To perform a critical evaluation of the literature, the authority, the reliability and the usefulness of each source was evaluated. To evaluate the *authority* of the sources the following questions were asked:

- Who is/are the author(s)?
- What are their credentials?
- What is their area of expertise?
- Which university (if any) are they affiliated to?

The authority for each article was rated either suitable or unsuitable for the purpose of this evaluation. The following questions were asked to evaluate the *reliability* of each source:

- Is the source peer-reviewed?
- Is the publisher or journal known and reputable?

For the purpose of this report, reliability was rated either reliable or unreliable. To evaluate the *usefulness* of the source the following questions were be asked:

- How does the source relate to the chosen topic?
- How current or relevant is it to the topic?

The usefulness of each article was rated either very useful, useful or useless for the purpose of this evaluation.

The combined result of the three evaluation criteria was used to determine whether the resources found are suitable as a primary resource, secondary resource or unsuitable for inclusion in this specialisation project.

To reduce the length of the evaluation, when checking the authors of the article just the lead author was evaluated.

Evaluation of Literature

The evaluation of authority, usefulness and reliability is performed on each resource individually.

Article 1 - National Alliance Contracting Guidelines: Guide to Alliance Contracting

Table 20 - Article 1 Summary

Year of Publication	2011
Author/s	
Publisher	Department of Infrastructure and Transport, Commonwealth of Australia
University Affiliation	N/A
Journal	N/A
Cited by	4
Length	168 pages

Authority

The authors are assumed staff and/or consultants of The Department of Infrastructure and Regional Development. According to their website, the department is “responsible for the design and implementation of the Australian Government's infrastructure and regional development policies and programmes” (Government, 2015a). Among others things, their main area of expertise is promoting, evaluating, planning and investing in infrastructure in Australia. They have no university affiliation however, being a government department, their authority is high. Authority of this resource: Authoritative

Reliability

Information couldn't be found as to whether this document was peer-reviewed however, the publisher, being a national government agency, is highly known and reputable in the industry. Reliability of this article: Reliable

Usefulness

Just by reading the title is enough to justify including this resource. This document has been written by the government with the intention of providing guidance to public sector agencies on alliance contracting. It was published in 2011 thus making it quite new and relevant to the current state of alliancing in Australia. It is a highly relevant document in that it covers all the areas of interest of the main research question. Part One is titled “Overview of Alliance Contracting” and covers everything from what is an alliance to the evolution of alliances, the differences between traditional contracts as well as covering projects most suited to alliancing. Part Two of the document is more specific and covers the development and implementation of alliance contracts, which is also of interest. Given the length of the document as well as the relevance and detail, this resource is suitable as a primary resource. The usefulness of this resource: Very useful

Article 2 - Performance of Project Alliancing in Australasia

Table 21 - Article 2 Summary

Year of Publication	2015
Author/s	Derek Henry Thomas Walker ¹ , James Harley ¹ and Anthony Mills ²
Publisher	University of Technology Sydney (UTS)
University Affiliation	1. RMIT University, Australia; 2. Deakin University, Australia
Journal / Peer Review	Construction Economics and Building / Yes
Cited by	Unknown (published this year)
Length	18 pages

Authority

A search for ‘Derek Walker Australia’ in Google returned his professional profile on the RMIT website. He has been an academic since 1986 (29 years) and has 16 years industry experience, seven of which were in Australia (Boer, 2015). A search of his Author ID in the RMIT Repository resulted in 160 publications to his name. He was also recommended by Ali Hosseini as a notable scholar in the field of alliancing.

