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An Investigation into the Impact of Governance on Megaprojects

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Abstract

'Despite the enormous sums of money being spent on transportation infrastructure, surprisingly little systematic knowledge exists about the costs, benefits and risks involved' (Priemus, van Wee, & Flyvbjerg, 2008)

Long-term infrastructure projects are often best judged with the benefit of hindsight. Many significant and important projects initially condemned as failures were later been regarded as great successes. Opinion can take years to deliver its final verdict. Megaprojects are the largest, most complex, and most inspiring forms of projects delivered around the world. They also have a poor track record for being delivered over-budget and late. In particular, Mega Transport Projects (MTP) regularly see cost blow outs of over 40%. The need for MTPs continues to grow, as more and more people live in urbanised cities and megaproject sponsors replace old and worn out transport systems with quicker, faster and more reliable transport systems. Due to the proliferation of megaproject cost blowouts there continues to be risk that sponsors of megaprojects are not receiving the optimal value out of the delivery mechanism deployed. Many contemporary studies have identified 'project governance' as one of the key areas for improvement with megaprojects.

Projects are under pressure to be commercially viable from the start (a pre-project construct) and once delivered, are measured by three main yardsticks: that the project was delivered

1. on-time;
2. under-budget; and
3. to agreed quality standards.

While there are many arguments that identify other considerations to define project success, these three yardsticks provide simple and effective mechanisms to convey the complex message about a project's success. Any further information is a level of detail that is dependent on the theoretical perspective taken, addressing context, complexity, short and long-term outcomes, interfaces and the impact of the environment in which it was delivered.

New ways of understanding and improving the approach to project governance are being investigated and better understood. Research in project management is rapidly expanding its horizon. In particular, researchers are suggesting that new research approaches are required in project management as there is "demand for more emphasis on detailed investigations of what is occurring in real practice and the management of complexity in projects describing interconnections" (Er, Pollack, & Sankaran, 2013, p. 164).

The present research is based on a critical study of one case, the Regional Rail Link Project in Victoria, Australia. This study involved detailed interrogations of the megaproject board's documentation over the project lifecycle, and through the use of a case, evidence supported the development of new megaproject governance arrangements. The research is grounded in the literature which strongly supports the need for enhancing the understanding of how megaproject governance structures are established and subsequently managed.

The aims of this study were to understand the functions and role of a megaproject board, and then to develop a new model to improve the management of megaprojects. To achieve this, a successful megaproject that was delivered over an 8-year period was investigated. The data used for the research included access to over 5,500 documents collected from within a megaproject's head office, with a focus on:

- the monthly board meeting minutes, attachments, briefings and reports;
- sub-committee monthly reports to the project board;
- a series of longitudinal interviews with all the project board members.

The research viewed theory from within the project; and the thesis adopts an 'inside-the-megaproject' view of project governance and iterated between data and theory; and not just relying on an outsider-looking-in perspective of the project governance arrangements. This study identifies that, for megaprojects, a board must identify and continually manage risk throughout the entire lifecycle of a megaproject, as it is ever present and ready to materialise as project failure if not adequately controlled.

Declaration

This is to certify that:

(i) The thesis comprises only my original work towards the PhD except where indicated in the Preface.

(ii) Due acknowledgement has been made in the text to all other material used.

(iii) The thesis is fewer than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Signed:

(original signed)

Nicholas Leon Pelham-Bomar
July 2019

Preface

From 2007 to 2012, I worked at the centre of the Victorian Government's infrastructure program. During that time, I provided oversight and assurance to over 700 major projects being delivered across the Government portfolio and was provided with an insight into the planning, procurement and delivery of a vast array of infrastructure, from hospitals and schools through to new transport systems and desalination plant projects. I also saw a number of projects fail.

This thesis is an extension of what I learnt while working for the Victorian government. I sincerely hope that this work contributes to developing new processes, theory and techniques to better deliver megaprojects; especially those megaprojects that support and improve the communities and cities that we live in and are a part of.

My thesis was the result of wanting to find an answer to the problem of, "*how can we improve the governance arrangements of projects?"* After spending much time searching for best practice examples around the world, it became more apparent that there were gaps in being able to answer this question. Many suggested that I should look towards the literature on corporate governance and see if it could be applied to project management. I initially asked the University of Melbourne for further assistance, and sometime later the discussion turned back towards me, with a new question asked: "*so Nick, it looks like your question might be a good PhD topic. Have you thought about doing some further study?"*.

I knew that further *generalisations* to improve project governance was not going to be sufficient for me to answer my original question; so by using my personal knowledge of both successful and failed projects, I hypothesised that with the right data, and knowing the right people to ask, I could research the governance arrangements of the largest, and one of the most successful megaprojects delivered in Australia. With persistence, I was granted complete access to all of a megaproject's documentation and board minutes, which also included personal access to all the board members, including the Chairman and CEO. I now had access to a rare type of megaproject – one that was delivered under budget and on time. I wanted to use a case study to provide a perspective that was unique and something quite special.

I feel privileged to have been able to answer the question that I asked over a decade ago, but also to learn about theory, innovative research methods, and to bring such a rich data source to light.

This research was supported by the Australian Government's Research Training Program scholarship, through a Fee Offset Scholarship. This thesis benefited from copy-editing services by my friend and neighbour, Dr. B.A. Smith, Semiosmith Editing and Consulting Services. Advice was restricted to copy-editing, as covered in parts D and E of the Australian Standards for Editing Practice, second edition, 2001.

Over the course of this research, a number of peer reviewed articles were published, tested with academia and industry practitioners. Elements of these papers have been incorporated into this research, in particular, the following papers have been used:

(a) The Effects of Governance on Information Technology Projects, (Wilson, Pelham, & Duffield, 2009).

(b) Corporate versus Project Governance: a review of governance initiatives trialled on Australian PPPs, (Wilson, Pelham, & Duffield, 2010).

(c) A New Approach to Governing a Complex Project, (Pelham & Duffield, 2013).

(d) Applying State-of-the-Art Governance Models to Major Projects, (Pelham & Duffield, 2014).

(e) A Case Study – the governance of a megaproject: does the guidance match practice (Pelham & Duffield, 2015, unpublished).

(f) Mega-Project Governance – a case study of the governance of a successfully delivered Project, Engineering Project Organisation Conference 2016, Seattle USA (Pelham & Duffield, 2016). Double blind peer review.

(g) Decision Making at the Megaproject Boardroom, Engineering Project Organisation Conference 2018, Brijuni Croatia, (Pelham & Duffield, 2018). Double blind peer review.

Acknowledgements

With pleasure I acknowledge the special people in my life who provided me with support and guidance during this research.

Colin Duffield, as my supervisor and friend who continues to encourage, guide and challenge me: your experience as an academic and infrastructure industry leader ensured that the research remained relevant, current and significant. The respect I have for your professional work ethic and willingness to think outside the box provided me with the grounding I needed to remain focused on this research, while all the other things were going on with life.

To my family – Simone, BiBo (William) and Indigo: how I admire the encouragement you have all given me during the many hours of me 'going off to the study'. Your acceptance that continuing education and research was a key priority, kept me going. Many times, around the kitchen table you engaged with my ideas, told me what made sense and, more often than not, let me know when things didn't! The ongoing support and love you gave provided me with the inspiration I needed to do the best that I could. Thankyou especially to you, Simone, for keeping me in check. You ensured we balanced fun, holidays, work, adventures and research. I could not have realised my personal goals without your support. To BiBo and Indigo, I loved the hours you spent with me out in the study, while I read and wrote. I hope you were able to see what hard-work and persistence can result in. From a very young age, you have had a connection with the University, and have experienced first-hand all the wonderful opportunities that further education can provide. Finally, I can't forget the two dogs, Penny-Brown and Liquorice. You kept me company through the many late nights; although you continually wanted walks and more food - typical Labradors!

There have also been so many industry leaders who gave me their opinions and trusted me with their personal stories from working on megaprojects. I hope I listened well, read thoroughly, and analysed data adequately to take your words and insights, and turned them in to a body of work that will advance project governance of megaprojects. Without doubt, had it not been for Victoria's Department of Treasury & Finance and the Department of Transport, this body of work would never have been completed. You provided me with unprecedented access to data, and gave me the opportunity to observe the inner workings of how a megaproject is successfully shaped and delivered.

When I began this research, I wanted to learn and change, but had little regard for the challenges ahead. My final thanks go to David Wilson, Felix Hui and John Fitzgerald, a wonderful group of like-minded people interested in academic excellence and pushing forward the new frontiers of infrastructure. Most of all, you saw the potential in me. You offered me support all the way along this journey. Thank you.

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Abbreviations

AO -	Administrative Office
AARNet -	Australia’s Academic and Research Network
AIPM -	Australian Institute of Project Management
ALB -	Arm’s Length Bodies
APM -	Association of Project Management
ASX -	Australian Stock Exchange
BOT -	Build Own Transfer
CBA -	Cost Benefit Analysis
CEO -	Chief Executive Officer
COO -	Chief Operating Officer
CQV –	Coefficient of Quartile Variation
CREP -	Complex Real Estate Projects
CV -	Co-efficient of Variation
CVD -	Competing Value Dimensions
CVM -	Competing Values Model
EHEAG -	Engineering Human Ethics Advisory Group
EPOS -	Engineering Project Organisation Society
GPG -	Good Project Governance
GRP -	Gateway Review Process
HBSG -	Hertie Business School of Governance
Ho/Ho -	Hand-Over/Hand-Off
ICCPM -	International Centre of Complex Project Management
IJPM -	International Journal of Project management
IPA -	Infrastructure Partners Australia
IS -	ICT Systems
ISO -	International Standards Organisation
IT -	Information Technology
JCC -	Joint Coordination Committee
KPI -	Key Performance Indicator

LEP -	Large Engineering Project
LLD -	Lessons Learnt Database
MEMo -	Megaproject Effectiveness Model
MMR -	Mixed Methods Research
MTP -	Mega Transport Projects
NED –	Non-Executive Director
OCR -	Optical Character Recognition
OECD -	Organisation for Economic Co-operation and Development
OEM -	Organisational Effectiveness Model
OGC -	Office of Government Commerce
OPM -	Organisational Project Management
PFI -	Private Finance Initiative
PMG -	Poor Megaproject Governance
PMI –	Project Management Institute
PMO -	Project Management Office
PPG -	Poor Project Governance
PPP -	Public Private Partnership
PRINCE2 -	Project In a Controlled Environment, version 2
PSC -	Project Steering Committee
RAT -	Red and Amber Traffic light
RQ -	Research Question
RRL -	Regional Rail Link
RRLA -	Regional Rail Link Authority
SCF -	Success Criteria Framework
SO -	Sarbanes-Oxley
SPEs -	Special Purpose Entities
UK -	United Kingdom
VIBRA -	Variables Influencing Board Roles and Attributes
VSM -	Viable System Model

Chapter 1 Introduction to the Problem

> ‘Despite the enormous sums of money being spent on transportation infrastructure, surprisingly little systematic knowledge exists about the costs, benefits and risks involved’ (Priemus et al., 2008, p. 120)

> ‘Megaprojects attract high levels of both public and political interest due their cost and their impact’ (Chapman, 2016, p. 937).

1.1 CONTEXT OF THE STUDY

One of the iconic attractions in Australia is a man-made infrastructure project designed by a Danish architect and constructed by an English engineering company. In 1957 it represented an opportunity for Australia to showcase itself as having a masterpiece of modern architecture. It used modern and innovative techniques including precast concrete, structural glue and computer analysis. Unfortunately, it is also recognised as one of the most spectacular project failures of all time. Cost blow outs were significant, estimated at 1400% (Flyvbjerg, 2005; Flyvbjerg, Holm & Buhl, 2002; Hall, 1980) and it holds the (*unofficial*) record of the most over-budget project. Even though it was delivered over 60 years ago, this project, the Sydney Opera House, and a long list of other megaprojects have become synonymous with one outcome – failure.

Research in the area of project management is rapidly expanding its horizons with prominent researchers suggesting that new research approaches are required to meet a “demand for more emphasis on detailed investigations of what is occurring in real practice and the management of complexity in projects describing interconnections" (Er et al., 2013, p. 164). In particular, researchers such as Cimcil et al. (2006) and Er et al. (2013), suggest the need for researching the actuality of projects. One particular aspect identified as a gap is that of project governance.

What is the impact of governance on a megaproject? It depends. Different organisations expect different outcomes from projects. Outcomes comprise a complex mixture of variables that respond to the economy, market conditions and organisational contexts. Meanwhile, there is much argument about what constitutes *a megaproject*, and the literature has not been able to precisely identify the exact size or scale at which a normal project becomes a megaproject (Sovacool & Cooper, 2013, p. 240). Megaprojects pose a problem for corporate governance, as once a megaproject has been delivered, there is little that can be done to reverse the decisions that lead to losses from cost blow outs of a failed project. Traditional project management methods appear to have failed as a reliable agent to deliver time and cost certainty for megaprojects. But regardless of the causes of failure, the mechanism of using megaprojects to deliver large scale projects is becoming more popular, despite carrying such a poor pedigree of performance.

My professional fascination with p*roject governance* and *megaprojects* commenced in late 2008. Back in 2002 the Victorian Government of Australia had a significant project delivery problem. Some of their flagship infrastructure projects were failing to deliver. In 2003, the Victorian Treasurer was in London and was introduced to a new project management process created for the Office of Government Commerce (OGC)[1] by Sir Peter Gershon. The new process, *'the Gateway Review Process™'*, was a six-stage independent project assurance process applied on all high-risk projects in the UK government. The Gateway Review Process (GRP) was developed as a strategic response to the problem of major projects' being delivered late and over their Total Estimated Investment (TEI). At a process level the GRP is a corporate governance tool that mitigates the project governance risk issue of *project failure*. The Victorian Government successfully trialled the GRP and subsequently implemented the process across all Departmental high-risk portfolio projects.

In 2007, I was given the opportunity to work at the centre of the Victorian Government's $AUD30 billion capital infrastructure program, and to lead the *'Gateway Initiative'* as an Executive Officer within the Department of Treasury & Finance. One of my primary roles was to implement the GRP to all High Value/High Risk[2] infrastructure projects to ensure that they delivered to their time, cost and quality objectives. A second role was to systematically improve the planning and delivery of major projects across whole-of-government. It was with this second activity that my interest with megaprojects and project governance commenced.

One of the project governance tools used to capture knowledge about the outputs of the GRP (and to subsequently make improvements) was a Lessons Learnt Database (LLD). The LLD captured and analysed

[1] The OGC, now no longer in existence, is probably best known for creating the world-wide successful project management methodology, PRINCE2.
[2] A high-risk project was one with a nominal value of at least $AUD100m+

all recommendations from individual Gateway Reviews (DTF, 2011). Over a 4-year period and 3,000-plus analysed recommendations later, themes began to emerge around a number of '*hotspots'* or '*weaknesses'* in the infrastructure delivery of projects. The top three of these were:

1. The quality of business cases needed improvement;
2. The application of risk management across the lifecycle was weak; and
3. A large number of project governance improvements were required, especially in the early stages of a project (see Figure 1-1).

Figure 1-1: Governance related recommendatons across the lifecycle[3]

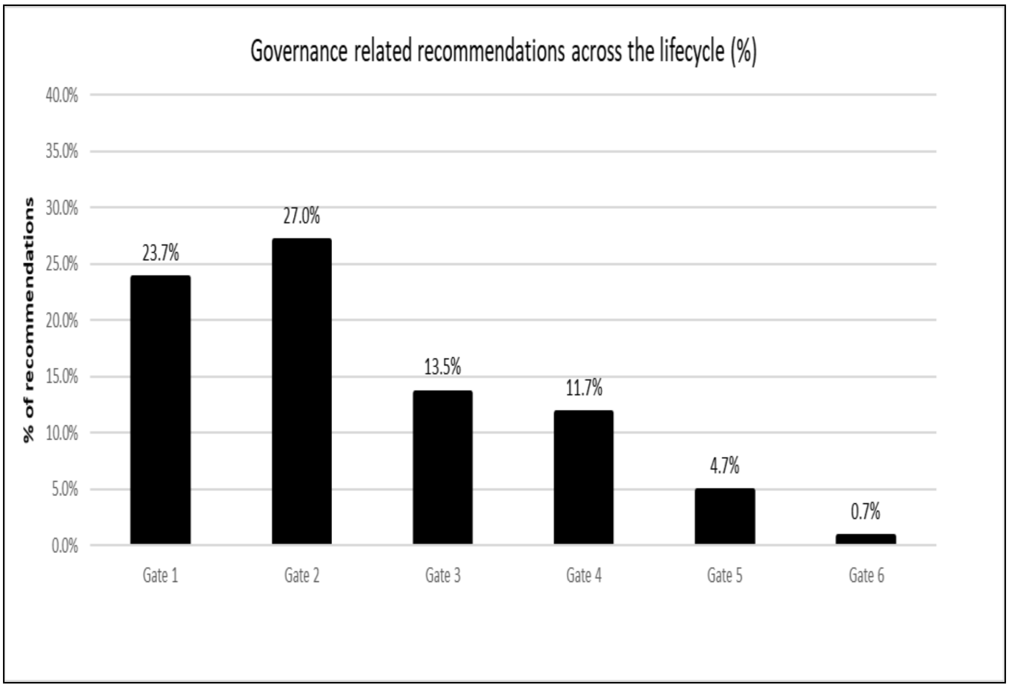


Figure 1-1 shows that 50.7% of all the governance related recommendations made occurred over the first two review gates (Gate 1 - Strategic Alignment, and Gate 2 Business Case),; and that in the very early stages of a project, a significant number of project governance deficiencies were being identified as requiring action. As the data were desensitised, the type of project governance issue or the project it related to was not available; but at a meta-data level, the result reinforced the relevance of project governance being considered, well before the procurement and delivery commences (Gates 3, 4 and 5).

Since 2006 there has been a growing body of research on the topic of project governance shortfalls, as well as industry concerns over project governance failures. Organisations such as Infrastructure Partnerships

[3] Source: Gateway Review Process (2003-2011). The 6 gates are: Gate 1 (Concept and Feasibility), Gate 2 (Business Case), Gate 3 (Readiness for Market), Gate 4 (Tender Decision), Gate 5 (Readiness for Service) and Gate 6 (Benefits Realisation) (DTF, 2019)

Australia (IPA), who represent infrastructure owners and delivery agents, clearly outlined business impacts that megaproject governance failure have been having on organisations:

> *"Business leaders expect short-cycle projects to be delivered on time and on budget and to attain the required functionality. Unfortunately, the cost outcomes for short-cycle capital projects are, on average, 20 percent more expensive than the industry benchmark for the given scope of work, according to IPA's most recent study of over 300 projects delivered by 18 companies. That means for a given portfolio of $US2 billion, the lost opportunity cost is approximately US$400 million. That is enough money to fund another larger project*" (IPA, 2017, p. 6).

1.2 STATEMENT OF THE PROBLEM

Is there an optimal governance arrangement for a megaproject? Too and Weaver (2014) suggest that one of the primary causes of project failure is the systematic failure of organisational governance; while other literature suggests that the lack of operationalisation of governance is a major cause (Müller & Lecoeuvre, 2014). Project failure is traditionally assessed by an inability to deliver according to the project management concepts of time, cost, and quality, and over the longer term, to deliver business benefits. Just as a company uses a board of directors to oversee an organisation's performance, a project board oversees the performance of individual projects. Questions, however, continue to be raised as to why the high rates of project failure continue to occur (Breese et al., 2015).

This research used a case study to investigate a successfully delivered Mega Transport Project (MTP) in order to understand, in great detail, the project governance arrangements and board decision making that occurred. Development of a theory divorced from experience and practice can make it so rarefied as to be largely useless (Benn, Dunphy, & Perrott, 2011, p. 12), and the use of a case provided a detailed understanding of what the project governance's impact was on the project, and whether this had an impact on the project success. This thesis will show that there were multi-dimensional factors and critical decisions that occurred; which is an aspect of project governance that had not previously been widely researched.

Bekker (2014) identifies in his review of the project literature that there are no commonly agreed definitions of project governance or what constitutes project success or failure. There has not been a great deal of research that examines the link between the role of a project board and the success of the project. The strategic key drivers derived from project management are often seen as tactical measures and not strategic (Crawford, 2014) and similarly, there is a shortage of research on the impacts that corporate and project governance have on megaprojects. The word '*governance*' is not new - it has been around longer than the word '*project*'. However, since the turn of the century, its application has been more commonly associated in the literature with failure of megaprojects and project management, rather than as a necessary control to deliver a successful project successful(Lehtonen, 2014; Lundringan, Gil & Puranam 2015; Turner & Xue, 2018).

In considering the impact of a project board on the project's success, it is important to understand what success is, and similarly, to understand whether the project board contributed to achieving that success. It is particularly relevant to understand what the core decisions and actions of the project board were to ensure the success of a megaproject. Along with the relationships, models currently deployed for projects do not seem to adequately control the risks, interfaces and complexities associated with megaprojects. To deliver the outcomes of this research, the following Research Questions (RQ) were developed:

- RQ1 – W*hat is megaproject governance?*
- RQ2 – *What is the impact of governance on a megaproject?*
- RQ3 – *What are the core decisions that are made by a megaproject board?*
- RQ4 – Are *there new models and/or processes that can be used to improve the functions of a megaproject board?*

1.3 RESEARCH AIMS & OBJECTIVES

The research objective of this thesis is to investigate the relationship between governing a megaproject and the success of the megaproject. The literature review will show that many researchers have linked poor project governance and project failure. Academically, the study responds to a challenge set from authoritative project management researchers who have identified that new and novel approaches to project management research are needed to develop more generalised theories around project management, megaprojects and project governance (Drouin et al. 2013). While there is wide acceptance that a project board is responsible for project governance, the literature has focussed on identifying the structural problems of governance and applying theory to understand failure, and has not necessarily investigated what a successful megaproject governance board actually does to be successful.

Another objective of this study was to solve a problem. A problem that I had not been able to find an answer to, when I began asking, '*what can we do to improve the governance of failed projects?'* The body of work presented in this thesis has been as much about providing a practitioner-led response, as about contributing to the knowledge-base on project governance.

New megaproject governance models are tested in Chapter 7 that contribute to improving the important relationship between corporate governance and megaproject governance, and places far more importance on proactively managing risk, rather than the traditional project governance roles of oversight and control. In particular, I was interested in understanding two aspects of what the core decisions made by a megaproject board were, and to understand the impact the board had on a project's success.

1.4 THE SELECTION OF THE CASE STUDY

The case studied was the Regional Rail Link (RRL) project. The RRL project was one of four shortlisted megaprojects that were identified as potential cases to study. Chapter 4 summarises the process of identification and shortlisting projects, however the RRL project was selected as the preferred case as a rich dataset was available, which included full access to all project documentation (some 5,500 documents), including access to the project board members and a desk in the project office.

The $AUD 4.1Billion RRL project was delivered in Victoria, Australia. The project was initiated following a Victorian Government sponsored report by Sir Rod Eddington, '*Investing in Transport, the East West Link Needs Assessment'* (Eddington, 2008), where the report made two recommendations for a Melbourne Metro [rail system] which included:

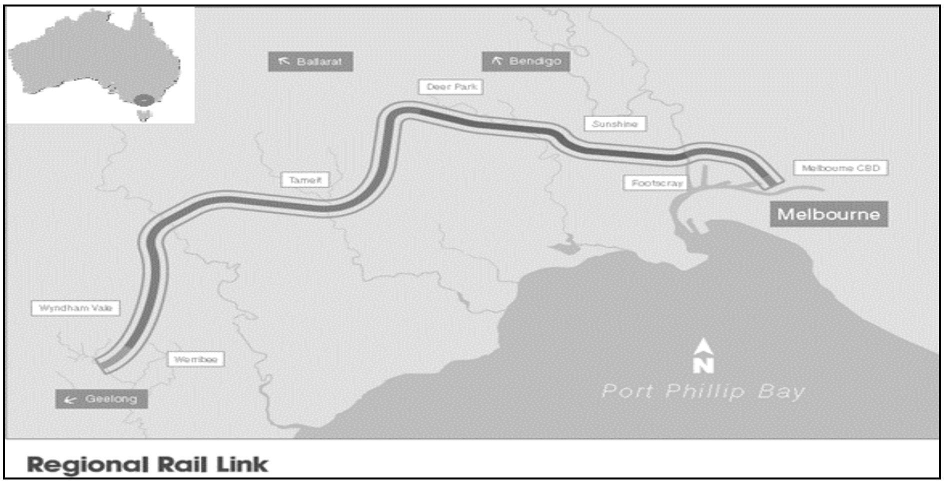
1. the construction of a 17km tunnel from the city's west to the south-eastern suburbs;
2. a new rail connection (the Tarneit link) to improve regional rail service to the city.

The 1st recommendation was announced as a nominated project in 2012, and is expected to be completed in 2026. The 2nd recommendation (the Tarneit link) was renamed the RRL Project and announced as a nominated project in 2008, and is the topic of this research. In total, 90 kilometres of new rail track were laid by the RRL project to connect the largest regional city of Victoria (Geelong) to the centre of Melbourne (Southern Cross Station). Eddington identified that the project would involve separating metropolitan and regional trains, and increase capacity for regional commuters. The indicative cost of the two initiatives was $AUD7.5-8.5Billion (Eddington, 2008), and the Federal Government of Australia contributed $AUD3.2Billion towards delivery of the RRL project, with the remainder funded by the State of Victoria (Mees, 2010). By implementing the Eddington recommendations, the estimated project benefit cost ratio was 1.2 (Meyrick, 2008).

The project was delivered over a seven-year period from 2008 to 2014. The project resulted in the separation of the metropolitan and country networks, creating a new rail corridor in Melbourne's western region, which was and continues to be the largest population growth region in Australia. Figure 1-2identifies the location and alignment of the RRL.

From its inception, the RRL project was recognised as being a complex megaproject (Garner, 2014), on the basis of its cost, scale and complexity of stakeholder interfaces. Unusually for such a large-scale project, the RRL was delivered under budget and ahead of time. In 2014, it was recognised as the Australian Infrastructure Project of the Year, delivering 'a step change for commuters travelling on one of the state's busiest corridors' (IPA, 2014, p. 1).

Figure 1-2: Route alignment of the RRL project (RRLA, 2014a)



1.5 SIGNIFICANCE OF THE STUDY

It has been previously established that project governance is of critical importance to ensure that major projects are delivered successfully (Crawford et al., 2008; Ika, 2009): yet there continues to be examples of projects running over budget and being delivered late. These failures are in part attributed to the complexity in the choice of appropriate governance structures, and the lack of current guidelines, frameworks and principles to consistently ensure that the most appropriate governance structures are selected.

The case in the present study is an example of a megaproject that was widely heralded as a success, and as such, researching the project governance arrangements provided a valuable insight into the project governance function. With a project of this size, there would always be some elements of opposing views (see for example (Nestor, 2011)) regarding the benefits and success, but these were few and far between.

To fully understand project governance and megaprojects, the literature review was separated in to two chapters – the first dedicated to discussing the many aspects of corporate, institutional and project governance, and the second chapter dedicated to specifically addressing megaprojects. While it is recognised that there are a number of elements of overlap and duplication, the approach was used to convey the complexity that is being addressed in the literature, and identify the gaps which this research will address.

This study will show that for a megaproject, a competent board must identify and continually manage risk throughout the entire lifecycle of a megaproject, as it is ever present and ready to materialise as *project failure* if not adequately governed.

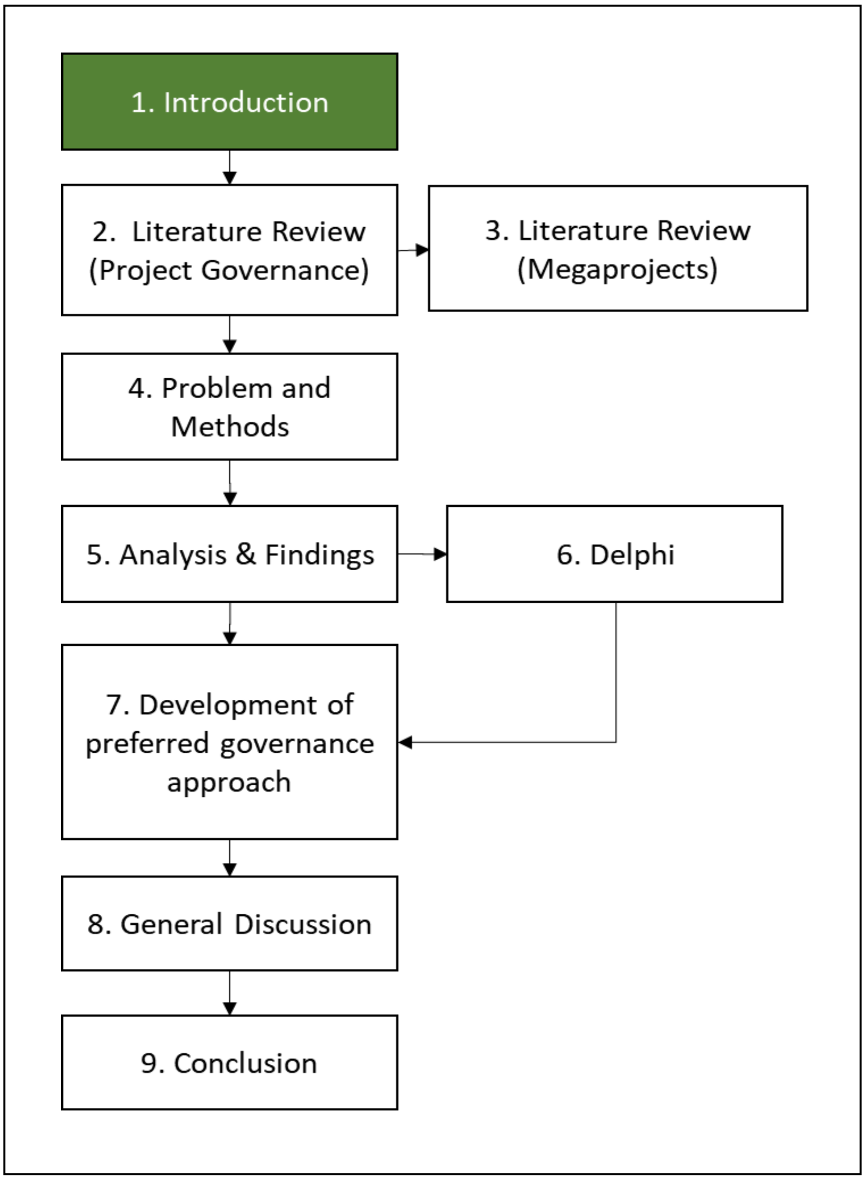
The significance of this study is about delivering results –megaprojects will always need to deliver their expected outcomes within constraints. There are a number of secondary issues of significance too, such as understanding in greater detail how to structure a megaproject board, and the identification of corporate requirements that should be set for a megaproject board to govern megaprojects.

The findings strongly support opportunity to better understand how megaproject governance structures are established, and how they dynamically change over the lifecycle as they respond to changing risk.

1.6 STRUCTURE OF THESIS

This thesis comprises nine chapters and twenty appendices. The relationship between chapters is represented at Figure 1-3, and summarised over-page.

Figure 1-3: Thesis chapters



Chapter 1 provides an introduction and justification for the topic. It outlines the objectives and aims of the thesis, and explains why it is a relevant topic.

Chapter 2 is the literature review, which considers governance, corporate governance, and the origins of project governance and identifies current gaps in the literature for this research to address.

Chapter 3 is an extension to the literature review, with a chapter dedicated to megaprojects. This provides a comprehensive understanding of megaprojects.

Chapter 4 outlines the problem and research methods used in the research to address the aim of the thesis.

Chapter 5 analyses data of the case, and presents the results of the analysis.

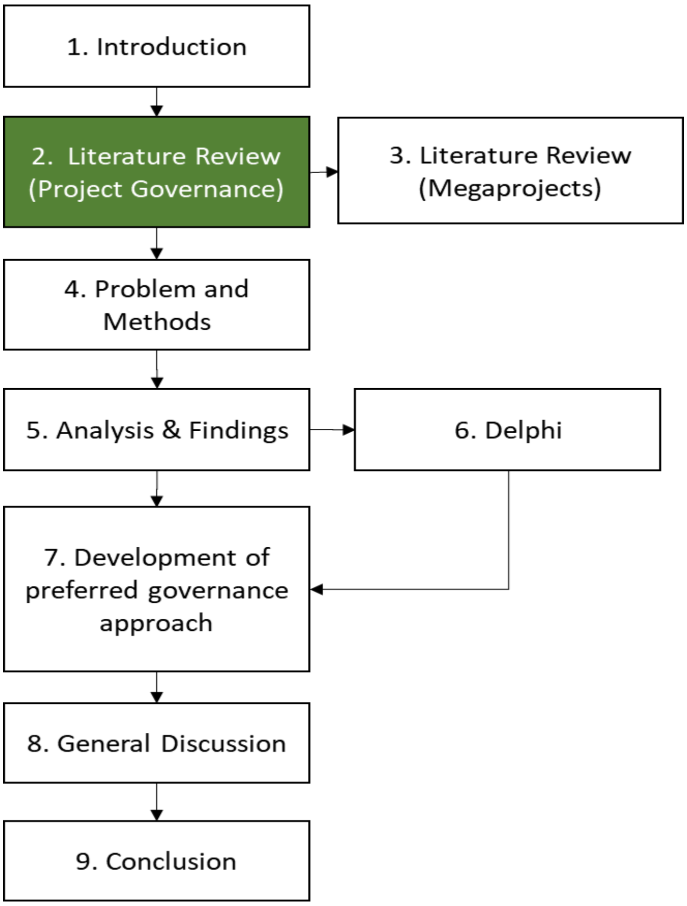
Chapter 6 validates the findings from Chapter 5 through the use of a Delphi validation study.

Chapter 7 presents the development of preferred governance arrangements through the application of three different models.

Chapter 8 is a general discussion that addresses the learnings from the literature review, analysis of the case and the Delphi validation study, and the proposed models.

Chapter 9 concludes by summarising the study, explains how the objectives were achieved and identifies future research opportunities.

Chapter 2 Literature Review



> "A final concern is the tendency among scholars to search for universal associations between board attributes, roles and company performance. This tendency should be replaced by well-crafted studies.........that aim to develop mid-range theories and test their predictions" (Zahra & Pearce II, 1989, p. 327)

2.1 INTRODUCTION

The first chapter provided context for the research and forms the basis of shaping the direction of this chapter. Chapter 2 reviews the literature to provide an outline of the current knowledge base on the subject of governance and project governance. This review identifies the focus of relevant literature by providing an in-depth analysis, focussing of what areas are well developed and what is not well understood. The chapter identifies and explores potential gaps in the literature, which supported and informed the direction of the present research.

The literature review is structured as follows:

- Section 2.2 discusses research priorities in the field of project management
- Section 2.3 introduces the concept of governance
- Section 2.4 addresses project governance, with the notion of a project, and its governance, as a temporary endeavour
- Section 2.5 discusses institutional design and project performance
- Section 2.6 discusses project governance failure
- Section 2.7 concludes, identifying what is known, and what is still unknown in project governance.

In the field of social science research, Neuman (2006) recommends that a good literature review addresses the most important ideas first, followed by logically linking statements and then noting discrepancies in the research. This review links the body of knowledge and confirms the relevance and significance of research. The objectives of this chapter are to understand what is and what is not known, and identify those issues being contemplated in the literature.

The thesis commences by broadly addressing the topic of governance, and then narrows the focus specifically to the topic of project governance. Literature was primarily sourced from project management, business management and economic domains. The literature review explores definitions of governance, through considering the literature derived from both project management practices and from the corporate governance domain. Much of the project management literature has been developed from traditional engineering and project management projects, but across a wide variety of sectors.

While the focus of the present research is on megaprojects, such projects are at a scale and in a league of their own and a separate chapter (Chapter 3) is dedicated to fully exploring megaproject governance literature as an extension of this chapter.

Project failure is a major focus currently associated with project governance. Elements of the literature suggest that one of the primary causes of project failure is the systematic failure of organisational governance (Too & Weaver, 2014, p. 1391), while others suggest that the lack of operationalisation of governance is a major cause (Müller & Lecoeuvre, 2014, p. 1346). Regardless, projects around the world continue to be delivered significantly over budget and late, disappointing shareholders, stakeholders and project participants alike.

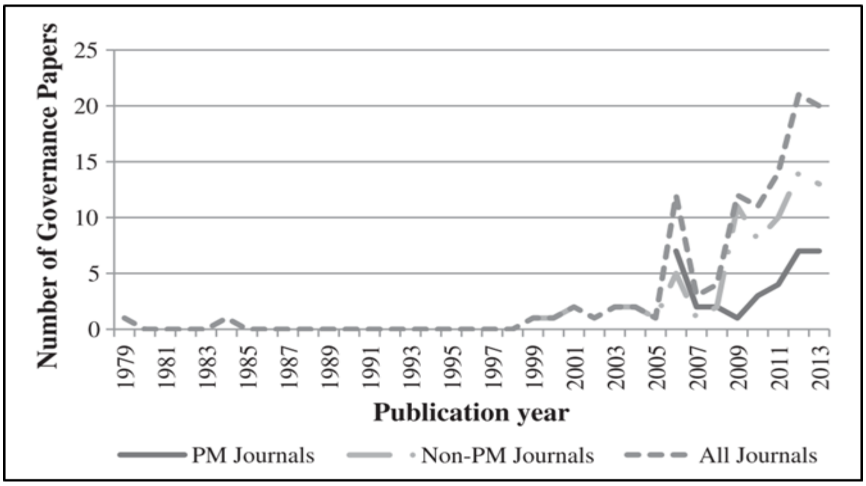
Summers' (2015) analysis of project failure identified that 18-40% of projects, from 1994-2012, reviewed by the Standish Group were classified as 'failed projects'. Project failure is marked by the inability to deliver within time and cost constraints while delivering the expected business benefits; and failures in project governance continues to result in high rates of project failure (Breese, Jenner, Serra, & Thorp, 2015).

It has thus been established that project governance is of critical importance for major projects to be successfully delivered (Crawford et al., 2008; Ika, 2009; Müller, 2009; Müller, 2016), and the relationship between project governance and failed projects was identified as a major problem area across a number of projects, regardless of the industry studied (Müller, Pemsel, & Shao, 2014; Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002; Williams, Klakegg, Magnussen, & Glasspool, 2010). In 2015, an independent report by Shergold (2015) reviewed government processes for implementing large programs and projects. On a word count basis, governance was mentioned 49 times. Of the five recommendations made, the second identified the need to "develop robust and effective governance and accountability arrangements" (Shergold, 2015, p. 5) to improve project governance.

In part, project governance failures have also been attributed to poor planning, poor delivery or the choice of appropriate project governance structures to manage risk. A lack of literature available on project governance structure is further reinforced in the literature by the limited number of guidelines, principles and proven practices available to practitioners. In further compounding to this deficiency, the literature identifies that it is difficult to assure that the most appropriate structures are being selected to successfully deliver organisation's project investments (Cardenas, Voordijk, & Dewulf, 2017, p. 435).

Figure 2-1 shows that, as an emerging field of research, the number of papers in the major Project Management (PM) specific journals (i.e. International Journal of Project Management and Project Management Journal) written on project governance has seen significant growth. It was marked with a spike in frequency of authoritative literature in both 2006 and 2012; but it also reinforces that prior to 2006, the topic had seen little activity. While the topic of projects has been universally used and accepted, project governance is variable, ill-defined and lacks consistent application of theory in practice.

Figure 2-1: Number of papers on project governance (Biesenthal & Wilden, 2014)



While relevant literature overwhelmingly considers 'good governance' as key to project success, Flyvbjerg cautions that while "progress is slow, good governance is gaining a foothold" (Flyvbjerg, 2014b, p. 16) within the projects domain. Müller (2009) identifies project governance as a growth area of interest for research, and his position is that at a corporate level, project governance impacts the behaviour of people. Through the implementation of project governance frameworks, which utilise policies, processes, roles and responsibilities, managers are guided in being able to make decisions and take action (Müller, 2009, p. 2).

In terms of project governance failure, Merrow (2011) found that project failure occurred when the context of a project was not adequately or correctly assessed. In addressing the issue, he identifies that the "ever-present danger in the early days of shaping, is an abundance of optimism" and that "sponsors must establish clear objective criteria in advance" (Merrow, 2011, p. 59). Both the project management and project governance literature identify the importance of early creation of critical success factors; however, the literature is immature in linking this to theory, outlining how this should occur, and more importantly, determining how good governance and project success are later evaluated. As organisational use of projects to deliver specific outcomes continues to rise, the debate about the role of project governance and the impact it has on projects is now a very relevant one.

2.2 RESEARCH IN THE FIELD OF PROJECT MANAGEMENT

Theoretically, projects are used to deliver outcomes efficiently and effectively as a transaction, as a project has unique characteristics and can be separated from other types of operations and construction methods (Lindgren & Packendorff, 2003, p. 4). However, when the transaction does not deliver as expected, outcomes are compromised which may lead to loss of opportunity, and can inhibit the strategic direction of an organisation that was dependent on the successful project outcome.

Project governance research now requires improvement to ensure that project outcomes are more predictable and that efficient project governance practices are used. Clegg (2013) identifies that project management research has not been keeping pace with organisational theory developments. In fact, he indicates that there has been a disconnect between theories and approaches in general, across the applied social sciences domain (Drouin et al., 2013). This, and a general recognition of the misalignment, was identified in the Engineering and Physical Research Council (UK) work on 'Rethinking Project Management' which argued the need for increased critique of project management theory and of developing new practices (Winter, Smith, Morris, & Cicmil, 2006, p. 638).

In particular the Council called for new perspectives from other related disciplines in the social sciences to be applied to project management. To respond to these shortfalls, Winter et al. (2006) developed a framework which summarises and identifies five future directions of project management as an agenda to inform future research in the field.

The five directions are presented under three specific headings addressing:

a. theory about practice (1 direction);

b. theory for practice (3 directions); and

c. theory in practice (2 directions).

The directions recognise the need for a greater focus (of future research) on concepts and theories to provide practitioners with practical concepts aligned with contemporary thinking in order to extend the field beyond its current intellectual foundations (Winter et al., 2006, p. 638). The directions are critically summarised in Table 2-1. The direction formed a solid basis on which to ground the present research, as well as preparing a practical framework for contextualising project management research and positioned the thesis by understanding the impact of project governance in relation to the identified directions.

For the purposes of clarity, the third direction (theory in practice) was adopted, which reflected the researcher's grounding in constructing knowledge by observing what was happening in the case studied. The observations provided a greater understanding of the uniqueness and complexity of the case, and through the use of iterative reflections between theory and data, allowed for new project governance arrangements to be proposed through a new process to support practitioners (see Chapter 7).

2.3 GOVERNANCE – DEFINITIONS, FRAMEWORKS, BOARDS AND MANAGEMENT

> "In general terms, a well-managed organisation must be effective: It must produce the results for which it exists. It must also achieve its results efficiently: it must be administered, that is, its decisions must be made in the right sequence and with the right timing and right intensity. In the long run, well-managed organisations must adapt to its external environment"
>
> Ichak Adizes (1979, p. 3)

This section focusses on grounding the thesis in the main field that the research is related to governance. Four topics are addressed that cover:

1. Definitions of governance
2. Governance and related theory
3. Corporate governance, boards and performance
4. Executive managers and Non-Executive Directors (NED)

Table 2-1: Summary of Project Management Research (from Winter et al, 2006)

Direction heading	**Direction definition**	
	From	**To**
a. Theory about practice – issues in conceptualising projects and project management	Simple lifecycle-based models	New models and theories on the complexity of projects and project management
b. Theory for practice – directions for new concepts and approaches to support practitioners	Projects as linear instrumental processes (as a temporary production process)	Projects as social processes which considers interactions, and the flux of events and human actions, with projects framed as an interaction of agendas, practices, stakeholder relations, politics and power.
	Production creation as the prime focus	Value creation as the prime focus
	Narrow definition of projects (i.e. objective defined, start and end date)	Broader definitions of projects (i.e. multi-disciplinary, multi purposed, not pre-defined)
c. Theory in practice – the actual use of theory in the midst of action	Practitioners as trained technicians who use methods and tools	Practitioners who are reflective, who learn, operate and adapt by using pragmatic theory, experience and their intuition.

2.3.1 Definitions

While there are many attempts to define governance, the term is broad and has a number of deep ranging meanings. The pedigree of the term governance is traced back to several origins, with Müller (2009, p. 1) drawing attention to its Latin heritage term ‘gubernare’, meaning ‘to steer’. While he accepts that it is not a new term, its contemporary meaning is related to the good and transparent management of firms. Torfing (2012, p. 2) defines the term generically as “the process of steering and the economy through collective action”, and recognises that the role of governing society (by government) is hierarchical and new interactions occur through quasi-markets, partnerships and governance networks. In clarify the basic concepts of governance, Treib, Bahr and Faulker (2005) identify that differing understandings of a governance definition depend on whether it is seen as belonging to the realm of politics, polity or policy. They refer to a definition from Benz (2004) as “steering and coordination of interdependent actors based on institutionalised rule systems” (Benz 2004, in Treib et al. 2005, p5).

The field of corporate governance is a mature field of study, and dominates the literature on governance. Policy makers, lawyers and boards of directors are able to skilfully navigate laws, legislations, policy and frameworks used in the field of corporate governance to deliver sustainable and profitable enterprises. The vast literature on corporate governance has many specific topics; but at its core, the corporate governance concept is seen as seeking to regulate the relationship between an organisation, its managers and the shareholders. Due to its wide remit and coverage, corporate governance is defined via multiple and varying dimensions, but it is a concept that is universally accepted and utilised (Baker & Anderson, 2010, p. 5).

There are many classifications that exist to describe it: internal vs external; international or domestic; managerial incentives vs monitoring and oversight considerations; and introduction of new laws and regulations. One of the wisest modern definitions of corporate governance, was given by Sir Adrian Cadbury (2002), who developed the UK government's modern approach to corporate governance:

> "Governance is a word with a pedigree that dates back to Chaucer and in his day the word carried with it the connotation wise and responsible, which is appropriate. It means either the action of governing or the method of governing and it is in the latter sense it is used with reference to companies....a quotation which is worth keeping in mind in this context is: he that sits quietly at the stern and scarce is seen to stir" (Cadbury, 2002, p. 2).

The Cadbury definition also holds applicability to project management, because one of the key issues is the movement of project management toward better governance, which is implicitly linked with the idea that managing a project is something akin to managing a company. Hilb (2016) identifies that, in research as well as in practice, there was an assumption that there are two basic models of corporate governance: the market-based model, and the relationship-based model. In the first, the corporate governance approach focusses on the shareholder and on maximising shareholder value, whereas the relationship model emphasises the interest of stakeholders. A third way, the new corporate governance approach is proposed here by Hilb, which integrates the best of both approaches in order to create additional value.

Corporate governance is implemented through a company board which shapes the vision and mission of a company, selects its CEO, and then works with the executive team to guide the executive in the achievement of corporate goals. In the public sector domain, the hallmark of a parliament's governance is free, frank and open debate (Wilson et al., 2010). The debate on subjects is brought to a parliament by its members to allow a transparent debate on the issues that are important. A company's board operates in a similar manner in order to be effective.

Economic theory has been used to define the way that transactions are managed. Coase (1986) and then Williamson (1996) both identified the minimisation of transaction costs as the explanation for the arrangement of firms and markets in their various combinations. From this, the use of corporate governance drives the way in which organisations are structured. The structures of firms and markets are seen from the governance perspective of a transaction. Frameworks can be used to analyse institutional choice, variables can be used to predict strategies, and predictions can be made that suggest that, "those who do not search for and select alternative rules that can enhance net benefits will lose out to those who are successful in adopting better rules" (Ostrom, 1990, p. 207).

2.3.2 Governance and Related Theory

With less than a razor-sharp definition, Ansell and Torfing (2016) recognise that governance theory can be used to encourage imperfect answers to big questions. They advance four governance propositions highlighting the strength of the field of governance, outlining:

1. the multi-perspective nature of governance;
2. enhancing the classical concepts of power and legitimacy;
3. differing discipline and theory in using the term governance;
4. expanding researchers' range of empirical domains to consider.

In highlighting the breadth of governance domains, Table 2-2 categorises related theories in to governance theories, theoretical concepts and modes of analysis. The three categories demonstrate the depth and breadth of governance theories, concepts and analysis modes, with over 43 of these in total. Ansell and Torfing (2016) recognise that, in the field of social science, the term 'governance' has been "one of the most fashionable and frequently used" (Ansell & Torfing, 2016, p. 2), and noting the increase in its recent usage, they recognise the difficulty in defining the term, as evidenced by the use of a qualifying prefix – such as 'good' governance, 'poor' governance, 'project' governance, and 'economic' governance as an attempt to provide a broader definition.

It is not the intention to identify a preferred definition for governance, but this thesis will consider in detail the specific definitions of project governance, and identify the relationships between both in Section 2.4

2.3.3 Corporate Governance, Boards and Performance

The field of corporate governance has been the dominant field of governance research and has provided the richest source of theory against which to test project governance. Bhagat, Bolton and Romano (2010) describe corporate governance as the "set of processes that provide assurance to outside investors of a fair return on their investment" (Bhagat, Bolton, & Romano, 2010, p. 97). This describes the agency problem, whereby the owners are not the managers who manage and control the operation of the organisation. In this circumstance, corporate law or policy is used to mitigate this problem by providing managers with a framework to ensure that managers are incentivised and act in the shareholders' interests. Bhagat et al. identify the key elements of the corporate governance system: the Board (of Directors); Shareholder Franchise and Block Ownership (meetings and voting), and Executive Compensation, as to link corporate governance and performance for governance systems to be effective.

Table 2-2: Governance theories, concepts and modes of analysis (adapted from Ansell & Torfing, 2016)

Theories of governance	**Basic theoretical concepts**	**Theoretical modes of analysis**
Collective action Organisational theory Public Management theory Planning theory State theory Democratic theory Public law and regulatory theory International relations theory	Heterarchy Network Public participation Deliberation Power Legitimacy Accountability Transparency Accountability Learning Innovation Risk Steering Soft and hard governing tools	Information based governance theory Discourse theory Institutional theory Public choice theory Economic theory Governmentality Complexity theory and systems analysis Narrative and interpretive theory Pragmatism Normative theory Forms of governance Democratic network governance Regulatory Network Collaborative Private Urban and regional Multi-level EU and supranational governance Meta-governance Adaptive / Grounded theory

.

The Australian Stock Exchange (ASX) guidelines on corporate governance are regarded as amongst the world's best practice, with 8 governance principles (ASX, 2014) presented in Table 2-3 which guide corporate governance practitioners in executing their duties, provided here as an overview of corporate governance priorities. The role of the board and its relationship to performance of the company is an area of research that has inconclusive findings (Dahya, Golubov, Petmezas, & Travlos, 2016). Glinkowska and Kaczmarek (2015) identify that the traditional role of the board (a "supervisory board") is to constantly supervise the activities of a company with the two main aspects of this being the instituting function and a supervisory function. For these to be achieved, there are three bodies involved: general meetings of shareholders ('company owners'), the supervisory board ('board of directors') and the management board ('the executive'). Glinkowska and Kaczmarek (2015) describe a number of studies that have indicated that focussing on individual governance mechanisms has not identified any strong correlation between governance and performance. Core areas considered included: voting rights (and board performance), director independence, ownership, relational investing (long term), executive compensation, and performance and ownership.

This conclusion from the literature suggests that better governance is related to various measures of performance (such as using governance indexes, stock ownership of board members, CEO-chair separation) and that while there is a strong empirical argument for dollar-based ownership levels of board members as good measures of the quality of corporate governance (Bhagat et al., 2010). Most interesting however, as a final note on performance of effective governance, are the actions that are taken by a governance body especially in one specific scenario: the actions taken by a governance arrangement after poor company performance and whether management is replaced or retained is a strong indication of governance effectiveness.

Table 2-3: Corporate Governance principles (ASX, 2014)

	Principle
1.	Lay solid foundations for management and oversight
2.	Structure the board to add value
3.	Promote ethical and responsible decision-making.
4.	Safeguard integrity in financial reporting
5.	Make timely and balanced disclosure
6.	Respect the rights of security holders
7.	Recognise and manage risk
8.	Remunerate fairly

2.3.4 Executive Managers and Non-Executive Directors

Another rich area of literature relating to company corporate governance performance is that of board composition. Dherment-Ferere and Renneboog (2010, p. 351) identify that the primary role for a board is supervision. Their position is that the role of a Non-Executive Director (NED[4]) has stronger incentives in board supervision because of their fiduciary duties (legal) and reputation building (as decision control experts). They suggest that improved monitoring also occurs when the roles of CEO and non-executive chair are separated, as the non-executive chair is more able to safeguard greater independence from management. While the structure of specific roles provides sound context, the board's governance is represented through two theoretical perspectives: agency theory and stewardship theory (Glinkowska & Kaczmarek, 2015).

When exploring the meta-analysis of board composition and financial performance, Dalton et al. (1998) were unable to find any substantiative relationship between the variables of organisation size, performance indictors and the operationalisation of board composition. The study sampled over 32,000 large firms; and the findings continue to be subject to continued major debate, and are a concern for the present research. Dalton et al.'s research demonstrates that the two leading theories in governance, stewardship and agency theory, were not supported either way. This leads to their conclusion that any "further research in the general areas of board composition/financial performance and board leadership structure/financial performance"

[4] *Referred to in the USA as a Director*

would not result in any great breakthroughs (Dalton et al., 1998, p. 284). They suggest that board composition and structures are common targets for reform agendas in governance; however, the results provide little guidance on the benefit of one governance structure over another. As a result, the call for the use of multiple theories to evaluate performance, which may draw out the subtleties of relationships between composition, structures and performance, was made.

Agency theory, in this setting is related to the field of economics, whereby rational individuals further their own interests. Stewardship theory on the other hand, is applied in organisational psychology and sociology, where the motivating factor for managers is getting satisfaction from a job well done. A third dominating theory of corporate governance and board performance is that of the stakeholder theory. Nordberg (2010, p. 180) traces this theory back to Freeman (1984), and suggests that corporate governance theory, which contrasted the two traditional roles of the board, those of control and of delivering value, now has a third strand whereby suppliers, customers and employees also contribute to success. Nordberg suggests that, by using the term ‘stakeholder’, managers (and researchers) come to see these groups as having a ‘stake’; and the needs of the stakeholder compete in relation to costs and concepts relating to a ‘model person’ (Glinkowska & Kaczmarek, 2015, p. 88).

2.4 PROJECT GOVERNANCE CONCEPTS

The body of work surrounding project governance has had its genesis in corporate governance, and was influenced by the principles of corporate governance, as exemplified by Clarke (2004), Benn and Dunphy (2007) and Cadbury (2002). Corporate governance has received significant attention from the business and finance community with the evolution of corporate governance regulation that has demonstrated that poor governance can have a direct impact on corporate failures. The subject of project governance has been shown to be gaining more interest relating to project management, and more broadly the application of research considering project success and failure, with Crawford (2014) arguing the need for balancing strategy and delivery, Joslin and Müller (2016b) using theory to evaluate project governance and success, and Flyvbjerg and Kao (2014) using reference class forecasting to advise project owners on how to avoid cost overruns.

Project governance has been sighted as an area that requires improvement, and may be one of the key topics in ensuring that project success does occur. Researchers have endeavoured to define project governance to gain a better understanding of the subject, with Bekker and Steyn (Bekker & Steyn, 2009) identifying the need for a definition of project governance, especially for large capital projects. Yaling and Yilin (2010) state that the effect of project governance on a project still needs to be confirmed; while Samset, Berg and Klakegg (2006a) agree, at the time of their writing, that project governance has only recently become a topic of importance in the project management community. They argue that project governance belongs to the research paradigm of the institution, quite separate from project management, with the latter being an operationally focussed area. Their research further suggests that project governance is a rather new concept (having been developed in the 1990s) and that researchers have not yet reached agreement; and yet there is still no definitive study that links success of a project to the performance of the board (Pelham & Duffield, 2013).

Identification of the theories built upon earlier work on governance theory which demonstrated that the policy science research in to governance considered both the body and the regulator, through the two main components of governance theory, the Actors and the Institutions (Müller, 2009). He outlines three forces that directly impact and determine the quality of project management, and which form the basis of a project governance framework for project management, focussing on: 1) education (of project managers), 2) management demands, and 3) economic pressure.

In research undertaken at the Concept Research Program[5], Klakegg et al. (2008) investigated governance frameworks, finding corporate governance to be the most common governance field, and used a quote by (O'Sullivan, 2003) as "a system [that] shapes who makes investment decisions in corporations, what types of investments they make, and how returns from investments are distributed" (Klakegg et al., 2008, p. 28). Their research focussed on the use of [project] governance frameworks as an important tool for clarifying the role of a 'project sponsor' (or senior responsible owner). Miller and Hobbs (2005) frame the use of a governance framework for projects with a need for scale and context to be applied stating that:

> "A specific governance regime must adapt to the particular project and its context. The approach taken is, therefore, not the design of a governance regime but rather the identification of design criteria that should be brought to bear when developing a governance regime for a megaproject. Several of the criteria contrast to the traditional conception in that governance is a static, binary, hierarchical process. Governance regimes for megaprojects are time-dependent and self-organising. They involve a network of actors in a process through which the project concept, the sponsoring coalition, and the institutional framework co-evolve" (Miller & Hobbs, 2005, p. 9).