RMIT is ranked number 14 out of the universities in Australia and among the top 100 worldwide in the area of Engineering and 273 in the world overall (Network, 2015). Authority of this resource: Authoritative

Reliability

The journal of Construction Economics and Building is a journal that publishes 12 issues per year and is endorsed by the CIB (International Council for Building). The academic Journal is international, peer-reviewed and published by The University of Technology, Sydney (UTS) (UTS, 2015a). UTS is ranked 95th in the world in Engineering and Technology, 9th in Australia and 218th in the world overall (UTS, 2015b). Reliability of this article: Reliable

Usefulness

This article is the most relevant in terms of date of publishing as it is the only article from 2015. The article covers an introduction to alliancing, its benefits, provides some comparisons to other contract types and covers some challenges. A sub-section of the article deals with answers to two key questions: What is a project alliance? Why should we use this approach? Both of which are key to understand the research question being explored in this paper. The bulk of the paper however deals with the performance of alliances in Australia, although interesting, it is not particularly relevant to the theme of this paper, thus making this article a secondary resource. The usefulness of this resource: Somewhat useful

Article 3 - In Pursuit of Additional Value: A benchmarking study into alliancing in the Australian Public Sector

Table 22 - Article 3 Summary

Year of Publication	2009
Author/s	Peter Wood; Colin Duffield;
Publisher	Department of Treasury and Finance, State of Victoria, Australia
University Affiliation	The University of Melbourne
Journal / Peer Review	N/A
Cited by	25
Length	197 pages

Authority

Peter Wood is an Australia and Middle East Principal for Evans & Peck. A search for ‘Peter Wood Evans and Peck’ in Google resulted in finding his LinkedIn profile page. His qualifications include a doctorate majoring in infrastructure, 25+ years construction experience and 9 years advisory experience. According to his profile, he has procured, delivered and advised upon literally hundreds of projects (LinkedIn, 2015b). Authority of this resource: Authoritative

Reliability

The Department of Treasury and Finance is a state government organisation in charge of the state’s finances. Part of their area of expertise is to be in charge of Government Procurement for the state (Government, 2015b). The same evaluation applies here as for article 1. It is worthy to note that this article is referenced in article 1 as being a key resource in the preparation of the national guide to alliance contracting. This contributes to its legitimacy. Reliability of this article: Reliable

Usefulness

The purpose of this article is to determine whether Value for Money (VfM) could be improved in the alliance delivery method. The research was commissioned by a number of State Treasuries who formed a steering committee to explore the rationale behind the increased use of the alliance delivery method in Australia. The intention behind the study and the organisations behind it make it quite a reputable source, one that is valuable to the research at hand. Chapter 2 contains the most relevant information, as this is where they discuss alliancing in Australia in general, the trends, views on alliancing and the process of how governments determine whether to use an alliance, which also delves into project characteristics suitable for alliances. This article addresses both the primary and secondary research questions and

contains additional information that is of interest for exploring the topic of alliancing further.

The usefulness of this resource: Vey useful

Article 4 - Delivery of Low-Volume Road in Pilbara Region of Western Australia by Alliance Contracting

Table 23 - Article 4 Summary

Year of Publication	2011
Author/s	Cocks, Geoffrey; Scott, Jacqueline; Pearce, Terry; Hazebroek, Mark; Fisher, Paul; Wilson, Robert
Publisher	N/A
University Affiliation	N/A
Journal / Peer Review	Journal of the Transportation Research Board / Peer Reviewed by Committee for the 10th International Conference on Low-Volume Roads
Cited by	Unknown
Length	8 pages

Authority

A Google search of ‘Geoffrey Cocks Coffey’ returned his LinkedIn page with the following information: 26 years as Senior Principal for Coffey International. He has a BE and a MSc in Civil Engineering (LinkedIn, 2015a). Although the author does not have an academic background like the other authors, he does have extensive industry experience and was involved in the alliance project of which the article uses as a case study. It is also worthy to note that two of the supporting authors, Terry Pearce and Mark Hazebroek, work for Main Roads Western Australia, the state road authority. Terry was also the Millstream Link Alliance and Stakeholder Manager (Zoom, 2015). Authority of this resource: Authoritative

Reliability

According to The National Academies of Sciences, Engineering and Medicine, the Journal of the Transportation Research Board is “one of the most cited and prolific transportation journals in the world, offering unparalleled depth and breadth in the coverage of transportation-related topics. TRR Journal publishes approximately 70 issues annually of outstanding, peer-reviewed papers presenting research findings in policy, planning, administration, economics and financing, operations, construction, design, maintenance, safety, and more, for all modes of transportation.” (Engineering and Medicine", 2015). Reliability of this article: Reliable

Relevance

This article was written in 2011 thus making it relevant to determining the current state of alliancing in Australia. A review of the article reveals that it is quite relevant to the subject

area. The article was not written by scholars or a university but by people in the industry. The purpose of the article is to describe the experience of using the alliance contracting model to deliver a low-volume road, and to share the process and lessons learned. The article contains information about what an alliance is in addition to describing the process and benefits of an alliance with reference a real world example. It also contains information on why alliancing was chosen for this particular job, thus containing information applicable to both research questions. The usefulness of this resource: Vey useful

Article 5 - Price Competitive Alliance Projects: Identification of Success Factors for Public Clients

Table 24 - Article 5 Summary

Year of Publication	2010
Author/s	Love, P.; Mistry, D.; Davis, P.
Publisher	N/A
University Affiliation	Curtin University of Technology
Journal / Peer Review	Journal of Construction Engineering and Management / Yes
Cited by	50
Length	10 pages

Authority

A Google search for ‘Peter Love Curtin University’ returned his university profile page. Peter is a professor with a PhD in Operations Management and MSc in Construction Management. From 2013 until present, he has published 39 journal articles and 2 conference papers (University, 2014). As for The Curtin University of Technology, it is ranked among the top 2% of universities in the world in the Academic Ranking of World Universities 2015 (University, 2015). Authority of this resource: Authoritative

Reliability

This article was published in the same journal as article 2. Reliability of this article: Reliable

Usefulness

The article was published in 2010, thus making it still quite relevant to determining what alliancing means today. The article has been written with public sector clients in mind and deals with a more specific aspect of alliancing, that being price competitive alliance projects. The article covers what is alliancing in the introduction and goes on to explore different alliance types. It also explores the differences and similarities between alliancing and partnering which is very relevant to the research theme. The bulk of the article deals with aspects that are a little

too specific to the main theme, however there are enough subsections that deal with information relevant to the two research questions. The usefulness of this resource: Vey useful

Conclusion

An important step for any literature review is having a good process for searching for and evaluating potential sources. This Appendix has documented the process for identifying, evaluating and selecting literature for use in the NTNU subject TBA4530 - Specialisation Project and a summary of the evaluation is presented in Table 25.

It is no surprise that all articles were deemed authoritative and reliable, as all articles were either peer-reviewed journal articles or government reports. However, because of limitation on time and report length, the evaluation presented here was not as in depth as it could have been and hence the rating for authority or reliability was just that each article was either authoritative or not, or reliable or not, and not anything in between. In the end, it turned out to be that the usefulness evaluation was the key criteria to determining the role that each article will play in the literature study.

To build upon the work undertaken here a number of recommendations are made. Firstly, obtaining sources from more than just two source types, for example information from books or conference papers, could help to obtain a broader spread of information. Secondly, the search process could be expanded by contacting professionals in both the public and private sector in order to determine where they get their information on alliancing from. Lastly, the search could be expanded by searching for the authors of the selected articles to see if they have written any other relevant articles on the topic of alliancing.

Table 25 - Evaluation Summary of the Sample Articles

Article	Authority	Reliability	Usefulness	Use in Literature Review
1	Authoritative	Reliable	Very Useful	Primary Resource
2	Authoritative	Reliable	Somewhat Useful	Secondary Resource
3	Authoritative	Reliable	Very Useful	Primary Resource
4	Authoritative	Reliable	Very Useful	Primary Resource
5	Authoritative	Reliable	Very Useful	Primary Resource