Klakegg et al.'s (2008, p. 529) position is thus to accept "the general form of a governance framework applicable to any project" and that it "should be flexible enough to fit projects of all types, size, and complexities". Thus, while there is no one universally accepted definition of project governance (Bekker, 2014), it is recognised that there is a maturing body of research that provides adequate definitions specifically on the topic of project governance, and that there are a number of variations or spin-off definitions from the core 'project governance' theme.

[5] Norwegian University of Science and Technology. The Concept programme is financed by the Norwegian Ministry of Finance, and was established in 2002 to develop knowledge and expertise to ensure efficient use of resources and enhance the benefits of major public investments. See www.ntnu.edu/web/concept/concept

2.4.1 A Definition of Project Governance

A disparate range of project governance definitions reinforces the emerging status of this body of research. This is supported by Too and Weaver (2014) who have a view that there are generally held misconceptions of governance being focussed only on due-process and control. The following three definitions for project governance, as summarised in Table 2-4 have been selected for the purposes of establishing a suitable definition.

Table 2-4: Leading accepted definitions of project governance

Author	Project Governance Definition
Klakegg et al. (2008)	The use of institutions, structures of authority, and even collaboration, to allocate resources and coordinate or control activity in society or the economy.
Bekker and Steyn (2009)	A set of management systems, rules, protocols, relationships and structures that provide the framework within which decisions are made for project development and implementation, to achieve the intended business or strategic motivation.
Müller (2009)	Comprises the value system, responsibilities, processes and policies that allow projects to achieve organisational objectives and foster implementation that is in the best interests of all the stakeholders, internal and external, and the corporation itself.

The third definition by Müller also expands the concept not just of project governance but also the governance of programs and portfolios. This definition suggests a new dimension of project governance that addresses not just individual projects but collections of projects, either interrelated or separated in some way. This approach challenges current practices within organisations that use projects to deliver outcomes, where there is competition for limited resources. The introduction of and focus on programs and portfolios, as an umbrella for a collection of projects focuses on doing the right projects and doing projects right.

For the purposes of the present research, the third definition (by Müller) has been adopted as a universally understandable and succinct definition of project governance that has stood the test of time over the course of this research.

In providing authoritative guidance on improving project governance, Müller (2016) identifies that project governance theories have been heavily influenced by traditional corporate governance approaches. Amongst popular corporate governance theories, Müller describes two organisational theories (shareholder and stakeholder theory), and three behavioural theories (agency theory, stewardship theory and transaction cost economics) as theories used in project governance contexts (Müller, 2016, p. 28). While other prominent definitions have been proposed, the Müller definition addresses all relevant inputs (processes), and system and stakeholders issues, with a link to the higher-level governance of the organisation. The definition is, however, silent on the temporary nature of the governance arrangement and it is suggested here that this omission was warranted for several reasons. Organisations that use projects routinely may have ongoing processes for governance and project control which are consistently used. While an individual project's specific governance arrangement may have different actors and deliverables, arrangements are in all likelihood, the outcome of a standard process and are structurally similar.

2.4.2 Corporate Governance and Project Governance

Consolidating what is emerging as best practice governance, and identifying what enhancements could still be made, provides an opportunity for understanding the development of project governance. The current level of research and thinking on project governance focusses on several specific key areas. The first is defining the term, project governance. The second investigates and identifies various structural aspects, generally through investigations on a series of projects that have experienced governance failures. The third proposes new governance structures or improvements to be used on future governance structures. There is a gap in applying new proposed structures for current or future projects. This topic is relatively un-explored in terms of active use of new governance structures, and this is for a valid reason: in simple terms, applying new and untested frameworks on major projects is very difficult, both to implement and to observe whether there was an improvement in project performance.

Governance has been either defined too narrowly or broadly considered, allowing for a number of contextual interpretations, and therefore opinions. The interesting proposition of sustainable and ongoing governance is that of viability through the lens of a project governance arrangement. A project board is a special purpose management vehicle set up to deliver the project, and once this has been achieved, the governance arrangements are terminated once the purpose of the megaproject board has been achieved. This in effect is opposite to the belief that all management systems remain viable when adequately designed and monitored (i.e. they are sustainable).

As mentioned earlier in the introduction and in the definitions (Section 2.3.1), in many ways, a project can be considered as transaction, whereby a product is delivered for an expected cost and defined timeframe to a client. Many theories have been used to define projects; however, there is a lack of a core theory. This suggests that new theory and practice may be a valuable avenue to challenge current perceptions and interpretation of 'a project' and its 'governance'. Economic theory has been used to describe the way that transactions are managed. Coase (1986) and then Williamson (1996) identified the minimisation of transaction costs as the explanation for the arrangement of firms and markets in their various combinations. The structures of firms and markets derive from the governance perspective of the fundamental unit – the transaction. Through the use of frameworks to analyse institutional choice, variables can be used to predict strategies; and furthermore, prediction can be made on who will be more successful (Ostrom, 1990).

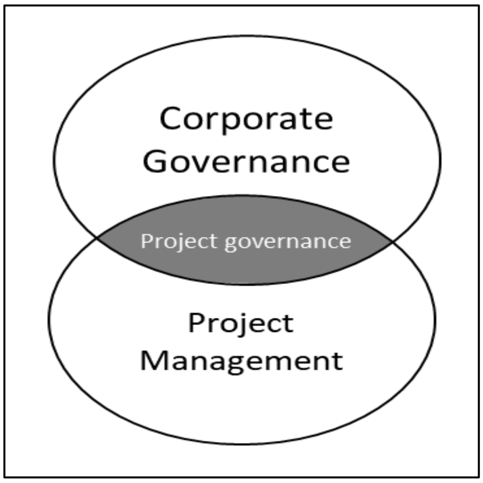
In the context of megaproject failure, the sheer financial impact of the failure can have a much wider consequence than just for the project. Due to the financial impacts alone, many countries have been required to implement governance controls to better understand and articulate project governance risk. Examples include the USA's Sarbanes-Oxley disclosure for internal project control risks (Dinsmore & Rocha, 2012) and governance guidance for Arm's Length Bodies (ALBs) in Northern Ireland (Ireland, 2007). Much of the new focus on governance is primarily on governments in liberal democracies, who recognise that governance has been "too formalistic, narrow minded, exclusive, inflexible, uncoordinated, undemocratic, and most importantly, out of step with reality" (Ansell & Torfing, 2016, p. 4).

From a legal perspective, a contract is a form of governance through a transaction. Macneil (1974) showed quite effectively that it is impossible to draft a complete contract about a transaction because of the nature and environment in which transactions occur. Macneil and Ostrom et al. (1999) have both supported the view that it is necessary to develop a climate of cooperation and flexibility to resolve the almost inevitable conflicts that will arise about a transaction. Williamson (1996) further considers that economics and the organisation are the main reasons for the economic organisation's development, in order to economise on the transaction costs; and this action lies in the details of the transaction and the mechanism of governance used.

Project governance could be viewed as the intersection of project management and corporate governance, which considers both corporate and project related theory, as illustrated in Figure 2-2 from Wilson et al. (2010). In this figure the cross-over also indicates a potential duplication or blurring between roles, functions and responsibilities of corporate and project governance.

Wilson et al. (2010) indicate that project governance has drawn upon concepts and theory from the domains of both the project management and corporate governance disciplines for its knowledge base. Corporate governance has been used in corporations because the owners of businesses (the shareholders) are not the people who manage the business. This structure is important because it provides the controls to ensure that managers are accountable and behave in a way that protects, respects and advances the wealth of the owners. In modern corporations, ownership (shareholders) and management are separated. Increasingly concerned at the financial mis-management of corporations by managers, governments' have enacted legislation and regulations that require good governance procedures and controls to be mandatory.

Figure 2-2: Project Governance as an intersection of two knowledge domains



2.4.3 Project Governance Theory

The literature demonstrates that, while there has been an increasing number of insights into governance arrangements of projects, this number remains relatively small. While many of the recommendations within the literature provide structural improvements or orientations, most are taken from an external view of the projects, the outside-looking-in perspective, and make suggested changes and improvements on this basis. This orientation is reinforced by Chang (2013) in his case review of a major privately financed UK transport project that required significant restructuring. While the issues considered in the case could be empirically explained by theory and modelling “without looking into this opaque box”, he identifies that essential aspects of the problems may not have been addressed, as access to such information is difficult, primarily due to commercial confidentiality (Chang, 2013, p. 629). While it is not the intention to describe all theory associated with project governance, Table 2-5 provides an overview of the dominant theory domains and examples. It is apparent from this table that the primary domain is corporate governance, but that specific project governance theories are emerging and gaining relevant traction.

As argued previously the literature has multiple perspectives, developments and localised practices. While project management research has surged, project management theory has been criticised for being overly rationalist and providing ineffective constructs in industry (Lindgren & Packendorff, 2003, p. 3). Padalkar and Gopinath (2016) identify theory weaknesses in two main areas: 1) underlying success or failure factors, and 2) weak theoretical foundations of the discipline.

Various theories are emerging that help to define, explain and establish principles and guidelines of project governance in practice, with Bekker (2015) identifying that Bevir (2011) and Sorensen and Torfing (2006) noted the more popular theories, including “principal-agent, transaction cost, rational choice, interpretive, organisation, institutional, system, meta-governance, state-society relationships and development theories” (Bekker, 2015, p. 36). Although these theories contribute to the understanding and definition of project governance principles, Bekker identified that two theories have been identified as key to further developing project governance theory (principle agent/transaction cost theory, and rational choice theory).

Turner et al. (2010) identifies nine schools of thought on project management in order to categorise and refine the perspectives being researched[6]. Based on this work, Drouin et al. (2013) observe that project management research uses different combinations of qualitative, quantitative and conceptual studies to identfy the dominant theories in the field.

In terms of project success, Juli (2011) focusses on the importance of project leadership as having five key project leadership principles. These principles focus on building a vision, nurturing collaboration, promoting performance, cultivating learning and ensuring results.

[6] The nine schools are: Optimisation, Modelling, Governance, Behavioural, Process, Contingency, Success, Decision and Marketing (Turner et al., 2010, p.8)

Table 2-5: Dominant theory shaping projects and project governance

Domain	Dominant Theory	Examples from the Project Management Literature
Corporate Governance	Transaction Cost Economics	Williamson (2002)
	Shareholder/Stakeholder/ Agency / Resource dependency	Müller (2009), Clarke (2014), Hilb (2016), Pirson and Turnbull (2011), Tsaturyan (2014), Littau et al. (2010)
	Actor / Network	Latour (2005), Johnson et al. (2016)
	Rational Choice	Jensen (2010)
	Recursive System	Beer (1979)
	Stewardship	Hilb (2016), Pirson and Turnbull (2011), Müller (2009), Joslin and Müller (2016b)
	Resource	Hilb (2016)
	Organisational	Quinn and Cameron (1983), Williamson (2002)
	Lifecycle	Lynall (2003)
	Multiple or blended theories (Agency, Stewardship, Corporate, Transaction Cost economics, Principle/ Agent, Rational Choice)	Joslin and Müller (2016b), Nordberg (2010), Pirson and Turnbull (2011)
Project/ Project Management	General Project management / Meta-organisation	Lundrigan et al. (2015)
	Lifecycle	Smith (1985), Quinn and Cameron (1983), Katina (2015)
	Systems	Saynisch (2010),
	Complexity	Cicmil et al. (2009)
Other / Management	Hirschman's hiding hand	Flyvjberg (2014b)
	Commons	Ostrom (1990)
	Cybernetics	Beer (1970, 1985), Lent (2013)

This perspective provides a focus on the human and personal perspective on project success, compared to focussing on governance structures and process driven approaches proposed to achieve project success. Pelham and Duffield (2013) suggest that selection of the appropriate governance structure requires consideration of desired project outcomes (time, cost and quality), organisational requirements (resource constraints, managerial and corporate incentives), and an understanding of the interrelated priorities of the organisation. In particular, there is a need for understanding what expectations and outcomes are being sought from the project governance arrangement. Morris, Pinto, and Söderlund (2011) reinforce this through stressing the important need for a new paradigm for viewing projects as an organisation in project management studies, and that such a new research paradigm should be the principal focus of studies in project management.

As a result, project governance research is now exploring the broader corporate requirements, not just of 'the project' but also the inputs for project governance arrangements across the lifecycle. This approach identifies four governance drivers: resource availability; understanding the objectives (of the project); the autonomy and control of the project governance; and the outcomes required and that influence the project governance on delivering the outcome.

While these drivers are most relevant at the commencement of the project governance arrangement, this does introduce the corporate governance consideration of longer-term sustainability post the project governance being completed.

One of the difficulties in investigating project governance success factors, however, is that, "in spite of extensive research…., there has been a limited convergence, let alone agreement on the ingredients and causes of project success" (Shenhar et al., 2002, p. 111). While the 'ingredients and causes' are not necessarily the ultimate solution to a project governance arrangement being delivered, the criteria used to assess the project success are specifically highlighted as an emerging topic.

2.4.4 Project Governance Assurance

One of the most popular project assurance review processes is the Gateway Review Process (Williams et al., 2010), referred to in Figure 1.1, where project governance was identified as a deficient area for high value projects. This process originated in the United Kingdom, and is a method used for critical decision support and project performance improvement. It is a systematic, independent, peer review process which reviews a major project at critical stages in its lifecycle (Ming, 2010, p. 52). From a project governance perspective, the Gateway Review Process guidance identifies three areas of importance for project governance, especially at the inception stage, which are summarised in Table 2-6.

The guidance demonstrates that project governance assurance considerations expect there to be commitment from the organisation to ensure that the roles and responsibilities are clearly assigned. In relation to risk, the guidance identifies risk as the most important project management issue; and assurance activities should consider how risk and issues are brought to the attention of senior management. Proactive management of risk, especially for megaprojects is highlighted as a major issue in the literature by a number of authors, such as Greiman (2013) in '*Megaproject management : lessons on risk and project management from the Big Dig*', and Flyvbjerg (2014a) in '*Megaprojects and Planning – Essential Reading*'.

2.4.5 Project Governance Principles and Practices

> "Although progress is slow, good governance is gaining a foothold, even in megaproject management" (Flyvbjerg, 2014b, p. 15)

In the literature the term governance is understood to be vast, having multiple applications, which thus does not present razor-sharp and tidy definitions due to the multiple perspectives being studied. Biesenthal and Wilden (2014) identify that, at the most basic level, project governance aligns objectives with organisational strategy, achieves set project objectives, and monitors performance.

Table 2-6: Project Governance: areas to probe (Finance, 2012, p. 36)

Area to probe	Evidence expected
1. Is the governance framework fit for purpose, and in particular, is there a commitment to key roles and responsibilities for this project within current corporate priorities?	Evidence of commitment from sponsors (e.g. senior management, key partners and Ministers), a willingness to take ownership, and a clear understanding of their roles in achieving successful outcomes. Key roles are identified and assigned (i.e. responsible Minister, Senior Responsible Owner, Project Director, Project Manager, Business Change Manager (or equivalent role) and sub-program managers with named individuals given responsibility for the transition to new ways of working.
2. Does the project, program or policy require new governance arrangements e.g. – cross portfolios?	For cross-portfolio projects, programs or policy, evidence that all parties involved know how they are engaged in the project and are committed to its delivery; clear governance arrangements to ensure sustainable alignment within the business objectives of all organisations involved
3. Is there a framework for managing issues and risk to this project?	Define roles, responsibilities and processes for managing issues and risk across the project, with clearly defined routes for bringing issues and risks to the attention of senior management.

This perspective is merely one such construct for project governance, which they too recognise by suggesting that much of the academic and practitioner focus has been on project management rather than on "how to best govern projects" to better understand the management and governance of projects (Biesenthal & Wilden, 2014, p. 1291). Merrow (2011) argues that megaprojects require more technical expertise than smaller projects; however, the more intimately the business is involved in decision making on megaprojects the more likely the decisions will be unsound from the project management point-of-view (Merrow, 2011, p. 134). These competing views provide a good starting point from which to discuss the intersection of corporate governance with that of the megaproject governance.

The research by Klakegg et al. (2008) that was described earlier focused on the use of (project) governance frameworks to clarify the role of the project sponsor; which is an integral ingredient of a project governance framework. The use of a project governance framework, as a necessary management instrument is also argued by Miller and Hobbs (2005), who identify the need for scale and context to be applied. In 2013, a study of project sponsors identified, however, that nearly 70% of organisations did not understand the differences and linkages between corporate governance and project governance (Caravel, 2013). That study reinforced that there are six significant deficiencies in the project governance areas of:

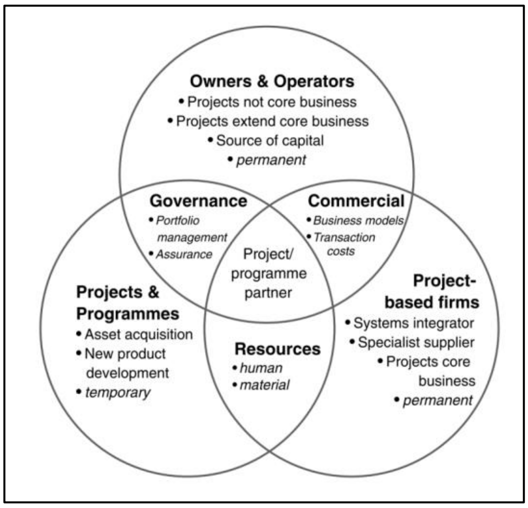
1. accountability,
2. capability,
3. behaviours,
4. complexity,
5. skills,
6. performance.

The 2013 Caravel report furthermore argues that project governance doesn't support the effective execution of projects, and that there is a strong argument that project failure has its root cause in inadequate project governance. Due to limitations already identified, this thesis identifies current practices used by project practitioners in order to govern projects.

Project governance research has addressed key areas of definition (of the term 'project governance'); identifying different structural aspects of governance (through investigating projects); and proposing new governance structures. A limitation is that there is little or no testing of whether these new governance models are actually effective in improving the performance of a project. This topic is largely unexplored; and for a valid reason: applying new and untested frameworks on megaprojects is both difficult to implement and to observe the effect. As the present research relates to megaprojects, reference to these project types will occur; however, as reinforced previously, the literature is limited on this.

Winch (2014) considers the governance concept of project organising of temporary projects, and uses three principle organisational types to describe them: the project and program; the owner/operator; and the project-based firms. The relationships and interfaces are described in a Venn diagram (Figure 2-3) where the owner provides the financing for the project, the project firms provide the resources to deliver the project, and the project management framework is used to deliver the output. Winch identifies a further three interfaces, of commercial (management), (project) governance and resources (management); which are referred to as "some of the most interesting and currently challenging areas of research in project organising" (Winch, 2014, p. 725), and are sources of project risk. These three interfaces also highlight some of the challenges that megaproject boards face, when balancing all their requirements, and attempting to define project success across each of the three domains plus also managing expectations across the additional interfaces.

Figure 2-3: Domains of Project Organising (Winch, 2014)



Project governance practices have primarily derived from theories in the field of corporate governance and from practices of project management. Project management industry body associations, standards institutions and practitioners, have created guidance, developed techniques, and used case studies to improve practices. Governance research has begun to add prefixes or adjectives to 'governance' to apply the concept to specific domains, such as economic-governance, network-governance, project-governance and megaproject-governance. Ansell and Toufing (2016) identify that although the governance field is diverse, there are the beginnings of convergences on new modes of governing. Such views more or less are describing the institutionalisation processes. In classical social science, concepts of power, legitimacy and accountability were used to build governance theories. The convergence from multiple fields has led to new boundaries being explored between such theoretical perspectives.

Within the field of project management there has been a focus on the use of projects as a management mechanism; and more broadly, there has been focus not just on 'a project' but on the relationship between projects, programs and portfolios. Adopting broader perspective and using theory from related fields is resulting in the development of new practices and techniques; but for those governance practitioners who work on megaprojects, the prevailing methodology to guide governance has been the PRINCE2[7] methodology (Murray, Bennett, & Bentley, 2009), whereby a project board is assigned responsibility for overall project governance. This methodology identifies the role of a project board as being:

> "…responsible to corporate or programme management for the overall direction or management of the project" (Murray et al., 2009, p. 365).

Fundamentally, the PRINCE2 methodology identifies three roles in project governance: the project executive, the senior user, and the senior supplier. These roles, in turn have a project manager to run the project on a day-to-day basis. Unfortunately, for megaproject governance guidance outside of generic

[7] PRojects IN a Controlled Environment, Version 2

mainstream guidance, there is little in the literature. While PRINCE2 identifies some specific governance responsibilities, it is a general methodology and needs tailoring for each specific project. As a result, there has been a growing realisation of the need for a body of research on the topic of both project governance and megaproject governance emerged to address such gaps.

2.4.5.1 Governance principles in a project environment

Four sets of project governance principles will be identified, discussed and compared in this section. The comparison will be used to further demonstrate the high level of overlap between corporate and project governance.

The first set of principle is by Garland (2009), who suggests that the fundamental mistake made by organisations in establishing project governance structures is in not understanding project ownership. This is reinforced with his view that ownership should not be a project management function, but that a project governance framework should be used to addressed by fulfilling one primary objective: to enable efficient and effective project decision making (Garland, 2009, p. 8). To deliver on this objective, Garland outlines four principles to ensure effective project governance:

1. Single point of accountability

1. Service delivery ownership determines project ownership
2. Separation of project decision making and stakeholder management and
3. Separation of organisational governance and project governance

In a similar view, the Association of Project Management, which represents the United Kingdom's project management industry, developed a set of eleven principles of project governance in 2004, which, according to the guideline, "help avoid common causes of programme and project failure" (APM, 2004, p. 5). In 2011, the principles were updated to introduce three new principles, and clarify two of the original principles. The original principles are presented in Table 2-7 and a comparison between the 2004 and 2011 principles is presented in Appendix A. Strong comparisons of the project management principles are drawn to those better practice guidelines used within the corporate governance domain. As described earlier, the Cadbury Report from 1992 was considered a significant milestone in strengthening "the unitary board system and increase its effectiveness, not replacing it" (Cadbury, 1992), and continues to be widely referenced in corporate governance literature, even some 27 years after it was first published (see for example Hilb (2016)).

Bekker's (2015) in-depth review of the project governance literature confirms that conceptualisation has been driven from a bottom-up project management view, with authors attempting to thus construct a project governance perspective. Due to the wide range of projects, stakeholders and complexity, it is identified that the bottom-up approach has had limitations around providing "concise guidance to leaders, when exercising and enforcing project governance" (Bekker, 2015, p. 33). Principles are used to set out recommended industry practices that are likely to achieve good outcomes for the relevant industry, which are usually based on industry expert experience (ASX, 2014). Principles can be based on theory or management concepts, or on practical experience (Juli, 2011). Project management organisations around the world have developed principles to assist projects, as has the literature proposing similar principles to do the same.

Table 2-7: Project Governance Principles (APM, 2004)

#	Project Governance Principle
1.	The board has overall responsibility for governance of project management.
2.	The roles, responsibilities and performance criteria for the governance of project management are clearly defined.
3.	Disciplined governance arrangements, supported by appropriate methods and controls are applied throughout the project life cycle.
4.	A coherent and supportive relationship is demonstrated between the overall business strategy and the project portfolio.
5.	All projects have an approved plan containing authorisation points at which the business case is reviewed and approved. Decisions made at authorisation points are recorded and communicated.
6.	Members of delegated authorisation bodies have sufficient representation, competence, authority and resources to enable them to make appropriate decisions.
7.	The project business case is supported by relevant and realistic information that provides a reliable basis for making authorisation decisions.
8.	The board or its delegated agents decide when independent scrutiny of projects and project management systems is required, and implement such scrutiny accordingly.
9.	There are clearly defined criteria for reporting project status and for the escalation of risks and issues to the levels required by the organisation.
10.	The organisation fosters a culture of improvement and of frank internal disclosure of project information.
11.	Project stakeholders are engaged at a level that is commensurate with their importance to the organisation and in a manner that fosters trust.

Garland's (2009) four principles of effective project governance (Section 2.4.5.1) demonstrate the importance of the separation of project governance responsibilities during the initial set-up stage of a project. Bekker (2015) provides guidance to project leaders to apply project governance principles in their projects. His approach superimposes the six OECD corporate governance principles onto the domain of projects. In a similar vein, Wilson et al. (2009) undertook a similar activity to compare stock exchange corporate governance principles and proposed equivalent project governance principles. As this outlined early, the Association of Project Management (APM, 2011) developed industry-based practices, identifying a suite of 13 project-specific principles for the governance of project management.

To understand the degree of consistency across all the range of principles, Table 2-8 cross-references best practice corporate governance principles (from the Australian Stock Exchange) against the four different sets of project governance principles described. An observation is that the corporate governance principles are all addressed by at least one of the corresponding project governance principles. This reinforces the presence of strong similarities and alignment between corporate governance and project governance principles.

Table 2-8: Corporate Governance principles mapped to project governance principles

	Corporate Governance Principle	**Project Governance principle equivalent**			
	ASX (2014)	**Garland (2009)**	**Bekker (2015)**	**Wilson et al. (2009)**	**APM (2011)**
1	Lay solid foundations for management and oversight	Yes	Yes	Yes	Yes
2	Structure the board to add value	Yes	-	Yes	Yes
3	Promote ethical and responsible decision-making	-	Yes	Yes	Yes
4	Safeguard integrity in financial reporting	-	Yes	Yes	Yes
5	Make timely and balanced disclosure	-	Yes	Yes	Yes
6	Report the rights of shareholders	-	Yes	Yes	Yes
7	Recognise and manage risk	Yes	-	Yes	Yes
8	Remunerate fairly and responsibility	-	-	Yes	-
	Alignment	**37.5%**	**62.5%**	**100%**	**87.5%**

The reason for the high levels of alignment between the sets of principles is the corporation. Corporations use project management as a principle method for managing change, with the project being the transition of technical progress while the lifecycle of the project is the evolution (Saynisch, 2010, p. 12). Although there is a high degree of similarity between a corporation and a megaproject organisation, Samset and Williams (2012) recognise that a universal ‘one-size-fits-all’ approach to project management principles does not reflect reality.

Their position is based on a contingency perspective whereby a project’s practices are dependent on macro-organisational, strategic and environmental conditions. This is further reinforced with the identification that project governance is also characterised by where it sits within the project lifecycle, with four basic stages: conceptualisation, planning, execution and utilisation (Samset & Williams, 2012, p. 82). The four-stage project governance lifecycle characterisation involves transitions between corporate governance, operations and project management, and has transition points between each. These are typically described as a ‘gate’ whereby an assessment process involves a project passing through a review gate designed to check the suitability to proceed (Shiferaw, 2013, p. 40).

From a project governance perspective, this provides assurance and independent review functions (Oakes, 2008, p. 184). Using the analogy of a relay race, the control of the megaproject is passed like a baton through the lifecycle stages of the megaproject. In particular, the hand over/hand off points and longitudinal governance control points are closely aligned to the gate stages reflecting the need for dynamic organisational change to megaproject governance.

2.4.5.2 Practices of project governance

Project success is a well-considered element of project management literature and will not be addressed further. A number of contributors in the literature have provided a collection of narratives that develop a loose collection of project governance principles as outlined previously. Müller (2009) was able to link corporate governance theories to governance of projects by identifying four governance paradigms. This was further developed to create a theoretical model, the total governance model, which addresses the "what to do in governance" (Müller, 2009, p. 95). The model considers the hierarchy of governance, the priorities (as either behavioural or outcome driven) and the process for increasing an organisation's project management capability.

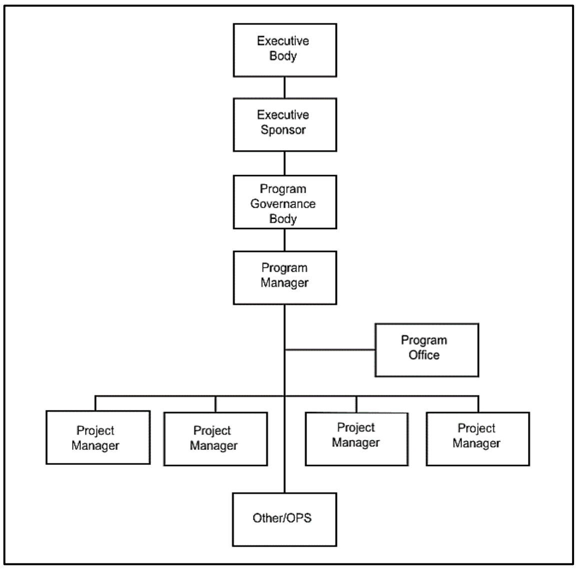
From a project classification perspective, Priemus et al. (2008) provide useful guidance on where megaprojects have normally been found a as:

- Major Transport Projects (MTP);
- Large Engineering Projects (LEP);
- ICT Systems (IS); and
- Complex Real Estate Projects (CLEP).

Merrow (2011, p. 134) confirms that most of the principles for delivering megaprojects successfully are the same for doing all projects well. In Merrow's analysis of megaprojects, he also argues that major capital projects require active business involvement in order to ensure project success. Turner (2014) identifies "the project manager's dilemma" in relation to benefits realisation of a project as an issue specific to project success. In his argument, Turner highlights the difference between delivering the project and the business change management needed to deliver the benefits. This differentiation suggests that the project manager is but one element of the project success in delivery of the output, with the role of the Senior Responsible Owner also needed to enable and deliver the benefits.

In fact, Turner provides a generic project governance framework (see Figure 2-4) which identifies four specific roles and responsibilities above the role of the project manager/s that undertake some form of project governance or oversight.

Figure 2-4: A project governance board structure, by Turner (2014, p. 438)



The relationship between the Board and project came to prominence from a number of lessons learnt from corporate failures, in particular for the United States, through corporate scandals from around the year 2002. Weill and Ross (2004) focus on ICT projects, and propose a framework to link Corporate Governance and Information Technology (IT) governance. They analysed corporate governance for IT systems in over 300 enterprises around the world and developed a governance methodology based on their surveys. The framework shows the relationships between the board, the senior executive team, strategies and key assets. While this did not specifically address the use of project boards, the relationship between corporate and project governance are becoming clear. Their governance model revolves around six key assets (human, financial, physical, intellectual property, IT and relationships), which explain that value comes from integrating these assets, and that integration is accomplished through governance.

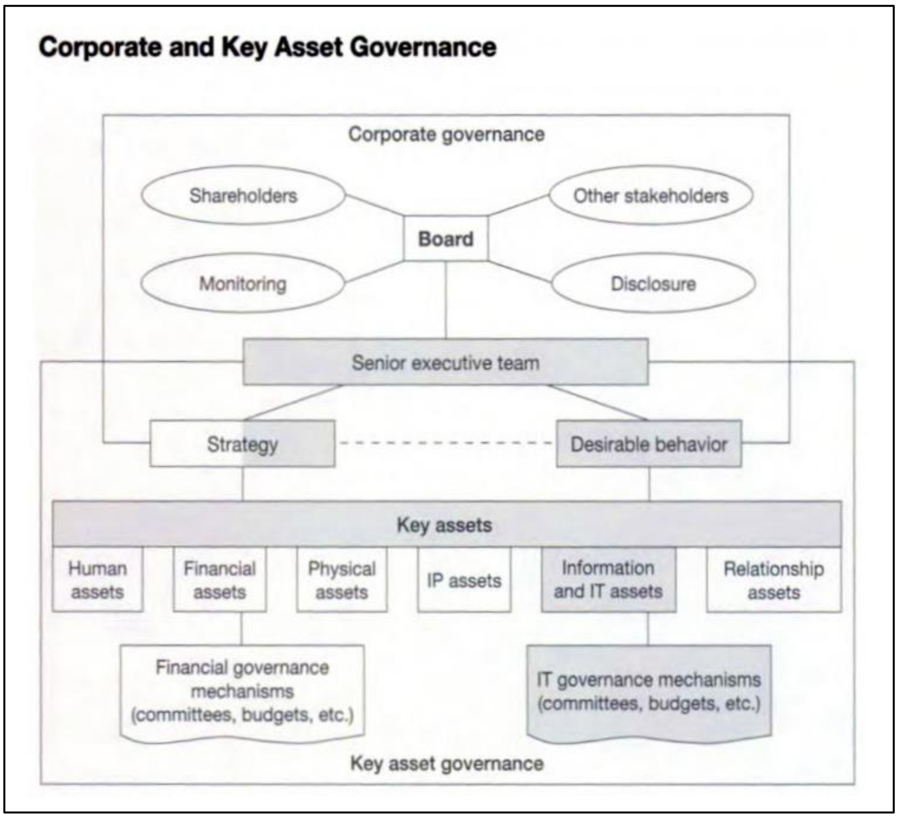
Figure 2-5 illustrates their model. By 2008, ICT project management / governance guidance was identifying the strong links between a Project Management Office, IT strategy, and Corporate Governance, through use of project boards. Project governance arrangements were highlighted as requiring compliance with "multiple national, international, local and industry specific regulations, as well as best practices, guidelines and frameworks" (Selig, 2008, p. 13).

Their model demonstrates that enterprises that have implemented effective IT governance had more than 20% higher profits that those with poor governance (Weill & Ross, 2004, p. 14). They identify seven characteristics of top governance performers:

1. managers in leadership can describe IT governance;
2. solid clear and continuous communication of governance rules and expectations;
3. more direct involvement from leaders;
4. clear business objectives for IT investment;
5. differentiated business strategies;

6. fewer renegade applications (more formally approved exceptions where necessary);
7. fewer changes in governance annually (stability and consistency).

Figure 2-5: Framework for linking corporate and IT governance (Weill & Ross, 2004, p. 5)



Governance considerations occur across all the key assets in the Weill and Ross model and the seven characteristics are a proxy for governance success. They define IT governance as "specifying the decision rights and accountability framework to encourage desirable behaviour in using IT" (Weill & Ross, 2004, p. 2); however, the framework also depicts the relationships from the board to the senior executive team. The board and executive set strategies; and this is through the key assets, in this case through the lens of IT, to deliver value. The value from governance is related through the organisational mechanisms; and it is the maturity of the integration, Weill and Ross suggest, that leads to better coordination across assets. Finally, Biesenthal and Wilden (2014) identify that much of the project governance research has focussed on construction projects. Their research suggests that, in order to enhance project governance understanding, a focus on projects with more transient and less structured approaches would help to validate the concept of project governance, as project governance is always context specific. They further identify project governance as requiring a "duality of success" (Biesenthal & Wilden, 2014, p. 15), both in terms of delivering project objectives but also meeting overarching organisational objectives.

2.4.6 Relevant Delphi Studies in Project Governance

As the present research used the Delphi approach, a brief section on the topic is provided. Within the field of study in project governance, the Delphi technique has been used by Bekker (2008), who developed a common definition and framework for project governance. The Delphi was used to gain consensus on defining the term '*project governance'*, and later to develop a concept project governance framework (CPGF) which aligned with corporate governance concepts (Bekker, 2008, p. 187). Bekker's work was built upon primarily through Joslin and Müller (2016b), who found strong agreement between the application of project governance principles and the success of a project.

Although small, project governance was show to have a significant correlation with project success; and supported the use of stewardship theory as a suitable lens for assessing project governance (Joslin & Müller, 2016b, p. 623).

2.5 INSTITUTIONAL DESIGN AND PROJECT PERFORMANCE

This section is reviewed to consider the complex decision-making considerations required to implement corporate governance structures, and of the importance of identification of specific functions relevant to project performance.

2.5.1 Predicting Megaproject Performance or Performance

Miller et al. (2000) used grounded theory to successfully show that a small set of covariates were able to predict 85% of project success or failure. Four covariates[8] introduce the concept of governability – the capacity of project participants to steer through unexpected turbulence – into the field of project governance.

The first covariant is identified as originating from both exogenous events (occurring outside of the control of management) and endogenous events (those arising from within). By infusing projects with governability characteristics, Miller et al. (2000) argue that projects are better equipped to resist shocks, whereas projects with low governability potentially fall in to disarray and even abandonment. Turbulence was measured using the frequency of surprising events that the sponsors had experienced but not foreseen. On average, for the projects studied in their research, this occurred close to five times per project with some projects observing up to twelve rocky events. The second covariant, the presence of strong institutional arrangements, was seen as the most important determinant of project success. Through anchoring a project, the project is stabilised against a long-term future to enable investment, allows for flexibility to cope with surprise events, and enhances legitimacy of the project to allow participation and agreements to be reached.

[8] The four covariates are: 1) turbulence arising from complexity; 2) institutional arrangements; 3) the presence of strong sponsors; and 4) strategic scope as designed by sponsors.

The third covariant is the importance of a strong sponsor. Large engineering projects are dependent on the "quality of the story (i.e. the project), but also on the talents of the players and context in which they work" (Miller et al., 2000, p. 27). While the concept of a strong sponsor is widely understood, the ability to identify traits of strong sponsors (or alternatively, weak or deficient sponsor) remains a challenge. The fourth covariate considers the strategic scope of the project, and is the last major factor used to determine project success. This element requires project sponsors to implement a range of devices to consider the 'broad' strategic scope of the project. While it is costly to build these strategic systems, projects that had a narrow repertoires of devices were often seen to fail (Miller et al., 2000, pp. 23-35).

In a second study, Miller and Floricel (2000) identify 29 devices to infuse governability in to projects; and within their study include the analysis of over 60 projects, identifying devices that could be used by (project governance) sponsors to enhance the governability of the project structure. This leads to identifying six properties that a project (governance) structure can display:

1. (bonding for internal) cohesion;
2. (long term) coalitions;
3. (presence of) reserves or stocks;
4. flexibility options;
5. generativity;
6. modularity and diversification.

While these six properties are explained in detail in the research, Miller and Floricel suggest that there are no optimal project structures, and that sponsors of projects should build configurations that are appropriate to the context of the project, using judgement to decide on the positive and negative contributions of each. To determine whether governability is relevant, they created an index to measure the impact of projects that were facing turbulence, and whether the projects with higher index scores fared better. The conclusion shows that projects with higher governability scores were associated with good performance (Miller & Floricel, 2000, p. 149).

2.5.2 Project Board Structures

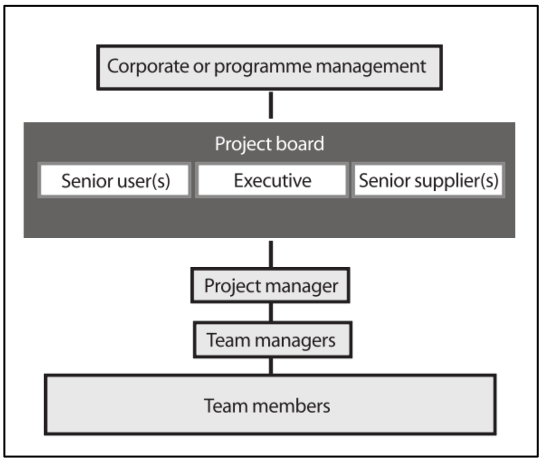
While the PRINCE2™ methodology identifies some specific project governance responsibilities, it is overly general and needs tailoring. Fundamentally, the PRINCE2 methodology identifies three roles in a project board – the Project Executive, the Senior User and the Senior Supplier. In turn, a Project Manager manages the project on a day-to-day basis and reports progress to the project board. Outside of this guidance there is little more. While the PRINCE2 methodology is robust, it has been criticised as lacking organisational project leadership, with Sargeant et al. (2010) identifying a number of criticisms concerning project board members, for:

- not understanding their roles and responsibilities, lacking experience or not possessing the necessary competencies;

- delegating membership to staff with no decision-making authority;
- not reviewing the business case to verify continual project viability;
- organisationally not providing sufficient priority to project governance (Sargeant et al., 2010, p. 5).

Project governance structures have evolved, more recently through exploration of the intersection between corporate governance and the management of projects. Garland (2013) confirmed that the PRINCE2 documentation introduces a generic project board structure, and while the Project Manager reports to the Project Board, the Project Manager is not a member of the Project Board, as is seen in Figure 2-6. The orientation of this structure reinforces that project governance organisational structures are created for the sole purpose of managing a project. While a project governance structure can be implemented to "draw the key decision makers out of the organisation structure in a focussed context" (Dept. Treasury and Finance, 2012, p. 8), the creation of the project governance function also allows for controlled delegation of governance functions for specific tasks relating to project shaping and/or project delivering

Figure 2-6: Generic PRINCE2 governance structure (Garland, 2013, p. 3)

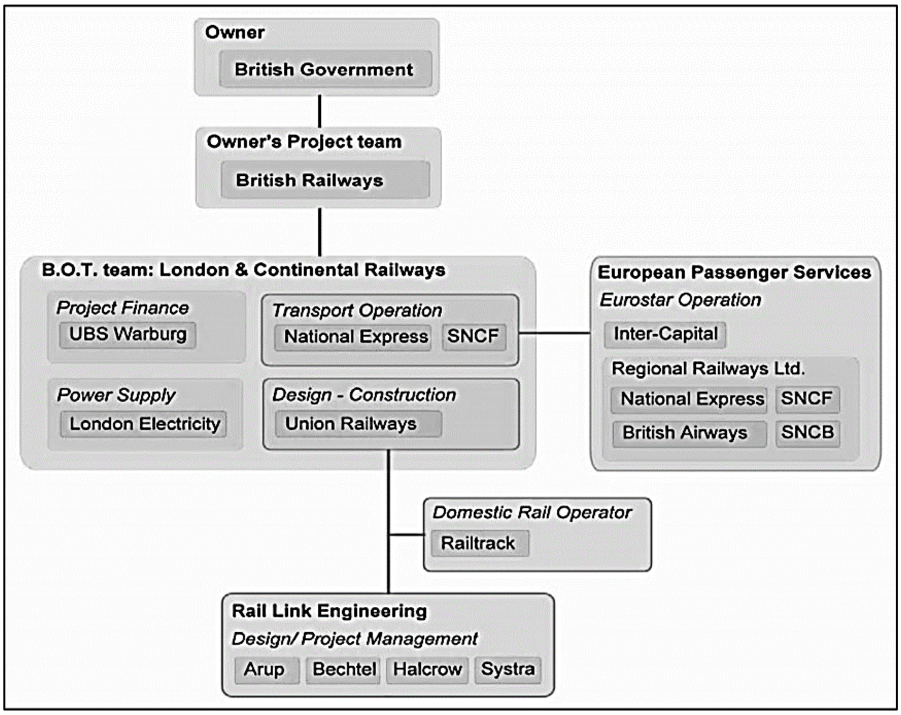


A structural governance approach to project definition is also used in guidance by the US-based Project Management Institute (PMI), which defines the roles and responsibilities of project governing bodies as the Project Sponsor, Project Manager, Stakeholders, and the Project/ Program/ Portfolio Management Office (PMI, 2016). While project governance arrangements generally suggest simplicity and presume governance as a static process that is hierarchical and binary, Garland recommends that it is often useful to map the governance arrangements in order to get an understanding of how it will operate in practice. By example, Garland demonstrates that a project governance arrangement was anything but simple, as it had multiple interfaces, implied power structures, and multiple decision-making bodies! These additional decision-maker approvals effectively made the authorised project governance arrangement ineffective. Attributed to many of the shortcomings is a lack of project leadership by project boards (Sargeant et al., 2010, p. 10).

By developing and proposing new project governance models, project governance practitioners are proposing a number of differing structures to govern specific projects. With differing organisational requirements and expected outcomes, project governance structures are selected to respond best to the higher-level need. Traditionally, the structure was to exert control and oversight, whereas other variables had not been generally considered, although there has been evidence of their application in practice. Alternative models give project governance practitioners a more detailed clarity on the outcomes required for the project. One of the limitations with new project governance models are that they are largely theoretical or not widely tested. As such, many models have not been applied and there is a need for an ongoing program of research to validate and test proposed models.

Different types of delivery and procurement mechanisms also have an impact on the governance arrangements. The use of alliance contracting, design and construct (design build), public private partnership and many variations of procurement can impact the choice of project governance arrangement. The procurement arrangement impacts will not be discussed in detail here; but it is necessary to address some of their implications. A specific example will be used to describe a generic project governance arrangement for a UK megaproject (the Channel Tunnel Rail Link project). This project is well researched in the literature, with a long history of planning, financial and political turmoil (UCL, 2017). As outlined in Figure 2-7 there were several corporate and project governance layers. The first was the Owner (the British Government), who provided a public governance function; the next was the British Railway Project (the sponsor) structure, which oversaw the megaproject delivery team (the Build, Own, Transfer group) consisting of the project financiers, rail operators, suppliers of power (essential services), and the design and construction organisations. There is also a side project governance relationship with an End User (the European Passenger Services, Eurostar OPerations), and the associated cascading of works to the project teams.

Figure 2-7: Typical complex project governance structure (Pollalis, 2006)



The governance arrangement above demonstrates that, in practice, megaproject governance arrangements are far more sophisticated and complex than the generic structure presented in Figure 2-6. This observation is supported by Lundrigan et al. (2015) who observed that megaprojects are a hybrid form of organisation which blends the properties of open-pluralistic systems and close-hierarchical systems, with two independent structures of an inner core and a periphery (Lundrigan et al., 2015, p. 23). The inner core contains those members who possess resources critical to achieve the project outcomes, and the periphery contains those resources that can be acquired through market transactions.

However, when researching megaproject governance, and depending on the theoretical position, the same project is presented quite differently. The ‘CrossRail project’ (UK) was a £15+ billion megaproject, and one of the largest investments of its type. Due to its size, there has been a large amount of scrutiny and various representations of the megaproject governance arrangements (NAO, 2014). At least three separate governance structures have attempted to describe the governance arrangement (see Appendix B). While each presents a structure, a hierarchy, and a number of direct and indirect relationships, the structure is reflective of the dominant perspective being considered. Because of this conflict, the differences in structures highlight that a megaproject governance structure is anything but simple, static and easy to represent. Finally, recognising that project governance arrangements are far more complex that just creating a project organisation and a project board, the Project Management Institute (PMI) developed guidance that addresses the governance of portfolios, programs and projects (PMI, 2016). The guidance addresses each layer[9] but also introduces the need for a governance framework, process and implementation approach to oversee Organisational Project Management (OPM). The PMI’s guidance outlines the OPM and its governance interrelationships, recognising that there are a number of process and activity overlaps. The guidance recognises that the level of project governance required depends on the size and complexity of the organisation, and warns that the authority, boundaries and limits should be clearly defined, communicated and adhered to. In previous guidance from PMI, the role of the Project Sponsor was considered to be “the person or group that provided the financial resources for the project” (PMI, 2004, p. 376) but a shortfall appears to be a lack of guidance regarding actual structures for project boards, and the skills, composition, focus and key performance indicators (KPIs) that megaproject boards deliver.

From a practice perspective, there are relatively few guides or methods that apply to megaproject governance. What is reinforced, however, is the divide between the current practices and the research on those megaproject governance structures. While some structures have been effective and others not, industry bodies (such as the Project Management Institute in the US, the Association for Project Management in the UK, and the International Centre for Complex Project Management in Australia) have produced guidance to assist projects to better govern their projects; most, however, are exploratory, focus on the process of implementing a project governance arrangement, or outline a process to better control a project.

[9] Project, Portfolio, Program, or P^3

2.5.3 Board Size, Performance and Structuring

The relationship between the size of a board and company performance has been well researched. In the early 1990s, Jensen (2010, p. 54) identified that boards with more than seven or eight members were less likely to function effectively. From 1984 to 1991, Yermack (1996) identified an inverse relationship between market value and the size of the board of directors. He presented evidence that small boards resulted in higher market value, based on analysing board sizes from between 4 up to 21+. Regardless of variables that he introduced (such as firm size, board composition, company age and corporate governance structure), these had no effect on the outcome of the results. In contemporary studies, Nyugen et al. (2016, p. 853) determine that past (successful) performance is usually followed by larger boards – and they become less profitable, are associated with higher operating costs, and offer generous CEO compensation that is not related to firm performance, but on the size of the firm's balance sheet. While there are many variables, and a corresponding number of competing studies, the relationship between performance and size continues to be explored, providing various interpretations. Of these, the impact of geographical, cultural and company size on the board governance appears relevant to megaproject governance. In an empirical study of Brazilian companies, Wodronski et al. (2017) show there was a strong relationship between better corporate governance and higher operational performance, as long as the company was small (as compared to the sample size of companies on the stock exchange that were analysed). For potential megaproject governance models, the implication that small boards are a key variable for project success will be in this present study. Conversely, larger boards can be advantageous because they can provide superior quality advice; whereas other studies show that larger boards are associated with weak monitoring and slow decision making (Baker & Anderson, 2010; Landier, Sauvagnat, Sraer, & Thesmar, 2013).

Within the megaproject governance domain, the literature centres on the three primary functions of the Sponsor, Supplier and User. Up until Hilb's study (2016), performance had focussed on large companies with global operations, which provided an opportunity to evaluate the type of firms that had, until then, been under-represented in most studies, where corporate control was far more active. The results show that the effect of board size is effectively weaker in larger firms, and that average board size for the study was 5.2 directors. The work by Hilb parallels work undertaken by Müller (2016, p. 28), who identified the use of organisational theory (shareholder and stakeholder theory) and three behavioural theories (agency theory, stewardship theory, and transaction cost economics) used within project governance contexts. In that context, as different priorities were assigned there were different effects created, which had an impact on behavioural or outcome objectives, stakeholders and shareholder needs (Müller, 2010).

For megaproject governance, there are compelling arguments for independent megaproject boards which parallel the legislative requirements for large listed companies operating in regulated corporate governance arrangements. In the work by Nguyen et al. (2016, p. 870), an investigation on the relationship between board size and firm value found that small firms do not benefit from large boards. In fact, the study indicates that the size of the board appeared to create increased communications problems. This finding could be applied to project management and megaproject governance, in that an external or independent board would not add value for smaller-sized projects (i.e. traditional projects), but is critical for larger projects or a megaproject.

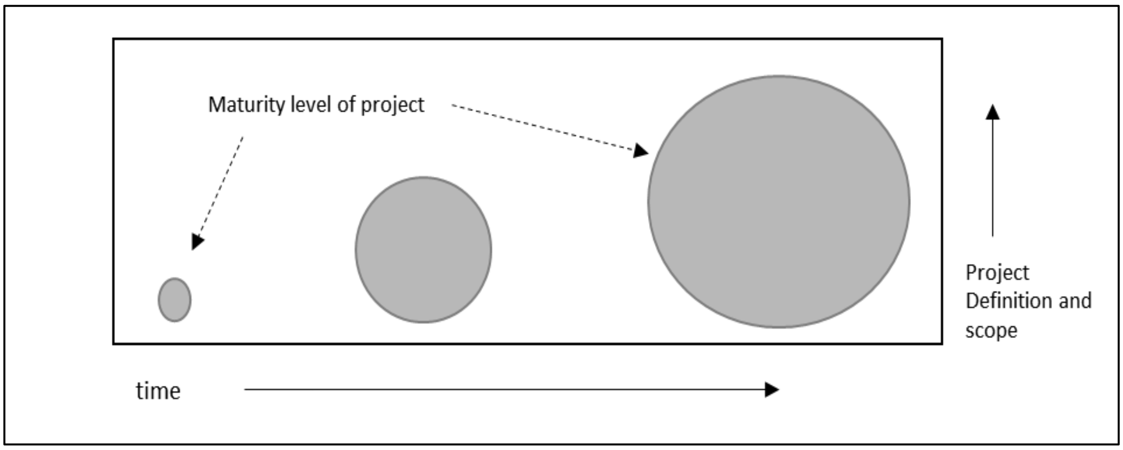
Specific megaproject governance skills, such as experience in construction, government relations, finance and cost, legal and compliance and stakeholder relations, are amongst the skills required. This is in line with the practice of having board members being independent of managers, and with their skills, bringing acumen and knowledge to decisions, and who can also pursue the shareholder needs (Baker & Anderson, 2010, p. 5). For megaproject governance, that would equate to delivering the project within its constraints. A governance agency perspective of board effectiveness, whereby a board is the governance and control mechanism for protecting shareholder interests from managers (Sur, 2014, p. 164) also supports the practice of bringing different skills sets to the project board table to effectively direct and govern the project.

2.5.4 Project Governance and the Project Lifecycle

The introduction of international standards on the governance of projects, programs and portfolios occurred in 2017 with the release of ISO 21505 (2017b). The standard recognises that 'organisational governance' concerns itself with directing permanent and temporary organisations through the establishment of a governance framework. The specific definition of 'temporary' within the organisation, namely the creation of 'a project', still requires integration into an overall governance framework but recognises that it is time-bound and defined by specific metrics. Regardless, the project and its governance still require alignment to support an organisation's principles, values and objectives and be designed in a way to deliver benefits from the project outputs (ISO, 2017b). Separation of responsibilities recognises that a project is the mechanism to deliver an output; while the ultimate quest of a project, as suggested by Bekker and Steyn (2010, p. 215), is in being able to complete the project within the predetermined time and cost constraints with the end product or service delivering the expected benefits. As a project itself is a temporary endeavour and the management of the project is to deliver the output or service within those constraints, it is therefore implied that the governance of the project does not simply 'turn on or turn off' but necessarily evolves over the project lifecycle.

The project lifecycle concept assists to frame the evolution of the project governance from corporate governance. Prior to the 'creation of a project', the corporate governance function undertakes activities to determine when a project is required. It is during this phase, referred to in the present research as the strategy and planning phase, where the project and its first evolution of project governance commences. The risk, costs, timing and delivery options begin to be defined and further understood. To govern such a phase, the corporation or institution uses its resources to gain a better definition of the scope, develop a case and associate funds and resources to plan the scope and costs. The evolving nature of the project governance function occurs as a response to the overall definition development. At the commencement of a project lifecycle, the understanding of the scope or need for a project is low, with a limited understanding of the output, armed with only basic order-of-magnitude estimates of cost and time. The scope and definition are developed over time through planning and detailed investigations. The evolution of this process is outlined in Figure 2-8, which demonstrates that, as the scope of the project is developed, the relative size of the scope is better understood and develops over time, as represented by the size of the circle. From a project governance perspective, it is important to recognise that the definition of the project in the early governance phase shapes the project, and that governance can either induce or eliminate risk throughout this phase.

Figure 2-8: Scope Development of a Project during Strategy and Planning



2.6 PROJECT GOVERNANCE FAILURE

Long-term infrastructure projects ('projects') are often best judged with the benefit of hindsight: many projects initially condemned have later been regarded as great successes, as opinion can take years to deliver its final verdict. Projects are under pressure to be commercially viable from the start (a pre-project construct) and once delivered measure up to three main yardsticks, that the project was delivered:

1. on-time;
2. under-budget;
3. to agreed quality standards.

In addition, while there are many arguments that identify other considerations to define project success, these three criteria yardsticks provide a simple and effective mechanism to convey the complex message about a project's success. Any further information is a level of detail that is dependent on the theoretical perspective taken, addressing context, complexity, short- and long-term outcomes, interfaces, and the impact of the environment in which it was delivered. When a project fails to meet these yardsticks, investigations are undertaken to determine what went wrong. Post-project evaluation tends to identify what happened technically, and consequently identifies both the general and specific issues causing the failure.

Using a specific case study, however, Vaughan (2006) challenges technical explanations for failure by using ethnographic analogies. She identifies alternative causes of the NASA Challenger incident that were not technical in nature, but were actually explanations of micro-level actions with "connections to history, politics, culture, and layered institutional and organisational structures" (Vaughan, 2006, p. 380).

During the 2000s, Flyvbjerg and his research on project costings highlighted that costs are underestimated in 9 out of 10 projects (B. Flyvbjerg, M. Holm, & S. Buhl, 2002a), and that over the last 70 years the accuracy in forecasting costs of projects had not improved. With transport projects as a specific category, he found there to be inaccurate estimation of between 20.4% - 44.7% over original cost estimates (Flyvbjerg, 2008). More recently in 2014, reinforcing the need for a focus on project governance, the *International Journal for Project Management* (IJPM) published a special issue on the topic of project governance. The journal once again reinforced that, "while governance is growing as an area of concern for management……even less is known about the systematic impact of project governance" (Pitsis, Sankaran, Gudergan, & Clegg, 2014, p. 863). One of the major issues faced by megaprojects is not only having a cost blow out but the lasting organisational effects post the project, which result in investigations, organisational reviews, and changes to project planning and delivery. Russell (2016, p. 220) identifies that project failure can result in a loss of support and a loss of legitimacy. Particular megaprojects, notionally those being defined as having a value of >$US1 billion have had an impact on both the public capital investment and private sector balance sheets (see for example Altshuler and Luberoff (2003) and Turner (2009b). The balance sheet impact is so significant that it has implications for the sponsoring organisation, from sustainability and corporate governance perspectives, and for the reputation of the organisation itself.

Commentators and researchers of project management have realised that trying to improve project success by using a project-based management and competency perspective, has not improve success rates of projects (Crawford et al., 2008). It appears that the traditional project manager role and technical perspectives of project management are unable to address the complexity and needs of megaprojects. While project management has been used as a useful tool to deliver projects, it has been sub-optimal in dealing with the complexity of megaproject investment decisions and corporate/megaproject governance arrangements. It is no surprise therefore that the topic of governance within the project management sphere continues to increase, year-on-year, especially since the 1990s (Turner, Anbari, & Bredillet, 2013).

As the topic continues to become better understood, 'governance arrangements' are now being sighted as a recurring reason for project failure (Williams & Samset, 2012). This focus identified that "for management and organisational researchers and theorists, very little is known about its role and impact on projects" (Pitsis, Sankaram, Gudergan, & Clegg, 2012). As a result, the IJPM special edition suggests twelve research questions that should be addressed. The questions are summarised in Table 2-9 and each is analysed for relevance to the 4 research questions for this thesis, which provided a strong basis to demonstrate a strong research problem alignment. In November 2014, it was released with 19 journal articles dedicated to the topic of project governance (IJPM, 2014). The research questions identified a strong relationship between questions raised by the IJPM and the direction of research in this thesis.

2.6.1 Poor Governance, a reason for project failure?

There is a theoretical position that suggests that good governance improves project performance (Crawford et al., 2008). The position suggests that effective project governance speeds up the decision-making processes, as well as providing clear definitions of each individual's role and responsibilities (Patel & Robinson, 2010). Popular governance theories are being used to gain a deeper understanding of the role of project governance, applying organisational theories of the shareholder and stakeholder, through to behaviour-related theories of agency, stewardship and transactional cost economics (Müller, 2016). Unfortunately, for those sponsors, advisors and investors in major projects there are too many well-researched 'spectacular examples' of major project failures (Flyvbjerg et al., 2002a) where projects have been delivered over budget and/or late. Research into both project success and failure has occurred primarily as a result of failed project case studies. This body of knowledge has resulted in the identification of a number of shortfalls in management of projects, and as a consequence, in an increasingly large knowledge base on what is often referred to as 'project failure' (see for example, Ika (2009)). In parallel to this knowledge is an even larger number of recommendations on how to improve the success of projects (Frese & Saunter, 2003).

While there is a growing body of knowledge about project governance, knowledge on relationship between the governance structures and the function of a project board is not strong. Conventional knowledge suggests that, when a project fails, one of the root causes is poor project governance (Pelham & Duffield, 2018). This section explores the concept of project board performance and the importance of dynamic institutional arrangements of governance in managing a project over its lifecycle.

Current research on project governance is trending towards the specific key areas of definition of terms, identifying various structural aspects of governance, and proposing new governance structures. The research on relations between project governance and failed projects is small, although this has been identified as a major concern across a number of project-related industries. A limitation of the current body of work is that there is no testing of whether new proposed models are applicable to megaprojects. Retrospective failed project analysis has focused on 'why projects fail' (Frese & Saunter, 2003; Williams & Samset, 2012), normally accompanied by a number of suggestions and recommendations on what (future) projects should change or improve to ensure that their project is more successful. One of the limitations in this approach is the effectiveness of new solutions and a lack of any significant in-depth research on the associated governance arrangements implemented. This gap also raises the questions of what is an effective project governance structure is, and what was it within the structure that made the project effective?

When a project fails to meet its yardsticks, investigations are undertaken to determine what went wrong. Evaluating such projects, many factors are highlighted as the issue/s that caused the failure (see for example Frese and Saunter (2003)); the governance arrangements surrounding the project are cited as a recurring reason for project failure. When faced with starting a new project, sponsors of projects are then faced with certain decisions to be made by the governance committees, which have long effects far into the future. The importance of these governance considerations have increased in their relevance in the boardroom, due to the difficulties faced by firms and organisations, based on examples of failures of hierarchical coordination as demonstrated by the collapse of large institutions and institutional weaknesses (Miller et al., 2000).

Governance can have many different meanings, ranging from the complex process of steering multiple firms and agencies, through to including the responsibilities for defining project success, or as is the case more often than not, a mechanism for avoiding non-compliance or corporate failure.

Patel and Robinson (2010) developed a theoretical framework that suggests good governance improves project performance. They further suggest that effective governance speeds up decision making processes, along with providing clear definitions of an individual's role and responsibilities. While there are some 'spectacular examples' of project failure, whereby extreme projects were delivered for 12-15 times higher than the predicted costs[10] (B. Flyvbjerg, M. S. Holm, & S. Buhl, 2002b), a wave of research in to project failure, and the associated identification of a number of shortfalls in governance of projects, has also been underway. 'Project failure' has also resulted in a growing knowledge base on the topic (see for example, (Ika, 2009)), and along with the knowledge base of failed projects, there is an equally large number of recommendations on how to improve success of projects (Frese & Saunter, 2003; UK, 2010).

2.6.2 An opportunity to learn from failed projects

A project board is a special purpose management vehicle set up to deliver a project, and once this has been achieved, the governance arrangements are terminated once the purpose of the project has been achieved. This phenomenon is, in effect opposite to the position that all management systems remain viable when adequately designed and monitored (i.e. they are sustainable).

Carpenter (2008) suggests that (corporate governance) Boards spend up to four-fifths of their time dealing with the 'trivial many', whereas if the Board focused on the few vital issues (20%), the board's value could create upwards of 60% greater value of their output than their input. Within the context of project management, one dominant position is of the importance of front end governance, as a mechanism to improve the analysis and decision making at the start of a project, in order to reduce implementation costs (K Samset, Berg, & Klakegg, 2006b, p. 4).

In 2013, Advances in Organizational Studies journal published a series that marked a realisation that there had been a major evolution of research methods in the field of project management (Drouin et al., 2013). The series aimed to expand project management research design, including the different phenomena being investigated. Of note, it recognised the need for approaches to be brought together using inter-disciplinary research methods and techniques from areas such as organisational science, organisational studies, sociology, behavioural science and biology. The series specifically highlights that there is a growing popularity of the use of mixed methods approaches, which…. "overcomes instability risks stemming from single perspectives" (Drouin et al., 2013, p. 20).

[10] Such examples include the Sydney Opera House, the Concorde Supersonic Airplane, the Suez Canal Project and Panama Canal.

With the increase in both the quantity and types of research being undertaken within project management, it is realised that contemporary research methods need to be introduced, which would stimulate researchers to take the next steps to apply them. Morris et al. (2011) reinforce this through stressing the important need for a new paradigm for viewing projects as organizations in project management studies, and that such a new research paradigm should be the principal focus of studies in project management. Taking this as an invitation to trial new methods, the mixed methods approach was adopted for the present research.

Table 2-9: IJPM Research Questions and alignment to the research problem (IJPM, 2014)

#	Research Question (RQ)	Alignment to RQ in this thesis
1.	What governance practices and processes are required to transform organisations through projects?	Yes – RQ2
2.	How do organisations govern complex project arrangements, such as mega-projects, public private partnerships, and other forms of projects?	Yes – RQ3 and 4
3.	How can governance performance be understood and assessed in complex environments?	Yes – RQ2
4.	How can projects be governed in ways that allow room for improvisation in practices and processes to deal with environmental turbulence?	Yes – RQ2, 3, 4
5.	What are the differences, if any, in governing projects in the private, public, or not-for-profit sectors?	No
6.	How are development projects governed effectively?	No
7.	What are the relational and power dynamics of project relationships?	No
8.	Can projects self-govern independently from organisational governance?	Yes – RQ4
9.	How can the fit between organisational and project strategy be aligned through governance?	Yes- RQ1
10.	What are the governance mechanisms that promote and inhibit innovation in and through projects?	Yes – RQ3
11.	How do leadership practices relate to governance in projects?	Yes – RQ3
12.	What is the interplay between different modes of governance, leadership and project contracts?	No

2.7 CONCLUSION

The literature review commenced by broadly addressing the topic of governance, and then narrowed the focus specifically to the topic of project governance. Definitions of governance were explored, and considered the literature derived from project management practices, and from the corporate governance domain.

The review has outlined the 'problem mess' with project governance. Torfing (2016) recognises that in the field of social science, the term 'governance' has been "one of the most fashionable and frequently used" (Ansell & Torfing, 2016, p. 2), and while noting the increase in its recent usage, identified the difficulty in defining the term, as evidenced by the use of a qualifying prefix – such as 'good' governance, 'poor' governance, 'project' governance, and 'economic' governance as an attempt to provide a broader definition.

Much of the project management literature has been developed from traditional engineering and project management projects, and Klakegg et al.'s (2008, p. 529) position from a project-governance perspective is thus to accept "the general form of a governance framework applicable to any project" and that it "should be flexible enough to fit projects of all types, size, and complexities".

While there is no one universally accepted definition of project governance, the current body of research provides an adequate number of definitions, and the priority of research needs to progress with new, and deeper avenues of research in the field of project governance. To facilitate the direction of this current research, the project governance definition by Müller (2009) was adopted, and is reinforced again here. Project governance:

> "Comprises the value system, responsibilities, processes and policies that allow projects to achieve organisational objectives and foster implementation that is in the best interests of all the stakeholders, internal and external, and the corporation itself" Müller (2009, p. 17)

The definition addresses Research Question one. This Chapter is also accompanied by Chapter 3, which is a detailed literature review specifically on megaprojects. Chapter 3 is provided to separately address megaprojects and contributes to answering the remaining three Research Questions.

The literature review identified that there are many complex, and sometimes conflicting perspectives to consider in understanding project governance. The literature suggests that governance has primarily been an oversight function, however, with the risk of project failure continuing to be so prevalent, new models and research agendas are being called for. Broadly the three streams of governance related to project governance are:

1. Institutional governance; which are those "visible structures and routines that make up organisations are direct reflections and effects of rules and structures built into (or institutionalised within) wider environment" (Bekker, 2008, p. 66)
2. Corporate governance; which refers to the interaction among many actors involved in the process of directing and controlling private firms (Ansell & Torfing, 2016, p. 2); and
3. Project governance, as defined earlier by Müller (2009).

Each stream has its own body of knowledge, and on reflection, a good way to consider the literature review for this chapter would be to address each. The research delves into the functioning of a project at the board level; and from an extensive literature review, argues that there are gaps in understanding in great detail the decisions undertaken by a project board, as well as understanding the relationship between project success and a project board.

While a large number of factors and frameworks have been developed, and the major focus of discussing these has been to interpret the relationship between corporate and project management to identify dominant theories related to each; and to highlight opportunities to improve project governance. Across a broad number of arguments, project management research has identified the need for projects to improve the business-like approach to projects, rather than relying on the predominantly technical approaches that have been previously used. One particular approach is to understand the relationship between a project and the project governance of a project.

At the same time, it is acknowledged that to govern an activity is to visibly exercise authority over it. While a number of perspectives were discussed, it is recognised that at times, similar concepts are repeated or viewed differently, albeit using different language. This was deliberate, as the literature has shown that project governance is difficult to grasp and requires far more understanding. So perhaps the true reason for the governance-movement in project management has been the recognition that projects have been un-business like, and that the literature needs to consider more deeply the relationships, especially those concerning the use of governance mechanisms and frameworks to drive improvements in projects.

In particular, the focus on project governance failure has resulted in an increase in the body of knowledge on the topic, and this thesis will use that solid foundation to now further understand the concept of project governance success. By using the principles identified in this chapter, new process models will be explored that are identified as a gap in the literature.

The next two concluding sections summarise this literature review by considering what is currently known and what is still unknown about project governance.

2.7.1 What is known about Project Governance?

This chapter reviewed contemporary literature on the topic of project governance and using current recommendations for improved governance, identified models that could be applied to improve the performance of project governance. It was shown that improving project success by using traditional project-based management and competency perspectives to drive improvements, has not improved the success rates of projects. The review has identified that project governance is far more complex than just oversight for the delivery of a project, program or portfolio, and requires multi-dimensional inputs which in turn deliver differing outcomes from the selected project governance structure. While the concept of implementing good corporate governance is strong, there are few examples in the literature that outline which governance solutions are effective for project boards to use; and the literature has struggled to provide project owners, sponsors and project governance practitioners with sufficient guidance that is backed by accepted theory.

Consolidating what is emerging as best practice project governance practice and identifying what enhancements can be made provides a focus for the next step in the development of this research. In particular, three directions of future research were identified (theory about practice, theory for practice and theory in practice). This present research was grounded in ‘theory in practice’, focussing on the construction of knowledge by observing what happened in the case study.

The literature on project governance focussed on several specific key areas. The first was in defining new terms of project governance. The second identified the different structural aspects of governance, and generally investigated projects that have experienced (project) governance failures. The third area of focus identified potential governance structures or improvements that may be used in the future to improve governance functions which may result in improvements in project outcomes or success.

These three specific areas are used to shape the direction of this present research. Using a case study, the inner working of a successful megaproject is used to identify whether the project governance function impacts on the success of a project. This in turn, allows for the development of new models for consideration for megaprojects and the answering of the Research Questions.

Eisenhardt (1989) suggests that, for case studies, early identification of a Research Question is useful, but so too is having a starting point being that no theory or hypothesis is being tested. An inductive approach to theory-building research identified that the research could commence without the need for an abstract theory as a starting point.

A number of theories are used to explain the many aspects of corporate and project governance, this provided a strong basis on which to commence the research, with knowledge that a broad general theory of project governance was missing. Overarching, the literature review in this chapter has identified that the theory and concepts to explain project governance and megaprojects presents a number of gaps. A major area of research has been on learning and applying theory from failed projects. As a result, applying theory in practice from successful projects is not well understood.

2.7.2 What is Still Unknown about Project Governance?

There is a need for increased critique of project management theory and to develop new project governance practices. New perspectives from other related disciplines, in the social sciences, have been identified as offering solutions. While project management researchers continue to develop a specific interest in project governance, project management research is not keeping pace with practice developments. This disconnect identifies the major unknown aspect of project governance.

While corporate governance theory has strongly influenced the development of project governance theory, the understanding of the governance function in projects and its underlying principles is relatively silent. In attempts to guide resolutions to these shortfalls, researchers and organisations have developed frameworks to identify broad future directions for project management. Project governance had previously been considered as a one-size-fits-all and one-dimensional activity, but the literature suggests that the project governance activity may be far more variable and dynamic, with multi-dimensional factors and change occurring throughout the lifecycle.

These dimensions, however, have not been widely accepted, and thus will be a focus in this thesis. In particular, there is a gap in understanding the decision making that is made by the megaproject governance arrangement.

There is also a gap in applying those new and proposed structures, for both current and future projects. The impact of using different governance (and project governance) structures is a topic that is relatively un-explored, and this is for a valid reason. In simple terms, applying new and untested frameworks on megaprojects is very difficult, to both implement and to observe any improved performance, due to the long lifecycles of megaprojects. As a result, there is still no definitive study that links success of a project to the performance of the board.

While performance of boards has been explored, little research has been applied such principles and relationships to projects and project governance. It is asserted in this chapter that studies that investigate corporate governance could use similar techniques for projects, using the project management constraints of time, cost and quality instead of share price, to determine board effectiveness.

Project governance models have serious limitations, in that they do not conclusively demonstrate when a certain model should or should not be used, nor are the models useful for post-project evaluation. These limitations are reflective of the state of knowledge on project governance, and further demonstrate the need for more detailed research on the link between project governance and project success. Furthermore, with the introduction of several models, while these have provided some new practices to the profession of project management, there is little evidence or longitudinal investigations of whether or how, by having a focus on project governance, this improves performance of a project.

Theoretical frameworks used to analyse governance were described, and will be built upon in future chapters, which outlined the dominant theories being used to describe project governance. There are also gaps in the research on whether the decisions of a project board assist or detract from the performance on a project, in particular: implementing governance prior to the start of a project; that the form of project governance may sensibly change over the project life; and whether novel governance structures that can deliver enhanced value. While there are indications that the function of project governance reinforces the importance of active, persistent and proactive approaches to governance, it is unclear what the priorities of project governance bodies are. This present research applies the use of a case study to deeply understand this relationship and uses the insights to propose new models. By using such an approach, the expected outcome is that a new process and conceptual framework for megaproject governance could be developed. To achieve this, special attention needs to be given to the use of content analysis as the methodology, and the importance of focussing on objectivity, systematisation sampling methods and reliability. Kolbe and

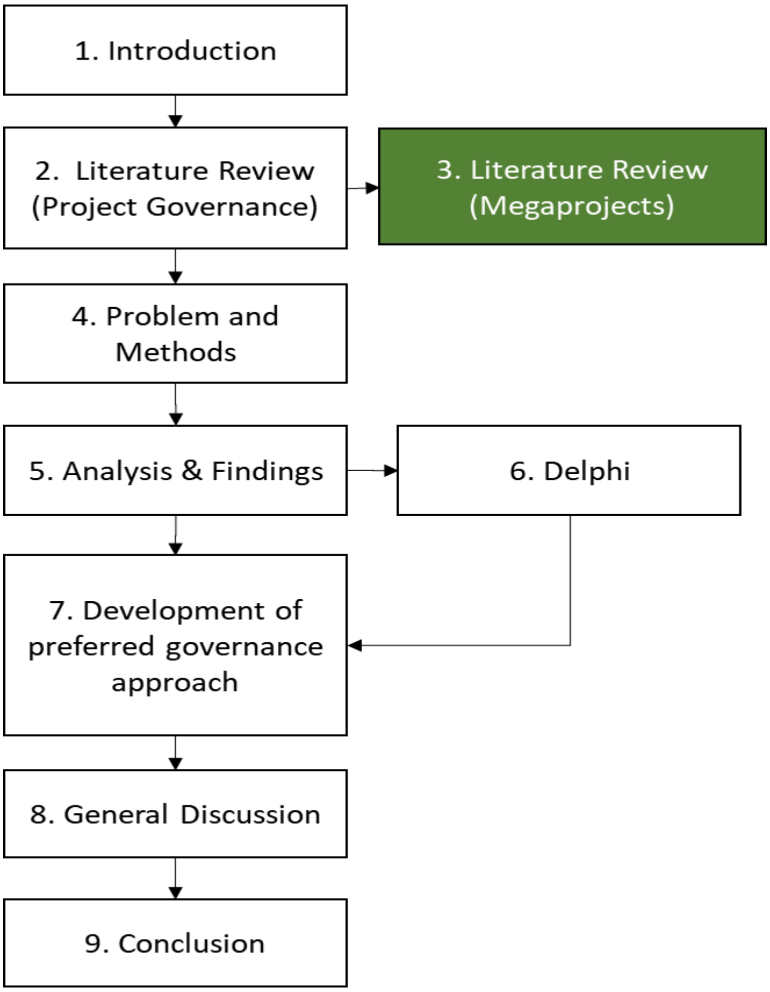
Burnett (1991) describe this as key, when they examined how to use content analysis to improve reliability and objectivity.

While it is generally accepted that a project board significantly contributes to the success of a project, the areas of focus are unclear. Many studies in the corporate governance field have resulted in conflicting views on the relationship for companies. Importantly, it is becoming clearer that project governance structures are far more dynamic than previously understood, as they necessarily change over a project's life to effectively manage the volume of risks and issues raised due to the increasing project complexity. It is hypothesised, therefore, that project governance is far more complex than just oversight for the delivery of a project, and requires multi-dimensional inputs which, in turn, deliver differing outcomes based on the selected project governance structure.

The use of project management techniques outside of the megaproject domain have considered theory that a project can be broken down into components or stages, and that through these stages, risks can be allocated to the party best able to manage the risk. For example, during the procurement stage, the tendering process is used to determine who will deliver the bulk of the project works and manage risk. In non-complex and smaller projects ('lower risk' projects), the position is taken that project governance arrangements can be administered using traditional and conventional project governance techniques, including procurement and scope management to transfer risk. It appears that megaprojects do not operate under the same delegation of risk and associated governance: regardless of the transfer of risk, the interfaces between parties are complex; and without ongoing governance oversight, namely, megaproject governing arrangements, the risk of project failure remains.

The next chapter will separately address the literature on megaprojects. This will be followed by a chapter that discusses the problems, methods and approach used to answer the remaining Research Questions. For the case study, the starting point was that there was no theory or hypothesis being tested, and therefore an inductive approach to theory building was adopted to allow for the research to commence without an abstract theory. The key consideration will be whether project governance is an essential enabler for a megaproject's success. The hypothesis of this thesis considers that there is a positive relationship, and that project governance is primarily a corporate governance risk mitigation against Poor Megaproject Governance (PMG). Furthermore, this suggests the need to implement Good Project Governance (GPG) as a critical risk management activity for megaproject success. Without a suitable governance arrangement, a megaproject is unlikely to be successful.

Chapter 3 Literature Review – Megaprojects



> 'Megaprojects attract high levels of both public and political interest due their cost and their impact….' (Chapman, 2016, p. 937).

3.1 INTRODUCTION

This chapter provides a more detailed understanding of the concepts associated with the question, '*what is a megaproject*?' and to understand the importance of governance in a megaproject context. Theories that are associated with megaprojects are discussed, and key differences between traditional projects and megaproject governance structures analysed. The adequacy of the body of knowledge, gaps and suitable theories for megaproject governance is outlined. Specifically, the following matters are discussed:

- Section 3.2 discusses concepts associated with megaprojects;
- Section 3.3 discusses project governance, megaprojects and theory;
- Section 3.4 argues for megaproject governance arrangements as a system;
- Section 3.5 outlines challenges and successes of megaprojects.

3.2 A UNIQUE PROJECT CLASSIFICATION

While the term 'megaproject' is not new, a number of definitions have been applied to it over time. The term often uses significant cost as the basis of a definition. Altshuler and Luberoff (2003) trace the term 'megaproject' back to the late 1970s where the Canadian Government and engineering firm Bechtel started to use the term. For both organisations the term referred to a project's size and scale in order to define the development projects they were delivering at the time. Altshuler and Luberoff further quantified the term 'megaproject' as a project costing greater than $US250m[11], while Lehtonen (2014) recognised that what made these projects so distinctive was their exceptionally large budgets, which require significant economic and political involvement.

Since 2002, the definition of a megaproject has been better represented as those infrastructure projects with multibillion dollar budgets, characterised by uncertainty, multiple network actors and political involvement (van Marrewijk, Clegg, Pitsis, & Veenswijk, 2008). One common trait with megaproject dimensioning however has been the overwhelming recognition that such projects have had "strikingly poor performance records in terms of economy, environment and public support" (Flyvbjerg, Bruzelius, & Rothengatter, 2013, p. 3).

Demonstrating that the field of research in to megaprojects was rapidly expanding and growing, Pollack et al. (2017) identify megaproject research as a relatively small field of research, with its span primarily drawing upon concepts from the field of project management. They undertook a study that considered whether there were any substantive and influential works on megaprojects. They identified three key works as the first potential *'classics of megaprojects'*, namely '*Megaprojects and Risk: An Anatomy of Ambition*' by Flyvbjerg et al. (2003), '*The Anatomy of Major Projects'* by Morris and Hough (1987); and '*Industrial Megaprojects'* by Merrow (2011).

While Pollack et al.'s evaluation concludes that only the first of these three works, Flyvbjerg et al. (2003) could potentially be a classic of megaproject research, their research serves as a relevant summary of the key facets of megaprojects and further contributes to the understanding of the emerging research phenomenon. Regardless of the results, all three books are very interesting reading and assisted greatly in

[11] Using inflation adjusted year 2002 US dollars

the present research in terms of gaining a far greater appreciation of megaprojects; as did personal communications by the author with Merrow.

3.2.1 Megaprojects Defined

While Merrow suggests that the $US1 billion criterion for defining a megaproject is completely arbitrary and misses considering the complexity and project environmental aspects of the project, he also argues that the dollar figure is less arbitrary than it seems: "in the neighbourhood of a billion dollars is where we see project outcomes begin to sharply deteriorate" (Merrow, 2011, p. 15).

As was previously discussed, definitions around project governance are varied. Too and Weaver (2014) argue that there are generally held misconceptions that governance is only focussed on due process and control. Ansell (2016) suggests that definitions of governance are in popular but often slippery terms. They either define governance too narrowly or are too open to contextual interpretations. In providing different definitions, the term governance has become blurred by the distinctiveness of governance, and they fail to demonstrate what governance adds, compared to notions of politics or policy.

For the purposes of the present research, the broad definition of project governance in the literature review presented in Chapter 2 (2.4.1) is adequate for megaproject governance as well as for traditional project governance. Apart from the scale, complexity and implied risks that megaproject governance contains, there is no reason found for why this definition is not also relevant for megaprojects.

3.2.2 Megaproject Categories

Megaproject are usually found in Major Transport Projects (MTPs), Large Engineering Projects (LEPs)[12], ICT Systems and Complex Real Estate Projects[13] (CREP) (Priemus et al., 2008). Lehtonen (2014) suggests that much of the focus for such projects has been on the megaproject 'pathologies', whereby the megaproject is characterised by chronic cost overruns, time delays, and not delivering the expected social and economic benefits. Frick (2008) uses the "six Cs" to characterise a megaproject that are illustrative of their many facets:

1. colossal,
2. captivating,
3. costly,
4. controversial,
5. complex, and
6. (laden with) control issues.

[12] Such as nuclear facilities, water treatment and military weapon systems
[13] Such as hospitals and shopping malls

By contrast, Lundrigan et al. (2015) evaluated the underperformance of megaprojects through the lens of a meta-organisation. A meta organisation is considered as a 'network of legally autonomous actors collaborating under an identifiable system-level goal' (Lundrigan et al., 2015, p. 3) and this implies that a megaproject is created through a central founding actor (an "entrepreneurial architect") who during the early stages of the project implements an archetypal structure and ideology.

By outlining the technical and social complexity of modern megaprojects, de Bruijn and Leijten (2008, p. 37) provide an innovative perspective on a megaproject's nature and its implementation. They suggest that preferred solutions don't necessarily result in the most manageable projects, as decision making, design and implementation take place in complex social environments with actors who can help or block. This is supported by evidence that suggests that megaproject implementation can generally be categorised as being manageable or unmanageable, through three types of explanation:

1. the decision making processes for megaprojects,
2. the technical complexity of the megaproject, and
3. the implementation of the megaproject (de Bruijn & Leijten, 2008, p. 24).

In reviewing eight detailed case studies of European major projects to get a greater understanding of what lessons could be learnt, Morris and Hough (1987) identified 22 pre-conditions for major project 'success' While the authors did not refer to the term megaproject, the types of projects they investigated would now be clearly considered as such (some of the projects included the development of the Concorde aircraft, a nuclear power plant, and the early attempt at the Channel Tunnel project from 1960-75).

Morris and Hough (1987) eloquently suggest that some projects are so large, complex and difficult that they require an exceptional level of management. They are demanding due to their size, schedule, and required resources and know-how (Morris & Hough, 1987, p. 14). However, with all the potential risks, there is still optimism in the use and the delivery of these projects, as they are central to the development of society; and therefore, the benefits of a megaproject are balanced against the large risks that they pose.

3.2.3 Types of Megaproject Classifications

While definitions from Frick (2008) regarding the six Cs can be interpreted in different cultural and language contexts, the six Cs do follow a logical sequence, and provide a sound framework to differentiate between what constitutes a megaproject and what does not (i.e. a 'traditional' project). With this differentiation made, the governance arrangements used for oversight of the project types can be separately analysed. At this point it is worth focussing on the '5th C' to differentiate between use of the term '*complicated'* and '*complex'* projects, as the latter has gained much interest and is a topic of focus.

The International Centre of Complex Project Management (ICCPM) authoritatively addresses project complexity in their 2010 report on Complex Project Management. The position of the ICCPM was that while "complicated projects comprise a plethora of distinct and linear elements essential to the project as a whole" (ICCPM, 2010, p. 18), complex projects have multiple mutual independencies. With regard to the identification of a complex project, the position is that, when one variable changes, the impact may create new realities and paradigms, for which traditional methods and practices (in relation to project management) are inadequate. Variables may include key human, technical, process or financial variables (ICCPM, 2010, p. 22). In particular, the differentiators for complex systems ('projects') are the attributes of emergence and self-organisation (Lichtenstein & Plowman, 2009). The framework by Frick (2008) is also able to complement these definitions of complexity with the characteristics of megaprojects.

This present research proposes the position that application of traditional project management techniques is inadequate to deal with the complexities of megaprojects; and implied in this is that the project governance arrangements also are inadequate. Because traditional corporate governance structures, of ownership and employees, do not exist for the megaprojects in the early stages of development, the meta-organisation influences two structural properties: member stratification and boundary permeability (Lundrigan et al., 2015). Stratification considers the decision-making privileges and responsibilities of members of the organisation; whereby highly stratified organisations have more privilege and responsibility compared to flatter organisations. With flatter organisations, there is more equal status; whereas with boundary permeability, the founder decides how external actors become members, either through gatekeepers or, for an open system, through self-selection and volunteering for tasks.

The conclusion of Lundrigan et al.'s analysis describes megaprojects as hybrids of meta organisations which blend both open-pluralistic systems and closed-hierarchical systems (Lundrigan et al., 2015, p. 23). This hybrid organisation comprises within it, a core and periphery. The core holds the resources critical to delivering the system-level goals, and the periphery holds resources acquired through market transactions.

In addition to the overall hybrid nature of the megaproject organisation, as it evolves through its lifecycle, Lundrigan et al. (2015) observed that due to the changing nature of the core membership, the scope of a megaproject:

1. evolves considerably;
2. deviates substantially from initial estimates;
3. is measured on very different dimensions;
4. will always leave some core (and non-core) members dissatisfied.

With competing demands, which also change over time, differences relating to baselines, preferences over priorities (primarily concerning efficiency and effectiveness), and competition in high-level choices occur. These factors result in competing performance narratives which cannot be reconciled. Lundrigan et al. conclude by suggesting that, like beauty being in the eye of the beholder, for a megaproject, different actors see different things as being important. The ability to consistently post-evaluate megaproject performance is difficult; but the competing demands observation provides, at least, a rational reason for why megaprojects have had such poor performance and reputation.

3.2.4 The Difficulty in Defining Transport Project Successes

Success and failure of a project is often defined in terms of time, cost, scope and quality considerations. By 1998, (Bruzelius, Flyvbjerg, & Rothengatter, p. 424) were suggesting that processes used for developing and appraising megaprojects required change. This position was based on their initial work which focussed on the tenet that good decision making was about institutional arrangements promoting improved accountability, as the processes that were being used did not promote economic viability and environment soundness. This was further reinforced with the view that the conventional approach to project development regarding government and private sector involvement, was unclear. The main lessons from their work were that, for transport projects:

1. cost overruns of 50-100 percent were common;
2. traffic forecasts were out by 20-70 percent compared with actual development results;
3. forecasts of project viability for major transport infrastructure projects are often over-optimistic (p 425).

By 2005, Flyvbjerg, Holm and Buhl (2005, p. 140) had systematically demonstrated that project performance as forecasted in terms of cost had a poor track record, with 9 out of 10 transport projects delivered over cost. More recently, there are emerging discussions on the importance of not only the project metrics but the longer-term benefits that are delivered after the project is completed.

Fahri, Biesenthal, Pollack, and Sankaran (2015, p. 52) suggest that project benefits can be recognised in both financial and non-financing forms; and that while tactical benefits may be realised through the completion of the project and transition to initial operations, the strategic and longer-term benefits need to be considered more comprehensively. With longer-term considerations, there is a contrasting view on project 'success', which was demonstrated through the work at the Omega Centre (University College of London) who specifically reviewed 30 Mega Transport Projects (MTPs) from 10 different countries over a 5-year period (2006 to 2011). The research focussed on gathering generic and context-specific conclusions on how and why MPTs were judged to be '*successful'*. Their findings show that such judgement can be misplaced due to excessive focus on project management criteria and according to technical specifications.

The findings identify two significant holistic and long-term perspectives on 'project achievement', relative to emerging objectives (which occurred during the delivery of the project) and around decision making in regard to risk, uncertainty and complexity of MTPs (Dimitriou, 2014, p. 391). While success is difficult to define, the 'megaproject failure' literature has some solid foundations, as argued in the next section.

3.2.5 Megaproject Failure

Hindsight provides very clear and over-simplified reasons for why a project failed. This is true for both generic observations and specific project types. From the perspective of management consultant firm McKinsey, they published a paper on why megaprojects '*go bad'*. Their conclusion was that there were three main reasons for failure:

1. over-optimism and over-complexity;

2. poor execution;
3. weakness in organisational design and capabilities (Garemo, Matzinger, & Palter, 2015).

In a similar manner, fellow consultants KPMG produced a lessons-learnt document focussing on the governance of a Transport Project delivered in the United Kingdom. Their report also provides three lessons for future megaprojects as a '*blueprint for success*' by focussing on three key areas:

1. integrating the sponsors and stakeholders;
2. forming a capable independent delivery body;
3. creating a governance that gives the delivery body freedom and accountability (KPMG, 2016).

Both sets of recommendations provide both valid and distinct issues that should be focused on; however, the literature suggests that there are many more issues than just these six identified. Megaproject failure research is not a new, as outlined by Miller et al. (2000), who provide a time series of Large Engineering Project (LEP) failures dating from the 1970s to the late 1990s. Their research identifies the primary reasons for why each project did not succeed, and argues that the stable modes of delivery that had been used over the past 70 years or so (since the early 1900s, using techniques of project shaping and delivery through expert design and competitive bidding) had been challenged as activists assert new rights, regulators promote competition and the methods of assessing risks in loan decisions were being reassessed (Miller et al., 2000, p. 3).

As the project delivery sponsorship of these projects also shifts from large public and private firms to alliances (comprising developers, engineering firms or entrepreneurs), Miller et al. identify that the gap between the realities of projects and the theories for managing them was widening. An example is provided whereby an engineering consultant who would traditionally meet an equipment supplier in competitive arrangements, was now meeting them as a partner, investor or as a contractor. Miller et al. demonstrated that the established body of knowledge, whereby LEPs are scoped, planned and managed within existing techniques, could no longer prevent project failure. In turn, this implies that the governance of these projects needs to significantly reconsider risk controls of project management and governance to address emerging failure of megaprojects.

Miller et al. provide a useful collection of 10 issues and 15 causes of failure of LEPs (see Appendix C). Their listing demonstrates the vast variety of issues and causes of failure, which on their own would seem quite within the control of a project or a company. It could also be asserted that these risks ought to have been effectively managed by the project governance arrangement. However, one consistent message extracted from Miller et al. is that these LEP megaproject case studies, over a very long period of time (20+ years), continue to present disparate issues and causes of failure. There does not appear to be one underlying causal mechanism of the 10 issues and 15 causes of failure, and this does lead to a view that failure is more complex than just controlling costs, managing schedule and supervising work.

The core purpose of this discussion was to go beyond a narrow perspective of megaproject failure, to a broader explanation of megaproject impacts, and highlight that suggested previous improvements had not resulted in megaproject success being more prevalent.

3.2.6 Pre-conditions for Megaproject Governance Success

The term 'Large Engineering Projects' (LEPs) was used by Miller et al. (2000) to describe megaprojects. LEPs are "unique, dedicated, and usually one-off products with intensive interactions between sponsors and contractors" and "tend to be massive, indivisible, and long-term artefacts with investments taking place in waves" (Miller et al., 2000, p. 22). In a study undertaken by the authors under the IMEC Research Program (Canada), they investigated sixty LEPs to identify benchmarks. What they found was that the LEPs demonstrated a number of similarities, which they described as '*hallmarks'*, which are summarised in Table 3-1.

Table 3-1: Hallmarks of LEPs (adapted from Miller et al. (2000, p. 9)

Hallmark	**Description**
1. Product of negotiated compromise	• Customised to meet client requirements • Integrated parts of networks
2. Contested externalities	• Facing extensive community opposition • Facing international pressure groups
3. Crafted over many years	• Average front end period (79 months) • Average EPC period (49 months)
4. Exposed to political risk	• Political considerations influenced initiation • Viewed as a vehicle for economic development • Facing bureaucracy with strong expertise
5. Facing coherent regulatory frameworks	• Highly developed regulatory frameworks • Having to deal with multiple uncoordinated agencies
6. Large, irreversible commitments	• Average cost - $985m • Built ahead of demand – 35.6%

These hallmarks are each, in themselves, very relevant to the shaping of expectations of what a megaproject is, and how the delivery of a megaproject is not a standardised or mass-produced process. The hallmarks demonstrate that each LEP is exposed to multi-variable factors, each competing against the project management criteria of time, cost and quality.

Merrow (2011, p. 134) argues that megaprojects require more technical expertise than smaller projects, but that the more intimately the business is involved in decision making on megaprojects, the more likely the decisions will be unsound from the viewpoint of project management. These competing views provide a good basis on which to discuss the intersection of corporate governance with megaproject governance, and their suitable arrangements. This chapter has identified a number of aspects and perspectives that describe the phenomena of a megaproject. It has also highlighted the need for a widening of the restrictive definition of a megaproject, beyond them simply being '*complex'* and '*valued at over $1b'*. The arguments presented here demonstrate that these types of projects, megaprojects, have unique traits and differences to traditional projects, but that they are still broadly defined and evaluated using project management mindsets and evaluation.

Megaprojects have been shown to exhibit both project and corporate governance traits. If a megaproject is developed and delivered effectively; using the traditional metrics of the triple constraint of scope, time and cost (PMI, 2004), a megaproject should be successful if it delivers the benefits that were defined in the original strategies and business case. In the past 40 years in particular, this has not consistently occurred, and the 'megaproject' has been plagued by a myriad of issues which have brought its shortcomings to the fore. This is reinforced repeatedly in studies showing that "performance data for megaprojects speak their own language. Nine out of ten such projects have cost overruns;……over 50% are not uncommon*"* Flyvbjerg (2014b, p. 9). Perhaps out of sheer frustration, he provides examples to illustrate what he terms, the Iron Law of Megaprojects – that megaprojects are "over budget, over time, over and over again" (Flyvbjerg, 2014b, p. 11).

With such a poor track record and pedigree, one may wonder why organisations continue to use the megaproject as a method to deliver an outcome. Merrow (2011, pp. 15-16) identifies four compelling reasons to further study and understand megaprojects:

1. there are many more of them than in times past, and this will continue for decades to come;
2. these projects are important (to societies, the global economy, to sponsors and funders);
3. these projects are problematic and failing at an alarming rate;
4. there is not much published that speaks directly to these types of projects.

While this list was produced several years ago, the first three reasons remain relevant in the context of the present research, with the fourth reason having now been addressed by more researchers specifically investigating megaprojects.

One final perspective on megaprojects is that of project-induced risk: risk that can occur on a megaproject throughout its development. Traditional project management techniques use a philosophy of risk-reduction as the project transverses through its lifecycle. This approach considers that as the project nears closer to its completion, risk is better understood, managed, controlled and closed-out. Sovacool and Cooper (2013, p. 217) make the contention (especially in the case of energy megaprojects) that failure of one sub-system introduce failure in another, which can create a domino-like effect for megaproject failure.

3.3 MEGAPROJECTS AND THEORY

Yi et al. (2015) investigated the number of published articles from 2000-2010 on the topic of megaprojects. While the total number of articles was only 85, the research identifies five theory-based contributions in the areas of: 1) cost and schedule management; 2) construction and site management; 3) risk analysis and management; 4) IT innovation and utilisation; and 5) leadership and professional development. A number of contributing theories are outlined; however, there is recognition that complex project management theory is increasingly being advocated as a main theory for megaprojects. It is also recognised that the phenomenon had largely been a practice-driven research area, and that there is an absence of a main theory (Yi et al., 2015, p. 8).

Broader analysis of the project management literature suggests that the field is characterised by multiple paradigms, perspectives, methodologies and weak theories (Padalkar & Gopinath, 2016, p. 1361). Theory on megaprojects can be linked from and traced to theories which were defined in the literature review in Chapter 2 (see Section 2.2.2). From an urban policy perspective, Vento (2017, p. 68), on one hand sees megaprojects as representing a turn from welfarism to entrepreneurialism; but on the other hand argues that the mechanisms used to implement megaprojects can result in a reduction of transparency and democratic control. Sovacool and Cooper (2013) continue their discussion on governance paradigms by considering five theories on why megaprojects fail, which emerge from different disciplines as outlined in Table 3-2.

Table 3-2: Emerging theory on megaproject failure[14]

Theory	Explanation	Disciplines
1. Social Governance	Megaprojects fail when they try to appease too many constituents	Public policy, sociology, governance
2. Technological Systems	Megaprojects fail because they are complex, tightly coupled, and costly	Historiography of technology, sociology of technology, science and technology studies
3. Democratic Politics	Megaprojects fail due to lack of representation, corruption, and authoritarianism	Political science, science policy
4. Externality Economics	Megaprojects fail by externalising costs and consolidating benefits	Economics, political theory
5. Risk Assessment Accountability	Megaprojects fail because of bias and overconfident planners	Strategic management, insurance and risk management, business, psychology

Sovacool and Cooper (2013) recognise that each theory has its own merit by focussing on a single dimension, but that this singular approach misses the value of what other theories have to offer. This further identifies reasons for the confusion in defining megaproject success. While it is difficult to define with any great deal of accuracy the point at which a project becomes classified as a megaproject, Sovacool and Cooper quite rightly point out that there is also a middle ground where middle-scale projects may be better

[14] Summarised in Sovacool & Cooper (2013, p. 43)

able to leverage the benefits of decentralisation but avoid the detriments of gigantism (Sovacool & Cooper, 2013, p. 240).

3.3.1 Corporate Arrangements and Megaproject Governance

What are the typical governance structures used for governing megaprojects? With limited consensus on defining megaproject governance, there is even less in the literature that relate to project governance structure use. In order to provide a comparison of the governance structure used in this thesis, a sample of three commonly used project governance structures are presented. The first structure (Figure 3-1), from Patel and Robinson (2010), describes a commonly used Private Finance Initiative (PFI) delivery model for UK health projects. It uses a simple reporting structure, allowing for clear accountability and decision making. This model focusses on the importance of the project governance being shared between the senior user, a project executive, and a senior supplier. The second structure (Figure 3-2), from the Association of Project Management (APM, 2004) describes the relationship between corporate governance and project activities. The Venn diagram shows the relationship of board, major project stakeholders and alignment of projects as the key to structuring project governance. The third structure (Figure 3-3) is from a better practice guide that describes a Public Private Partnership (PPP) project governance structure (Finance, 2012). It focuses on the relationship between a department, the steering committee, and the relevant PPP delivery authority. In this structure, the complexity of the governance relationships is shown relating to functional roles within the structure.

In Figure 3-1 and Figure 3-3, the hierarchical construct is of a higher-level group overseeing the work of subordinate work groups. The works is further broken down into groupings of tasks in order to efficiently deliver the work. In both, the organisational structure is simplified to show the key relationships in how work is compartmentalised and divided up. Figure 3-2 is also a simplification where the corporate and project activities of an organisation overlap, which overlap is considered the project governance arrangement.

One view on megaprojects is that they are being used for strategic transformations yet in the context of uncertainty, which makes it difficult to govern the project to deliver objectives. In such circumstances, there is a requirement for skills in technical matters and the ability to function in turbulent operating environments (Pitsis et al., 2014). This may indicate that the outcome required (of the megaproject) can be more important than the project governance structure to deliver the project. This position is reinforced by Too and Weaver (2014), who suggest that ‘good governance’ is about achieving an optimal balance between portfolio management, project sponsorship, project management offices, and projects and programs.

Figure 3-1: Typical PPP governance structure (Patel and Robinson, 2010)

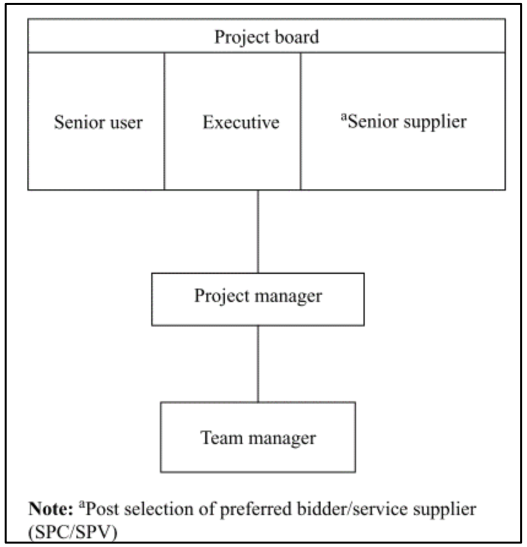


Figure 3-2: The Governance of Project Management (APM, 2004)

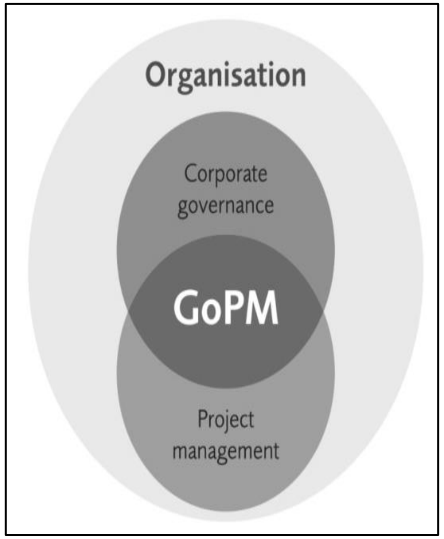
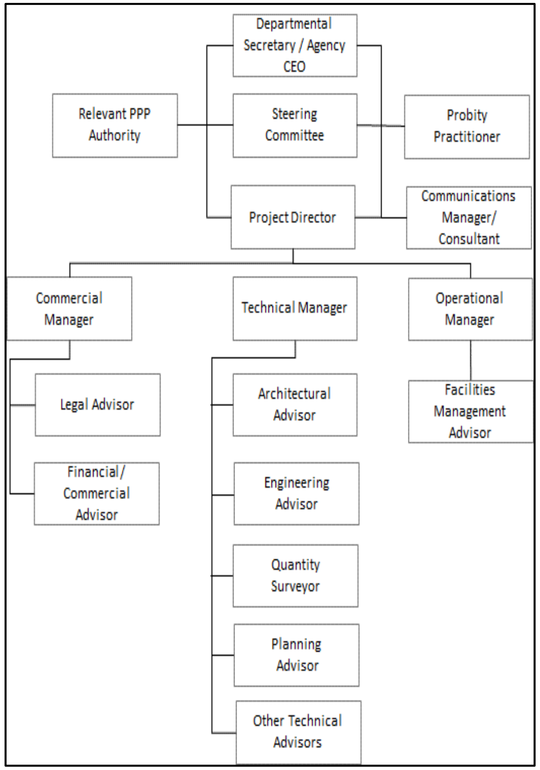


Figure 3-3: Typical project governance structure (Department of Treasury & Finance, 2012)



A number of institutional models are used to describe, develop and operate megaprojects. Miller and Floricel (2000) note that, over the past two centuries, there have been three different institutional arrangement approaches for Large Engineering Projects (LEPs): the Entrepreneurial Approach, the Rational System, and the Governance Arrangement. They identify that, since the mid-1980s, the approach to sponsorship of LEPs has been evolving, which has seen partnerships being formed between entrepreneurs, engineering firms, and financiers.

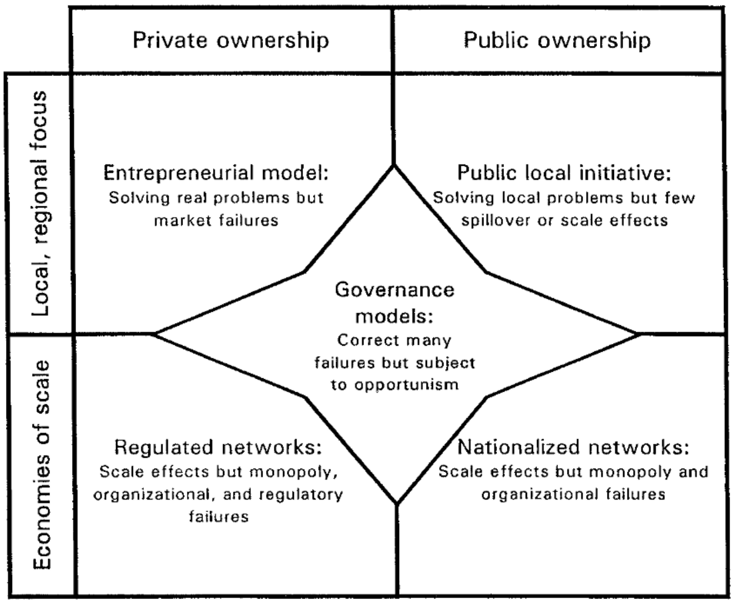
This has resulted in private actors becoming more involved in the sponsoring of LEPs through Private Financing Initiatives (UK) and Build Own Transfer (BOT) project delivery methods, right through to multilateral agency sponsorships using vehicles such as the International Monetary Fund, World Bank, and the International Financial Corporation (Miller et al., 2000, p. 52). These actors are alliances of project owners which include developers, contractors, banks and institutional investors, and operating firms. The actors themselves interact with other related project stakeholders such as government, the community, and regulators.

By the end of the twentieth century, Miller and Floricel observed that new social arrangements were also being used to sponsor LEPs, whereby networks of sponsors, banks, private investors and contractors developed projects and financed them. The newest type of institutional arrangement for sponsoring LEPs is the Governance Arrangement, which has allowed for the better allocation and sharing of risk, which is the key differentiator of the previous arrangements. Each of the institutional arrangements were based on deficiencies in previous models, with the contemporary Governance Arrangement model the result of attempting to satisfy failures of the previous, Rational System. The model is presented in Institutional models for Large Engineering Projects (LEPs) (Miller et al., 2000, p. 70) represents coordination of the four categories of issues used to classify the approaches. In their closing remarks made about the models, they question whether the model is a better way to shape and deliver LEPs. There is a belief that, due to the characteristics of LEPs, it is “difficult to design institutional arrangements that will remain optimal over the long term” (Miller et al., 2000, p. 70). This realisation sets the path for recognising that megaprojects are not static and should not be treated as such.

While Frick (2008) and Lundrigan et al. (2015) identify characteristics of a megaproject, Miller and Hobbs (2005) argue that there is little in the project governance literature addressing the dynamic nature of governance structures of megaprojects. The literature indicated governance is primarily an oversight function; with that oversight function being quite stable despite changing activities and context within the project. From a project management methodology point of view, as advocated by project management methodologies that consider project governance as being static (such as PRINCE2), the position on megaproject governance is that it differs significantly. Miller and Hobbs argue for “governance regimes that are themselves dynamic – that can change themselves to adapt to the emerging context” (Miller & Hobbs, 2005, p. 48).

They further suggest that when designing a project governance structure, there are three relevant streams in the literature that require consideration: corporate governance; institutional governance; and project governance. Within each of these streams, corporate and project governance is conceptualised as an oversight function; however, there is recognition that complex projects require governance structures that adapt to the context of the project.

Figure 3-4: Institutional models for Large Engineering Projects (LEPs) (Miller et al., 2000, p. 70)



The concept of project governance adaptability is supported by Too and Weaver (2014) who argue that there must be a link between the outputs of a project and the business strategy in order for projects to deliver value. In a review of project governance structures of Australian projects, Wilson et al. (2010) argue that the complexity of a project necessitates the use of a variety of governance structures, ranging from corporate governance and reporting obligations, to internal governance accountability. While the performance of corporate boards has received much attention in the literature, there has been little application of such principles and considerations to megaprojects and project governance.

3.3.2 Major Roles in Megaprojects

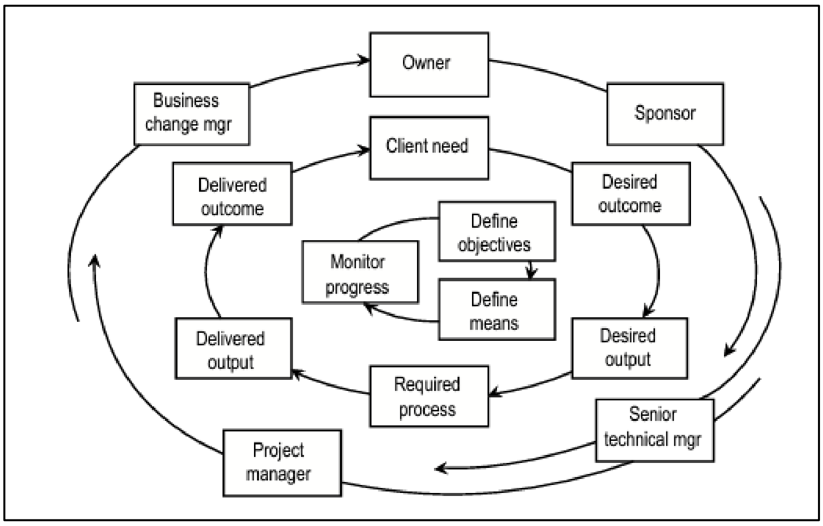
Project based organisational literature has focussed on specific management functions, whereas projects are used to integrate diverse knowledge and skills and undertake complex non-routine tasks (Miterev, Turner, & Mancini, 2017). At the core of a megaproject there are a several key roles in the structure: the Project Board (consisting of a number of individuals who represent various interests); Project Director (whose primary role is program management of a body of work with multiple sub-ordinate projects managed by project managers); Project Managers (responsible for the delivery of project outcomes using a range of tools, processes and methodologies on a daily basis); and more broadly, the Project Team. There are also many other enabling support services and sub-sets of these key roles, such as those outlined by

Turner (2014), which include the Owner, Contractor, Users/ Operators, Consumers, Sponsor, Senior Technical Manager and Business Change Managers. With all these differing roles and responsibilities, each function takes on activities that create an advantage to deliver the project successfully.

Turner uses the diagram presented in Figure 3-5 to describe and demonstrate the cycle and interrelationships between core roles. Lester (2017) confirms the importance of clearly defining the governance project management functions to ensure that the project manager and project team "are competent, aware of their roles and responsibilities and motivated to improving the performance and delivery of the project" (Lester, 2017, p. 404). Lester also suggests that a project sponsor must keep up to date with the progress and management of the project and, as the owner of the project's business case, must accept responsibility for the realisation of the benefits that the project will deliver. As the intersection between the corporation and the project, the project governance arrangement can be seen as both the corporation and the project.

Findings from Chapter 5 and 6 will identify that the case study project considered success of the project as both the responsibility of the board and of the project team. The role and relevance to megaproject governance of the project director and project manager, however, have been somewhat overlooked. Industry associations have developed competencies and training for project directors and project managers, including definitions, primarily for project management, but not for megaprojects.

Figure 3-5: Governance roles of projects (Turner, 2014)



Project management bodies such as the AIPM (2011) and PMI (2016) define the work undertaken by the project manager and project director succinctly. The project manager is broadly the person assigned to deliver the project objectives and manages a project team/s. The role utilises a range of tools and methodologies, as well as having responsibility and autonomy in performing technical operations, delivery and planning functions. Turner and Müller (2005) specifically identify that the literature on project success rarely mentions the role of the project manager.

The work of a project director is normally performed under the direction of a project board or project senior executive. The project director's role can consist of multiple subordinate projects, and ensures effective control over scope, escalation of issues and risk and budget allocation. They are likely to be involved in analysis, diagnosis, design, planning, execution and evaluation of technical and management functions (AIPM, 2011). While these roles are generally well understood from a project success and governance perspective, an emerging field for consideration is the impact of the project manager and project director on the success of a project and the governance. Interestingly, those two roles, which are closest to the delivery of the project, are not well understood with respect to success in the literature.

3.3.3 Megaproject Governance: A Temporary and Time Dimensioned Construct

A project is judged by its ability to meet what are primarily economic constructs of time and cost achievement, which have several constraints, assumptions and time-dependant risks. In effect, the temporary nature of a project conflicts with the longevity and legacy of the outcomes the project delivers. One of the challenges of a megaproject is that it is an engineering and economic creation to effectively deliver a defined outcome through investing significant capital, which will only materialise benefits into the future and will impact upon different actors through its lifecycle.

Merrow (2011, p. 191) argues that megaproject governance is a historical accident, designed based largely on traditional methods of a project leader, with some activities coordinated under a project director due to efficiencies, and others that are centralised (such as human resources, estimating, scheduling and procurement) to prevent chaos. He argues strongly that megaprojects should not be delivered by a '*program'*, as sometimes the organisational risk management response to the complexity of a megaproject is to, instead, deliver the megaproject as a series of related projects in order to spread the cost of a single project. His argument is that, when megaprojects are carved up (for whatever reason), the results have been miserable. In addressing the viability of megaproject models, he proposes three basic models, which are presented in Table 3-3.

The Hertie Business School of Governance (HBSG) stated in 2016 that the "objective of good infrastructure governance is to make the right projects happen in a manner that is cost efficient, affordable and trusted by users…*"* (2016, p. 103). Much of HBSG's work focussed on large infrastructure projects and as a part of their analysis, the need to re-introduce governance into infrastructure is argued. Earlier, in 2014, the HBSG identified 4 core governance administrative capacities for improved governance, which are outlined in Table 3-4 which provide a framework for exercising governance. In 2016, HBSG examined 40 cases of infrastructure governance worldwide, and identified four governance responses for infrastructure projects and programs. The four additional key responses (identified as Topics 5 through 8 in Table 3-4), combined with the 2014 administrative responses, form the basis of 8 Topic areas identified as potential innovative approaches for governance bodies overseeing infrastructure projects.

Table 3-3: Alternative megaproject governance structures, based on Merrow (2011, pp. 191-196)

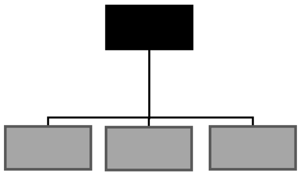
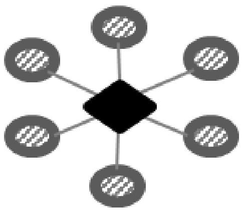
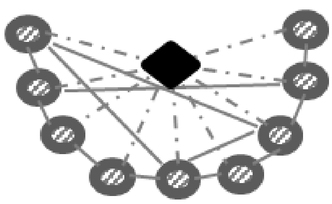
Megaproject model	Description	Characteristic
Traditional 	Large but simple project. One or two teams report to a project director and a business project director	Clear lines of authority Quick communication (downwards) Unable to handle complex integration (greater than 2 teams) Often morphs into model 2, without being carefully planned as such.
Hub and satellite 	Moderately complex with 3 or more teams with different scope Most common approach for megaprojects	Each area managed largely as a separate smaller project Boundaries need to be carefully drawn ('good fences make good neighbours') Central hub requires tight integration which can slow works down, especially with third-party involvement.
Organic 	The centre outlines the master plan and distributes out to all of the team to carry out Easily scalable	Change and surprises managed at the area level Requires integration managers from each area disseminates information to affected parties Better for front-end integration

Table 3-4 : Administrative and Strategic governnce capacities (Hertie 2016, pp 127-128)

Topic	**Core governance administrative capacities (Hertie, 2014)**	**Strategies for improved governance (Hertie, 2016)**	**Description**
1. Analytical	X		The capacity to provide intelligent advice
2. Coordination	X		The capacity to mediate between and bring together actors to achieve joint action
3. Regulatory	X		The capacity to provide oversight over heterogeneous private and public organisations
4. Delivery	X		The capacity to execute and manage policy requirements at the front line
5. Allocation		X	Reconfiguration of existing governance arrangements (i.e. responsibilities, risk and decision making. How stakeholder groups coordinate for efficient, effective and equitable outcomes)
6. Reform		X	To ensure optimised arrangements are embedded in practice
7. Trust Building		X	By engaging society in decision making processes about infrastructure
8. Future Proofing		X	To ensure policy and assets are resilient and adaptive to future unforeseen events, developments and events

The first four topics identify administrative capacities required by governance bodies. Capacities could be reflected as skills or competencies required for governing bodies; but in the context of HBSG these provide a lens to understand how governing bodies exercised their responsibilities. Combined with the four new 2016 governance-based strategies, they provide an additional lens with which to consider governance effectiveness. The 8 areas are also interconnected and dependent on each other: good delivery capacity (topic #4) allows for reform (#6) and trust building (#7) to be implemented; and likewise, poor future proofing strategies (#8) will be unlikely to be achieved if coordination (#2) of all relevant stakeholders does not occur.

3.4 THE LIFECYCLE OF MEGAPROJECT GOVERNANCE

In order to frame governance as a mechanism that is useful for managerial and organisational insights, Gil and Lundrigan (2012) discovered that megaprojects could be understood as a relay race, whereby control of the megaproject passes “like a baton between leadership teams” (Gil & Lundrigan, 2012, p. 5). The relay race has four stages, which are not unfamiliar to common lifecycle stages of project management, each having a unique function and priority: the inception, gestation, delivery and operation. Framing the issue of megaproject governance (and leadership) as the passing of a baton has highlighted a previously overlooked element of governance arrangement: hand-over/hand-off (Ho/Ho) points, and longitudinal governance control points.

Gil and Lundrigan’s initial position were that it was at these hand-off stages where strategic change is most likely to be resisted. Their later position was that by identifying the hand-off points, this demarcates the project management function from the megaproject leadership functions. In fact, they demonstrate that megaprojects rely on different leadership teams at various stages along the lifecycle. In the context of consistent language for the present research, the term leadership has been interpreted to mean the governance arrangement for a megaproject.

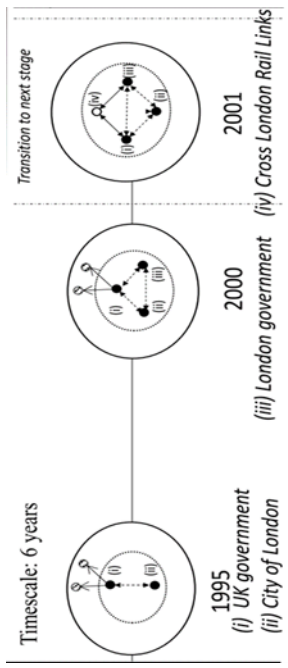
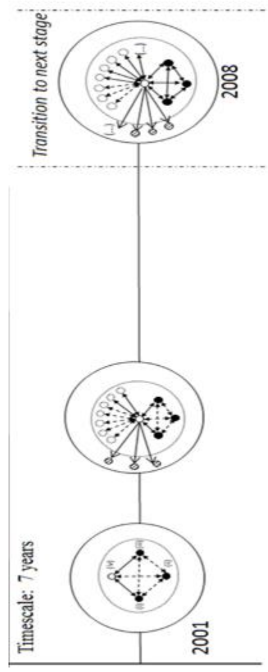
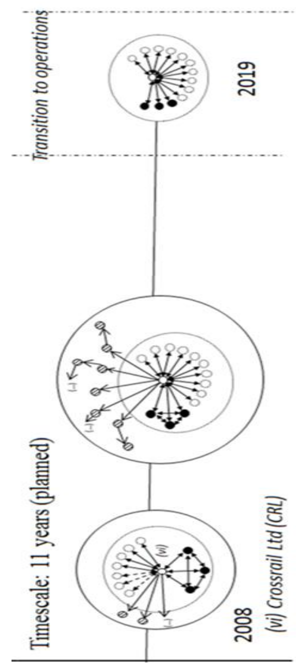
3.4.1 The Changing Nature of the Governance over the Lifecycle

The framing of a 4-step governance relay race construct was further tested and refined by Lundrigan et al. (2015) several years later, through a longitudinal inductive analysis of three megaprojects.. This construct uses a precept of theory on meta-organisations that the system is not self-organising but must be designed and managed by a central founding actor (Lundrigan et al., 2015, p. 4). The resultant megaproject structure is considered as a blend of an open, pluralistic system and a closed, hierarchical system, with the core being made up of members to deliver the overall project objectives and outcomes (through the project board, sponsors, senior project owner team and the organisation) and a peripheral made up of suppliers of resources to deliver the project.

Several dynamic changes between the core and periphery occur over the lifecycle, shown through an example of a megaproject in Table 3-5. From this example, it is clear that there are three meta-project stages (or Ho/Ho points) where the core and periphery actors evolve and change over time. In the example provided, the number of actors in the core grows during the early stages, as more stakeholders become aware of (and interested or involved) the possibility of the megaproject concept being approved.

In the gestation phase, the inner core arrangement is at its most complex, as the scope and key stakeholders work together to determine procurement arrangements, engage with key providers, and sign complex contracts. In the delivery phase of the third timescale (2008-2019), there is significant growth of the outer core, as the physical works of the project commences; and while the inner core is still complex, relationships between the inner and outer are coordinated through contractual relationships. Scope and key stakeholders work together to determine procurement arrangements, engage with key providers and sign complex contracts. Membership in Stage 2 grows, while the cost estimates at this stage remain stable. At the handover to Stage 3, at which point the meta-project arrangements terminate and transition to operations, the organisation returns to a core inner arrangement.

Table 3-5: Stages of meta project stages for the Crossrail project (Lundrigan et al., 2015, pp. 42-43)

Meta organisational stage	**Evolution of the constituent parts (core and periphery) over time**
Stage 1 - Embryo Conceiving the project and the project organisation (1995- 2001)	
Stage 2 - Gestation (of the organisation) Widening the structure (2001-2008)	
Stage 3 - Delivery (of the project) Consolidating the structure (2008-2019)	

While traditional project management methods suggest that a project board also is created by design, the awareness that the project governance structures also change, has not been widely considered. The changing nature of the governance actors over the life, and the durations of these organisations (the example has a 24-year lifecycle, from 1994 to 2019), demonstrate how the environment of megaprojects changes significantly and that those initial concepts of a megaproject are realised only over a very long period.

To further test the concept of a project board being created-by-design versus being an organic and self-regulating system, the next section will discuss cybernetics and a leading model used in that domain.

3.4.2 Cybernetics and the Viable System Model

By no longer considering a megaproject as just a static actor with one governance arrangement (the project board), but as a dynamic and evolving system, opens up the opportunity to consider the application of theories from different fields to megaproject governance arrangements. Such analysis is reflective of the in-practice application of theory, as it is developed to explain the practices that are occurring. As themes and ideas of complexity are introduced and addressed, a megaproject is considered as an evolving and changing system.

An area of potential application to explain megaproject theory is thus that of cybernetics. In a modern setting, cybernetics was first mentioned in the 1950s by Norbert Weiner, while Stafford Beer applied cybernetics to a management domain, where he defined cybernetics as the science of effective organisations (Kummamuru, 2016, p. 71). Beer (1970) focused on operational research and cybernetics, specifically on the use of management systems that "grow and are stable, learn and adjust, adapt and evolve" (Beer, 1970, p. 114). His research saw the development of the Viable System Model (VSM). Beer's view was that systems manifest viable behaviours, or in other words, are designed to evolve and change in order to survive and continue to be viable. The theoretical model on Viable Systems was described in *Brain of the Firm* (1972) and refined using a first principles approach in *the Heart of the Enterprise* (Beer, 1979, 1984). It is not the intention here to define the construct of the VSM in any great detail, as there are already many avenues of research on the use of the VSM, and the present thesis presumes its validity (Beckford, 1993; Ja'bari, 1995). The intention, however, through the research method, is to consider the similarities of a VSM to megaproject governance structure, as an adapted theoretical concept for explaining megaproject governance. The comparison is undertaken in Chapter 7, while the next section provides a literature summary.

The main assumption of the VSM from the theoretical perspective is the Recursive System Theorem: that "in a recursive organisational structure, any viable system contains, and is contained in, a viable system" (Beer, 1979, p. 118). Beer's VSM identifies five sub-systems of a cybernetic model of any viable system, and these subsystems interact within a shared environment and are capable of maintaining its identity independently (Beer, 1984, p. 14). The VSM has five sub systems, detailed in full at Appendix D, which are generally referred to as:

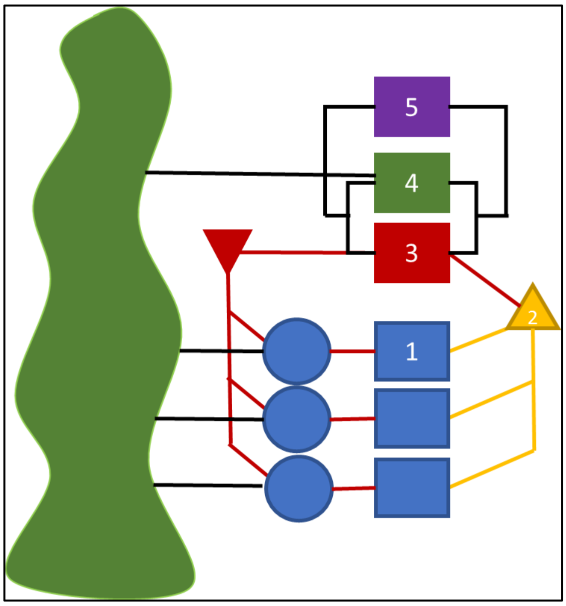
- System 1 – implementation;
- System 2 – co-ordination;
- System 3 – control;
- System 4 – planning;
- System 5 – policy.

Within the VSM, there are two meta-systems comprising the Systems of 3-4-5, known as the first recursion, System 1, and the second recursion, which is an operational element of another viable system in itself (Beer, 1979, p. 318). While there have been many interpretations of the five systems, Beer demonstrates that each of the sub-systems are Viable Systems in themselves.

3.4.3 Comparisons of the VSM to a Megaproject

For the purposes of comparison of a megaproject structure to the VSM, the adaption of the VSM by Lelic and Sourlas (2012) is useful in further describing the VSM. The Cwarel Isaf Institute (2017) simplify the five systems to more contemporary management language. The colour coded graphic of the VSM at Figure 3-6 shows these relationships, and in using a visual representation, colour coding has been used.

Figure 3-6: Colour coded Viable System Model (VSM) (Lelic & Sourlas, 2012)



Using the layout and definitions of the VSM, it is possible to compare the VSM to a project governance structure by direct comparison through mapping. System 5, which is the policy function, is compared to the overall department responsible for the strategic direction of the megaproject. This function is responsible for identifying new projects and will be the overall recipient for the benefits of the project. System 4 would compare to the project board or chair of the project, which works with the external environment (suppliers, contractors, service providers, designers and the like) and responsible for the delivery of the project itself. The System 3 could equate to the role of the project director. The term project director is used here to nominate the most senior person responsible for the delivery of the project. System 2 function is the reporting function where multiple work packages, issues and status reports are collated to provide management information; and System 1 represents either the singular deliverer, or for megaprojects, the delivery groups who undertake stages, work packages or discipline-related works. This comparison of the VSM to a project governance structure is summarised in Table 3-6.

Table 3-6: VSM mapping against a project governance structure

VSM System	VSM Name	Project governance equivalent
System 5	Policy	Department / Asset Sponsor
System 4	Planning	Project Board / Chair
System 3	Control	Project Director / CEO
System 2	Coordination	Reporting
System 1	Project implementation	Work packages/ delivery groups

3.5 EVALUATING THE SUCCESSS OF MEGA TRANSPORT PROJECTS

3.5.1 Success Criteria

While the performance of corporate boards has received much attention in the literature, for example the relationship between corporate governance and performance (Huang, Chan, Huang, & Chang, 2011), corporate governance and price-to-book ratios (Newell & Wilson, 2002) and incentive pay for Directors (Gerety, Chun-Keung, & Robin, 2001), there is little evidence that the principles and considerations addressed have been applied to megaproject governance. In particular, the criteria for the successful delivery of these megaprojects is under-represented; and for now, the project management criteria of time, cost and quality, are the main criteria in use.

Dimitriou, Ward and Wright (2013, p. 20) found that 84% of respondents to their survey agreed that using Cost Benefit Analysis (CBA) was an adequate tool for appraising megaproject transport projects. The research concludes that, when asked the question "What constitutes a successful Mega Transport Project (MTP)?" there were many and varied responses. Factors such as considering risk, uncertainty and complexity in the decision making were identified as important; however, judgements based on limited business cases failed to capture the transformative aspects of the economies and cities in which the projects were delivered. The scope of the time, cost and quality metrics can hide broader and longer-term effects created by the MTPs. MTPs, if accepted as open systems, often require time and space in order to evolve and adapt in response to the lengthy project lifecycle. As a result, the research concluded that it is "imperative to ensure the proper framing of MTPs in a manner that enables appraisal to be based on a more broad, fair and transparent foundation" (Dimitriou et al., 2013, p. 38). The concept of broader foundations was explored further, where Dimitriou (2014) considered project achievements in relation to the original objectives and 'merging new requirements' as the project progressed.

With emerging objectives, the MTPs are provided with opportunities to redefine the predefined project boundaries and maximise the longer-term opportunities, even though the original objectives may have changed. As opportunities to deliver additional value appear through identification of emergent objectives, the function and scope of the project is likely to have changed significantly. Identification of changing political, environmental and stakeholder priorities provides Dimitriou with evidence to suggest that "MTPs should not be seen as static engineering artefacts but organic phenomena that alter over time" (Dimitriou, 2014, p. 429).

3.5.2 Managing Risk to Assess Success

The final consideration that will be addressed in this discussion is the complexity of arrangements required for MTPs. As the chapter has argued, the depth of studies and research on megaproject governance structures is limited, however risk management is one in which Biesenthal and Wilden (2014) identify as requiring sophisticated governance mechanisms that manage and control projects. Sanderson (2012) used snowball sampling in order to understand the different types of explanations for the performance of megaprojects. This work resulted in the broad categorisation of three types of explanation based on decision-maker views on the nature of the future (especially relating to risk and uncertainty) with arguments classified in to three categories of:

1. intentional and strategic rent-seeking behaviour15;
2. misaligned and underdeveloped governance;
3. diverse project cultural and rationalities.

The position taken by Sanderson is a reasonable place to conclude the analysis of the challenges faced by megaproject governance arrangements. As Sanderson (2012) suggests, the key gap in the explanations is that:

> "all of these explanations relate therefore to their emphasis on project governance as a form of organisation that can be consciously designed ex ante. As a result of their acceptance of actor farsightedness, none gives sufficient attention to project governing manifested as spontaneous micro-processes of organising as a project unfolds ex post" (Sanderson, 2012, p. 440).

3.6 CONCLUSION

The inclusion of this chapter has been an important aspect of the overall research to define what a megaproject is, and its many dimensions. The chapter has focussed on describing multiple facets of the characteristics of a megaproject in order to gain a solid understanding of the phenomenon. The definitions of a megaproject, and success and failure factors, were considered, as were the different models being used to deliver megaprojects. The chapter highlighted differences between a traditional project and a megaproject, but also gave insight into the complexities of the construct of a megaproject.

[15] Systematically under-estimating project cost, over-estimating benefits and optimistic with regard to schedule (Sanderson, 2012, p. 436)

One widely held view of megaprojects is on the poor track record of delivery, with these projects having gained their own ‘megaproject law’ of being ‘over budget, over time, over and over again’ (Flyvbjerg, 2017, p. 11). Contrasting views on the use of megaprojects were considered in the arguments of Merrow (2011), who reminds us that there are many more (megaprojects) than in past times, and that this will not change for many decades yet. The concept of induced risk was considered, as was the application of the viable system model being used to map against a project governance structure.

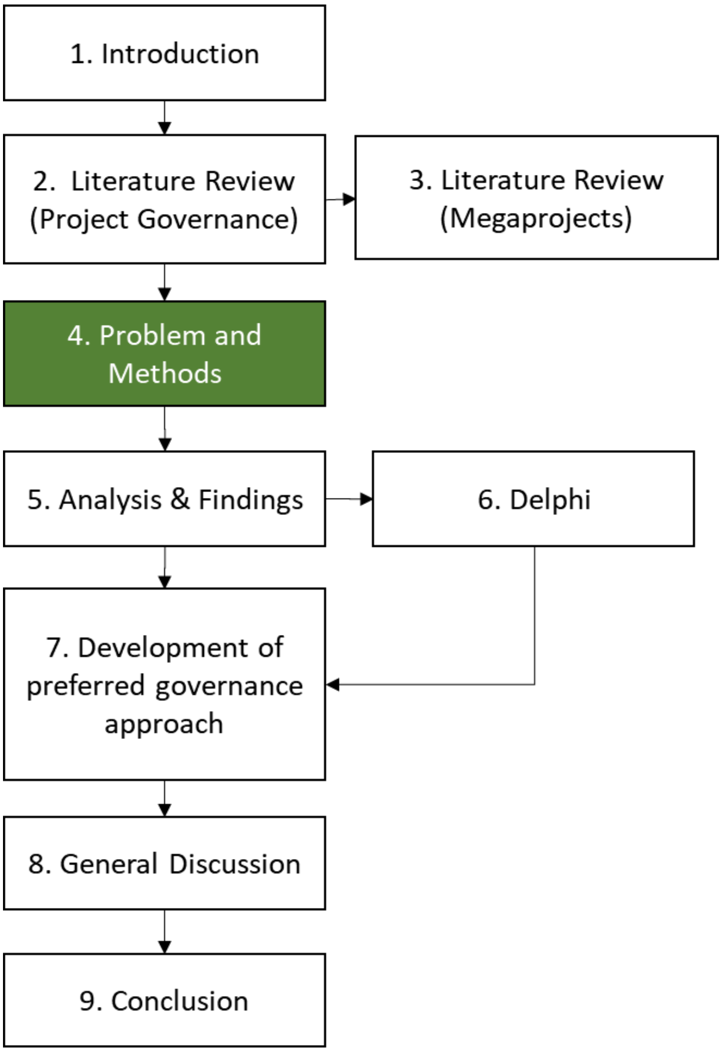
Theories currently associated with megaprojects were addressed; and this provided a better understanding on the governance arrangements required of megaprojects. While complex project management theory was identified as being advocated as a main theory for megaprojects, the literature identified that there are weak theories associated with megaprojects, with multiple paradigms, perspectives and methods. A relevant question asked of a megaproject is: ”Is a megaproject actually a project?”; and this thesis concludes that a megaproject is a project, borne from the domain of project management, but also displaying traits more similar to corporate governance, than to that of a traditional engineering project.

The literature reviews in Chapters 2 and 3 combined provide detail on the current knowledge base on the topic of project governance and megaprojects. Chapter 2 identified the origins of corporate governance and the relationship it has played in developing project governance from theoretical and practice perspectives. The reviews determined that research to date had focussed on developing new structural models and definitions to improve governance arrangements. Megaproject were differentiated as different from more traditional projects. This differentiation is important to support the selection of a megaproject case study and to identify potential new governance models or processes.

The two literature review chapters identified and explored potential gap and supported the direction of the subsequent chapters in this research. In particular, it was highlighted that a megaproject governance evolves over time, especially in relation to the number and intensity of stakeholders. One aspect however is clear: megaproject structures are not well understood.

Before moving to the case study (Chapter 5), the methodology used for this thesis is explained in the next chapter (Chapter 4), which defines the problem, methods and methodology used to answer the Research Questions.

Chapter 4 Problem and Methods



4.1 INTRODUCTION

There has been a focus in the literature on improving deficiencies in previous governance models, and on the application of new governance structures in future projects. The present research has responded to calls from project management researchers to develop new approaches to project management research.

Theoretical frameworks used to analyse governance were described and dominant project governance theories were introduced. While new models have introduced practices to the profession of project management, there is little detailed research on whether these impact or improve the performance of a megaproject. Furthermore, there is a gap in the research demonstrating whether the decisions taken by a project board assist or detract from the overall performance on a megaproject. To address specific gaps in the knowledge, this chapter will describe and discuss the methods selected to answer the Research Questions presented in Chapter 2.

This thesis focussed on a rare megaproject – one that was successful. The case study was the Regional Rail Link project and was universally recognised as a success: it created 5,000 jobs and as a transport project, provided capacity for an additional 9,000 passengers in the morning peak period. It was also delivered under budget and within its timeframe.

The aim of this chapter is to discuss the issues outlined below. Through addressing these, a clear link between the problems identified and how this research will close the gap will be made, through explaining the methods used. The following matters will be discussed in detail in this chapter:

- Section 4.2 addresses the research approach taken, and the merits of using a case study approach including data gathering techniques.
- Sections 4.3 and 4.4 address the selection of the case, justification of this selection, and subsequent case study methodology and application;
- Section 4.5 discusses the ethical considerations of the approach, including a review of the literature on how to assess such considerations;
- Section 4.6 discusses the limitations of the approach and methodology.

By the end of the chapter, the five sections will have provided a comprehensive understanding of the approach to the research methods. The following, Chapter 5 will be dedicated to analysing the data and will position the research in order to present the results and finding of the case study. This will allow for the 4 research questions to be answered, which are:

- RQ1 – What is megaproject governance?
- RQ2 – What is the impact of governance on a megaproject?
- RQ3 – What are the core decisions that are made by a megaproject board?
- RQ4 – Are there new models and/or processes that can be used to improve the functions of a megaproject board?

4.2 THE RESEARCH METHOD USED

To answer the Research Questions, a case study approach was used. The study of a case: can involve single or multiple cases; can use qualitative, quantitative (or both) forms of evidence; and can be used to achieve various aims, from providing a description to testing theory or generating theory (Eisenhardt, 1989, pp. 534-535). In this instance the study was used to provide a description of a specific case and to test theory.

A case study seeks to appreciate the case from multiple perspectives, seeking out its uniqueness and complexity, and through the use of protocols such as triangulation, observations, interviews and documentation can support the validity of the data observed (Stake, 1995). Case study methods for the development of theory, as identified by Yin (2014), guided the early development of selecting and using a case for the research, as did guidance from Creswell and Plano Clark (2011) who provide an awareness of using mixed method research approaches in case studies.

Eisenhardt (1989) suggests that one of the strengths of using a case study to achieve this is in its likelihood of generating novel theory (1989, p. 546). One of the important process steps is building theory from a case study. Eisenhardt provided an 8-step roadmap to build theories from case study research, which was adopted for the present research and outlined at Table 4-1 and discussed in detail in Section 4.4, with rationale argued. The Eisenhardt roadmap induces theory through case studies and is recommended for new topic areas. The process was also highly iterative, and required tight links to data. As the area of investigation is an emerging topic area, the appropriateness of using this method is consistent. The steps are described in conjunction with the overall steps undertaken during the research cycle.

To support this research, a primarily qualitative approach was used to analyse data. Harrison III (2013, p. 2160) recognises that qualitative research is more appropriate for answering questions that address the ‘why’ and ‘how’; but when qualitative analysis examines a few, the ability to generalise results to many can be lost. Stake’s (2010) view is that qualitative research can be used to understand one thing well. When using a qualitative approach, researchers need to avoid both overcomplicating and over-simplifying understanding, which Stake refers to as a stereotype, or a simplistic representation. While a stereotype can be addressed by emphasising a particular experience, dialogue, context or multiple realities, this chapter also discusses the limitations and weaknesses of the overall approach used. It is appropriate at this point to note that one of the weaknesses of qualitative research is its subjectivity.

In qualitative research it can take a take a long time to understand what is going on and how it all works (Stake, 2010, p. 29). Compounding this weakness is the specific nature of using one case, and the question of whether a case study is representative of broader samples and how theory building can occur from a single case study, especially in a social sciences field.

This chapter will describe in detail the process of selection of the research method and will argue why the approach was taken, including the specifics of the case studied. However, firstly, it is important first to describe the context and approach used for the case.

Table 4-1: Process for building theory from Case studies (Eisenhardt, 1989, p. 533)

Step	**Activity**
1. Getting started	Definition of research question Possibly a priori constructions Neither theory nor hypotheses
2. Selecting Cases	Specified population Theoretical, not random, sampling
3. Crafting instruments and protocols	Multiple data connection methods Qualitative and quantitative data combined Multiple investigators
4. Entering the field	Overlap data collection and analysis, including field notes Flexible and opportunistic data collection methods
5. Analysing data	With-in case analysis Cross-case pattern searching using divergent techniques
6. Shaping hypothesis	Iterative tabulation of evidence for each construct Replication, not sampling, logic across cases Search evidence for 'why' behind relationships
7. Enfolding the literature	Comparison with conflicting literature Comparison with similar literature
8. Reaching closure	Theoretical saturation when possible

4.2.1 Social Science Research Methods

This research is within the bounds of the social sciences; and therefore, the approach to the methods selection adopted a social science framework, as proposed by Crotty (1998). Crotty's position is that, to develop a research proposal, significant effort is required to be put in to answering a number of questions in order to understand knowledge. He proposes four questions within his framework which constitute the basis of the research methods process. There is a recognition that a bulk of discussion and terminologies on methods, in general, relate in one way or another to the four elements that he proposes. These four elements ask the following questions:

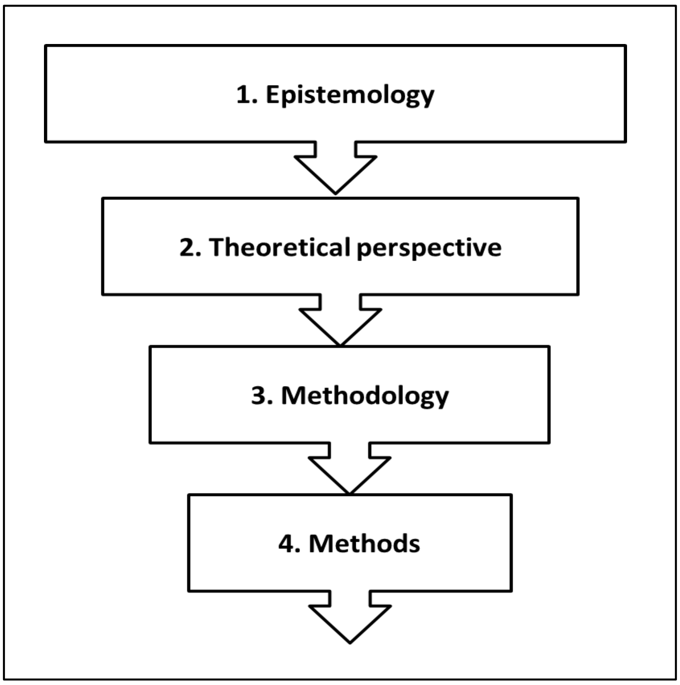
4.2.2 What epistemology informs this theoretical perspective?

1. What theoretical perspective lies behind the methodology in question?
2. What methodology governs our choice and use of methods?
3. What methods do we propose to use?

By answering these questions, the framework allows for a clear pathway both in understanding the benefits of the approach taken, and also identifying the limitations of the research. In turn, the answers to these four questions allow for a sound research methodology to be developed and contextualised within each of the elements. To develop the overall approach, each of the four questions is defined and discussed as follows.

Crotty (1998) used a definition from Hamlyn (1995) to describe epistemology as dealing with "the nature of knowledge, its possibility, scope and general basis" (p. 8). This is further explained by Maynard (in Crotty, 1998) as a grounding for deciding what kinds of knowledge are possible. The four elements of the framework can be shown to relate to each other, as is outlined in Figure 4-1. The framework was useful for the present research in allowing for the initial development, and then further refinement, of the methods selected and used. While each of the four elements is shown as sequential, in practice there was a significant amount of back-and-forth between each of the elements, gaining confidence in the adequacy of the each of the decisions made and the final direction taken. Each element is addressed to provide an understanding of the overall research method.

Figure 4-1: Research Methodology Elements (Crotty, 1998, p. 4)



4.2.3 Defining the Four Elements

Within the social science domain, and in particular that of the humanist, there are many views on *epistemological* positions. One such view is through the use of constructivism, where the approach is said to sometimes lack epistemological and methodological status, as it is seen as being less rigorous than the physical sciences (Van Gigch, p. 554). The issue of rigour is also reflected in epistemological debate within the field of management, which lies somewhere between the cognitive philosophy discourse and the theory of organisation and management, as described by Sulkowski (2013, p. 24). As such, the management field may struggle to maintain its status as a science, due to many popular ‘management gurus’ being perceived as having a lack of scientific character. This issue is further reinforced with the confusion of whether the management field is actually a science and an art, or both at the same time. With rapid development of the philosophy of science, derived from modern empirical studies which occurred in the 20th century, there are now fundamentalist and non-fundamentalist epistemologies in social science (Sulkowski, 2013, p. 28). While there are a range of epistemologies, Crotty (1998) focusses on three main types of epistemologies as being:

1. Objectivism;
2. Constructionism;
3. Subjectivitism.

Objectivism holds meaning, as such, apart from the operation of any consciousness. Understanding and values are considered to be objectified, and objective truth can be discovered. *Constructionism* on the other hand views truth as occurring from coming in and out of engagements with the realities in the world. In this way, truth is not waiting to be discovered, but meaning is not just discovered, it is constructed. The third epistemology described by Crotty is *Subjectivism*, whereby meaning is imposed on the object by the subject. The object makes no contribution to the generation of meaning. This is balanced by the realisation that meaning is imported from somewhere, not just the interaction between the subject and object. Regardless of the approach adopted, Crotty gives guidance that *“*to avoid such discomfort [in contradictions], we will need to be consistently objectivist or constructionist (or subjectivist)*”* (Crotty, 1998, p. 15).

The *Theoretical Perspective* describes the philosophical stance behind the chosen methodology. It provides the necessary “context for the process and grounds its logic and criteria” (Crotty, 1998, p. 7) used in the methodology. This provides context to the assumptions used in the research task, by reflecting the methodology used. By defining the theoretical position, the research describes the way of looking at, and making sense of the issue.

A *Methodology* is described as the plan of action. It shapes the research in terms of use of methods and provides a link to the outcome, including proving a rationale for the method, and methods employed. Within the field of project management, Cicmil (2006) suggests that mainstream research in to project management relies heavily on the prescriptive and the instrumental, whereby project management can reduce or remove problems through appropriate actions or behaviours..

Method are the techniques (or procedures) used in the research. In particular, this element supports the gathering and analysis of data. The method is an important part of justifying the overall research process, which requires describing in detail, the techniques used, and the sort of activities undertaken. Crotty (1998) suggests that the methods don't just "identify themes in the data but show what we mean by the themes, how the themes emerge…and what is done with them" (Crotty, 1998, p. 9).

4.3 SELECTION OF THE RESEARCH METHODS

Some literature recommends that social scientists should begin with an *ontology* before developing the epistemology and methodology (Bennett & Elman, 2006, p. 457), but recognises that scholars are more likely to see the social world in a certain way. Within the project management field, Joslin and Muller (2016a) identify *ontology* as the way the problem is seen and *epistemology* as how it is accepted. Epistemology and ontology address the theory of knowledge and views of reality; however, the framework adopted in the present research does not specifically separate out or address ontology.

Crotty's (1998) framework allowed the research to be scaffolded in order to allow the outcome of the research to be convincing. Neuman (2006) recommends in making such decisions, that considerations of "who is the intended audience; what is the purpose; what is the research cycle; and what is the approach?" are taken in to account.

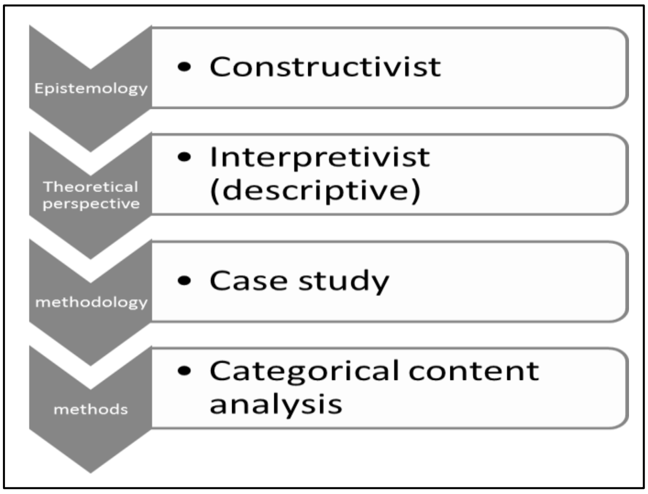
While Crotty's framework in Figure 4-1 may appear to follow a linear process, in that it cascades from element-to-element, in practice this did not occur in this research. Crotty recognises the simplicity of his representation as a limitation, suggesting that few would start their research with the epistemology as their starting point (p. 13). This provides reassurance, as in general a real-life issue is normally first identified, which then in turn needs to be addressed. Regardless of the direction that the arrows in the framework go, the overall methods and methodology required justification. A justification reinforces the need to be able to explain the steps that were undertaken, regardless of the interim steps that occurred to reach the end point. For the present research, each step was highly iterative, which allowed for new possibilities and directions to be introduced and discarded through the development and discovery process.

The approach adopted in this research defined the methods and methodology, and data were then analysed. This approach was selected because of the iterative process used where the methods and methodology required significant revision, as will become evident. For this thesis, a *constructionist* epistemology was selected. An *interpretivist* theoretical perspective provided the context for the process and philosophical stance that informed the methodology. The methodology, as identified earlier, was a *case study*, and the method used was *categorical content analysis*. The next section discusses each element of the research methodology.

4.3.1 Overall Research Method

The research framework is described in Figure 4-2. The four elements of the Crotty method (epistemology, theoretical position, methodology, methods) are populated with the methods that guided this research. Each will be explained and justified as being the most suitable approach for this research.

Figure 4-2: Research Method



4.3.1.1 Epistemology and theoretical perspectives

Vejar (2008) describes epistemology, or the theory of knowledge, as an age-old concept which is sophisticated and multidimensional. The position taken with the present research is that, to understand project governance arrangements of a successfully delivered project, truth needed to be constructed through locating and understanding multiple sources of perspective surrounding the success of the project. For some, even the notion of '*project success*' has various degrees of meaning depending on relationship the individual has to the project and the intimacy of the details, the processes and the relevance of the project to their reality. Crotty (1998) explains that constructionism is relative, and "what is said to be the way we do things around here is really just the sense we make of them" (Crotty, 1998, p. 64). Once recognised, it became clearer that the present research was not just observing what was occurring, but provided a narrative through how the project was seen and how it reacted to the environment in which it was delivered. Qualitative approaches often use a constructionist approach, as this view actively seeks multiple perspectives from participants (Creswell & Plano Clark, 2011, p. 41). This theoretical position is based on a view that meaningful social action occurs, whereby the research needs to consider social actors' reasons and actions.

The original perspective for the present study was to compare a successful and a failed megaproject's governance arrangement, in order to construct meaning. Due to constraints that are identified later, this approach was modified to specifically focus on the project governance arrangement of a successfully delivered megaproject. As part of providing the necessary depth of perspectives, four additions were made to the original method:

1. While embedded within the Project Office during 2014 as an observer, the data collection stage occurred concurrently while the project documentation was being discovered, classified and filtered. This allowed for a greater understanding of the culture within the project to be observed and constructed, and provided an opportunity to appreciate the project environment and operational tempo;
2. The research method was refined based on feedback from Prof. G.P.M.R. Dewulf, Dean, Faculty of Engineering Technology, University of Twente, Netherlands, at a postgraduate Infrastructure Engineering workshop at the University of Melbourne in October 2015.
3. Interviews with all of the board members (20/2/2016 – 12/6/2016) were included as part of the study to gain a greater appreciation of the board member's perceptions and insights into the project;
4. Initial findings were validated with Subject Matter Experts (September – October 2017) in order to ensure that the findings were credible and valid. This occurred through the use of a modified Delphi, which is described in detail in Chapter 6.

These enhancements were novel additions to the initial research method. An interpretative approach considers common sense as a vital source of information for understanding people (Neuman, 2006, p. 91), and for this research, this was invaluable. As an example, when the project board minutes were reviewed and methodologically coded, one theoretical position would consider that the board minutes reflected a true and full record of what occurred at the meetings. The interpretivist approach would consider this to be far too pure a view, as it would be unreasonable for all issues and discussions (including the tone of the meeting and other non-verbal actions), to be captured. As stated by Neuman (2006), the practical interpretist orientation of the perspective is "its ability to reflect in an authentic and comprehensive way how ordinary people get things done in commonplace situations" (p. 93). While this could be seen as a limitation, this perspective allowed for a robust methodology and method to be constructed and used as a strength in the methods developed.

4.3.1.2 Methodology and methods

The method describes the technique or procedures used in research. Neuman (2006) suggests that qualitative researchers tend to use a case orientated approach, whereby the analysis occurs in messy settings (*many factors and events in one place and time*). A detailed and data rich insight in to a case was used to replace a quantitative research approach, where precise and detailed analysis of measurements can be undertaken across a sample of units (Neuman, 2006, p. 158). The methods selected for this case utilised *Categorical* Content Analysis. Content Analysis examines social artefacts, which are usually written documents and uses coding as "the process of transforming raw data in to a standardised form" (Babbie, 2015, p. 328).

For a qualitatively oriented procedure for interpretation of text, Kohlbacher (2006) identifies '*structuring'* as a distinct analytical procedure that is the most crucial technique of content analysis. The goal of this is to filter out particular structures; and it requires the use of a '*coding agenda'* as part of the category application. The data sets analysed for this thesis were the formal project board documentation; in particular, the board's minutes and its sub-committee report minutes. Using the interpretivist approach, the formal documents were supplemented with interviews of the individual board members. The findings from each were triangulated to provide detailed new insights into the functioning of the project's governance body.

Gaining a detailed insight into the functioning of a megaproject, its mechanics, and how it operates in near real time, for research can be difficult. On face value, this may seem an odd statement. Research into the topics of project success and failure have ultimately been retrospective. The research agenda in the literature has considered '*why the project failed?*', accompanied by a number of speculations, suggestions and recommendations on what (future) project boards should change or improve to ensure their future projects are a success. As described in the literature review, there have also been a number of recommendations of how to improve governance arrangements of projects.

While the recommendations have generally moved the profession of project management forward, many of the recommendations were observed from the external project view of the project – research on the outside, looking in, and making sense by suggesting improvements. This approach has been identified by project governance researchers as a limitation; but it is unclear whether the external perspective was the only contributing issue to the perceived failure of such an approach. This gap is reinforced by Chang (2013), in his case review of a UK Privately Financed transport project which ultimately required significant government restructuring during the delivery phase "to salvage this derailed project" (Chang, 2013, p. 634). While the case study issues could be empirically explained by theory without looking into the opaque box, essential aspects of the core problems may have thus been lost. In Chang's case, there were many published reports and public hearing that provided valuable research data that could have been "neglected by simplifications made in theoretical and economic modelling" (Chang, 2013, p. 629) .

While Neuman suggests that the context of the research is important, it is also important for the project settings to be considered. The project details of the case are described in the next Chapter. The subject of governing projects and project success is varied and dependent on a large number of environmental factors and conditions within which the project was delivered. To ensure that as many contextual and setting elements could be considered and understood, selection of the case was critical. A number of criteria were developed to select the case, with the project setting a critical criterion. The case that was finally selected was undertaken in the home location of the researcher: it was a very well-known project: the availability of information was able to be easily verified: and based on the researcher's standing and contacts, unprecedented and complete access to datasets was provided, as well as access to all of the board members for personal interviews, and their ongoing and overwhelming support for this research.

Yin (2014) identifies four basic types of design for case studies based on a 2x2 matrix. The first consideration is that between the use of a single or multiple case study; and the second between holistic (single) or embedded (multiple) units of analysis. The decision on the type of case study needs to be made prior to the data collection stage, to ensure that the research questions can be answered. The present research is a single case study with a single unit of analysis; which using the Yin classification, is a Type 1 case study. A potential vulnerability of a single case study is that it may not turn out to be the case the researcher thought it was; but a rationale for using a single case study is that it can "represent an extreme or unique case" (Yin, 2014, p. 39). For the present research, the case was unique: it was a successful megaproject that was delivered within its timeframe and under budget.

In the fields of business administration and management, it has been a well-recognised practice to appreciate cases over rules, with an emphasis on case based practical teaching (Flyvbjerg, 2004). This is reinforced by Harrison III (2013) when discussing the use of mixed methods in business research. Harrison III suggests that mixed methods research, whereby qualitative and quantitative components are used in a single study, is linked to pragmatism as a philosophy, and that pragmatic inquiry includes induction, deduction and abduction. Providing guidance on when it is best to use the approach, he identifies sixteen design types. One of the rationales, triangulation, was described as a convergent design type where the components are combined to triangulate findings to be mutually corroborated (Harrison III, 2013, p. 2154). In order to corroborate findings, Content Analysis was used as the approach for the case in the present study. Content analysis systematically evaluates the symbolic content of all forms of communication (Kolbe & Burnett, 1991, p. 243). In the case studied, the board minutes and sub-committee reports were collected and analysed through the coding process itself.

Kolbe and Burnett (1991) identify that any direct method of enquiry can yielded biased responses. As the minutes of the board meetings were time bound, the methods used allowed for results to be considered within a distinct environmental and economic timeframe. The market appetite for delivering large projects of this scale was well known (for example, the Global Financial Crisis was occurring at the time the project was being approved). The analysis and coding techniques used for the board minutes were also successfully replicated for the board sub-committee documents and the findings are wholly based on documented data captured throughout the project's life. Along with data later collected and analysed through board member interviews, the results are able to be corroborated and understood in order to test the findings against theory.

A question raised by Crotty (1998) concerns understanding the methodology that governs the choice and use of the method. Neuman reinforces the importance of the methodology as the "research methodology is what makes social science scientific" (Neuman, 2006, p. 79). Neuman further suggests that, in modern times, science has become the accepted way to gain knowledge. One of the challenges observed analysing projects from a governance perspective can be that:

- the primary objective of a project is to deliver something new, and not necessarily to implement untested or novel governance approaches;
- getting access to accurate data on a project's governance structure is very difficult (especially if the project was not a success). A failed project receives a disproportionally high level of scrutiny

for not delivering to its expected parameters, and successful projects have little publicly available data to constitute a suitable dataset.

Significant effort was required to find a case study that would be suitable for understanding the actuality of the project governance, and by immersing myself in discovering suitable potential cases, a case was finally selected. The following provides an overview of the methods adopted in this research. A mixed methods research approach was adopted in the form of a case study, and its setting took place within the project office of a megaproject delivered and managed in Victoria, Australia. Data collection was in the form of written board minutes, sub-committee reports and interviews with each of the board members. These three data sources were triangulated to identify the core decisions and important issues the project board focussed on during the planning and delivery of the project.

Data analysis input used content analysis, which was supported by a qualitative software program, *ProSuite*, developed by Provalis Research, a Canadian company founded in 1989. ProSuite provides text analysis software with qualitative, quantitative and mixed methods programs (Provalis, 2018).

Gaining access to the board and project documentation of a successful megaproject was a significant challenge, but using industry knowledge and personal contacts, inroads were made, and closed doors slowly opened. One of the strengths of using a case study is its likelihood of generating novel theory, especially in areas where there is a lack of a strong theory or exploration of new concepts. In order to build theory, an 8-step roadmap was followed, which is described in Section 4.4.

4.4 APPROACH, METHODOLOGY AND STEPS

This section addresses each of the 8-step method as defined by Eisenhardt in Table 4-1. The method used a single case study. A case study '*allows investigators to focus on a case and retain a holistic and real world perspective'* (Yin, 2014, p. 9). While a significant amount of research on the topic of project success and failure has been undertaken, it has ultimately been retrospective. Gaining a detailed insight to the functioning of a megaproject, its mechanics and how the project board operates has not been widely considered. Many examples of retrospective analysis have focused on 'why projects fail' (Frese and Saunter (2003), Williams and Samset (2012)), whereby theory and practitioners make recommendations of what improvements should be put in place to ensure the future projects are more 'successful', or more accurately, to avoid repeating mistakes of the past.

4.4.1 Step 1 - Getting started

An inductive approach to theory building research allowed for a focus on the research without the need for an abstract theory as a starting point. The topic of governance is broad with a number of theories already used to explain its many aspects. As was explained in the Chapter 3 on megaprojects, project governance theory has largely been driven by practice, while there is an absence of a main theory. This initial step allowed for the creation of a specific focus, and creation of a priori specification of constructs. Eisenhardt observes that early identification of a Research Question and constructs is useful, but that, at the commencement of the research, these are tentative; with a caution that the starting points should be as close as possible to the idea that no theory or hypothesis is being tested. Constructs were iteratively tested and refined, as were the research questions identified in Chapter 1.

4.4.2 Step 2 - Case selection

The Research Questions were developed to extend the current knowledge base on project governance by exploring the relationship between the project board as the project's governing function, and the impact it had on the project's success. As the literature shows, there has been a strong correlation between the failure of a project and a governance failure. The literature supports the assumption that improving the project governance function would improve the success of projects. On face value, practitioners of project governance would not disagree with this. However, the doubtful position remains that, by merely having an improved governance arrangement in place, this be sufficient for all projects to therefore successful. If this were true, the research would be of little value as projects would all be delivered successfully and there would not be a gap in the literature.

Therefore, an important step was to eliminate as many external or unknown variables in order to develop a deep understanding of the key governance functions and variables of a successful megaproject case. The identification of a case required a listing of known megaprojects that were successful (or not), which also had a sufficient body of knowledge and data sources to undertake research and be of significant interest, so that the case studied would have broader significance to the overall sector.

Fulfilling this requirement was significantly harder than initially expected. Getting access to detailed data sources, especially for megaprojects was difficult. As with many failed megaprojects, there are large and publicly available data sources, through media, audit reports, case studies and so on; but for successful projects, there is surprisingly little (except for awards, or short statements announcing the project was successful). A second challenge was identifying a sufficient number of megaprojects to compare and contrast. While this research could have used data from projects delivered at different times, locations and/or environments, it was unclear whether such factors were major influences on the project governance function, and these would thus have been ignored or not considered. Therefore, the focus prioritised having megaprojects delivered in the same (or similar) environmental conditions, using the following guiding criteria:

- nominated projects were to be within similar or comparable sectors;
- nominated projects were to be sufficiently different to allow for cross examination and comparison;
- sector knowledge was needed in order to validate the credibility of any source data and claims made;
- nominated projects were to be contemporary and relevant to the current field of research;

- nominated projects were to have sufficient evidence of their success or failure (either by fact or implied);
- nominated projects were to have sufficiently broad available data and records to provide an accurate assessment of the project performance over the lifecycle.

Added to these constructs was the need for a strong appreciation for the context in which megaprojects were created, delivered and later judged as successful. With these constructed limitations, the next step was to identify suitable projects and seek access to data. As the researcher works in the transport sector, this was an appropriate place to commence. A number of candidate transport megaprojects were identified; however, it soon became apparent that the limiting factor became access to adequate project data and enough context around the project's history.

A shortlist of four megaprojects[16] was identified. Approaches were made to the responsible government departments. For two of the projects, it was difficult to access further data-sources and for one of the projects, there was reluctance to provide *sufficient* access to data as the project was '*in trouble'* at the time of the request being made. The rationale for the unwillingness to provide access to the data is out of scope. However, it does demonstrate very clearly the sensitivity that large organisations have when megaprojects fail to deliver and not meet expectations.

Access to one of the shortlisted projects, the Regional Rail Link Project, along with its large data source was ultimately granted. The resultant modified design was then reshaped as a detailed case of one megaproject. This refinement in methodology, a single case, highlights the iterative process of the research, and the sound guidance that theory building using case studies should stay clear of a theory until later in the theory building process.

4.4.3 Step 3 - Crafting instruments and protocols

This step guides how data were collected. Eisenhardt (1989) suggests that for hypothesis testing research, triangulation from multiple data collection methods provides stronger substantiation of constructs and hypotheses. The present research used one investigator who employed a sequential three-phase data analysis process, as outlined in Table 4-2.

The first phase involved visiting (and becoming embedded within) the case study project office over a number of months on a part-time basis. Initiation of this stage occurred after being granted full access to all the project files, which became the primary data source for the research[17]. The first two phases (Phase 1 and Phase 2) analysed the written project documentation, namely the project steering committee (Phase 1, Stage 1) and project board meeting minutes (Phase 1, Stage 2); and then the project board sub-committee

[16] The projects were : MYKI Ticketing Project ($1.5b, 2003-213), Waratah Trains Project ($9.8b, 2004-2014), Alice Springs to Darwin Rail Project ($1.2b, 1996-2003), and the Regional Rail Link Project ($4.3b, 2007-2015)

[17] Sensitive documents and detailed contract finance spreadsheets were excluded, which did not deter from the intent of the overall case study.

reports (Phase 2) were analysed to understand from the minutes and reports what decisions and activities the project board spent their time focussed on.

The results from Phases 1 and 2 provided a significant view into the decision making undertaken by the board and its sub-committee; but the methodology identified that there could be potential *biases* in the minutes, as the minutes did not necessarily capture all the actions of the board. Such omissions included records relating to, for example, the relationships between the membership, offline discussions (pre and post meetings), the tone of the meetings, or even whether the minutes were a factual reflection, or just a summary or an action list.

A third phase (Phase 3) was considered necessary in order to further triangulate results. Phase 3 saw the development of a questionnaire which each of the board members answered through face-to-face interviews. The questionnaire design utilised a semi-structured series of questions which were developed to confirm themes, issues and items that were discovered through the first two phases. The questionnaire was informally validated by external subject matter experts with board experience prior to use, to ensure that the questions were clear and would solicit responses to produce valuable data results to analyse. The detailed steps and approaches adopted to analyse the results are described in Chapter 5.

4.4.4 Step 4 - Entering the field

The research questions were crafted to extend the current knowledge base on project governance by exploring the relationship between the project board, the governing function and the impact it had on the project's success. The literature had shown that the understanding of these relationships was limited. On entering the field, the methodology recommended overlapping data analysis and data collection. With a theory-building approach, this overlap allows for the research to take advantage of flexible data collection. This occurred with discovery of the data, and the initial analysis and findings (Phases 1 and 2). This identified the need for the additional data collection through Phase 3. Phase 3 provided the board member perspectives on the success of the project, which validated the results of Phases 1 and 2. Eisenhardt confirms that this approach is legitimate for theory building, because in a case study, researchers are trying to understand the case in as much detail as possible.

4.4.5 Step 5 - Analysing data

The volume of data produced by the case over its 8-year lifecycle was vast. With a case study, there can be a "staggering volume of data", which can result in "death by data asphyxiation" as noted by Pettigrew (1988) in Eisenhardt (1989, p. 540). The present research used a longitudinal data management analysis to sequence and analyse the data over the project lifecycle. Reviewing the board minutes and associated reports, which were produced on a monthly basis, was a logical way to store and manage the data. The coding process used allowed for the analysis of different trends over the lifecycle (such as early decisions vs later decisions, recurring issues vs one off issues, and identification of trends), all of which could be analysed over discrete periods of time.

Table 4-2: Three Phase Data Analysis Process

Phase	Stage	Focus
Phase 1	1	**Project Steering Committee** Analysis of the Project Steering Committee (PSC) minutes. During the strategy and project development stage (pre project approval), the project governance arrangement was within a government department. There were 5 board meetings in total. The minutes were the primary data source, however in total there were 272 files associated with the 5 meetings, which included supplementary papers for each of the agenda items, presentations and speaking notes.
	2	Project Board Analysis of the Project Board minutes (the Regional Rail Link Authority). This governance arrangement was responsible for the procurement and delivery of the project. There were 46 monthly board meeting held during this phase. The minutes were the primary data source. For each meeting there was an agenda, minutes, and copies of all supplementary files. For meetings 1-5, 21, 26, and 40-46, all 177 supplementary files were read in detail to appreciate the content of board meetings. On average, each board meeting had 12.6 papers, presentations and speaking notes.
Phase 2		Project Sub Committee Analysis of the board's subcommittee monthly report. There were 31 monthly meetings in total. The summary report in the report was the primary data source. The JCC monthly report contained over 50 pages of reporting each month, and also had 8 subcommittees below the JCC.
Phase 3		Board Members Interviews with each of the board members and analysis of the results. Two rounds of interviews occurred. The first was individually with each board member to complete a 75 minute semi-structured questionnaire, and the second was participation in a Delphi study.

In developing a rationale, Neuman recommends paying attention to the audience (of the research), the purpose, the research cycle, and the approach (Neuman, 2006, p. 33). An inductive approach was adopted whereby an empirical dataset was created to formulate concepts in order to develop abstract theory. The approach was developed by refining and testing the Research Questions, which were first identified through the researcher's identification of a failure in trying to source answers to project governance issues in the literature at the time.

The overall priority of a case study, however, is to become intimately familiar with the case. This required access to a detailed amount of information and for this research, a total of 1,854 separate files and board papers formed the core set of documents analysed[18]. By reviewing this core dataset, unique patterns within the case emerged, even before analysis started to consider generalisations or broader considerations that the data supported. Where there are multiple perspectives on the cases, case analysis can be compared to other cases. This ensures that analysis does not jump to conclusions based on limited data. In such scenarios, individuals can be overly influenced, ignore basic statistical properties, or inadvertently drop disconfirming evidence. To mitigate such influences, good cross-case analysis counteracts these tendencies by analysing data from different perspectives (Eisenhardt, 1989, p. 540). In the present research, while noting that there was only one case being analysed, data sources from the three phases were separated and compartmentalised into three separate database file structures (1- board minutes, 2-sub-committee reporting and 3- board member responses) and were subject to separate case analysis. This separation allowed for cross-case analysis. Two tactics are suggested to ensure sound cross-data analysis: the first is to look for inter-group differences; and the second is to list similarities and differences between the pairs of analysis. These were successfully undertaken with the Phases 1 and 2 datasets (see Chapter 5), which allowed for the researcher to use these to develop the Phase 3 questionnaire and undertake further analysis in rather more detail than relying on first impressions of the initial results.

Analysing board minutes and interviewing the board members was undertaken with acute awareness that the decisions made by a project board on a megaproject would be multi-faceted, and occur over many years, and most importantly, that the decisions made by the project board would (potentially) not be realised for some time after those initial decisions were made. As an example, deciding on whether an item should be in-scope or out-of-scope, and how the board made this decision, was of interest. Another interest was to explore the project board members' views on why the case was a success, whether they believed the governance arrangements contributed to that outcome, and why.

To assist in the detailed analysis through different lenses, a number of software tools were trialled during this period for suitability[19]. The usability of tools was trialled on sample set of data to test the functionality and capabilities of each tool prior to full analysis commencing. QDA Miner™ (Version 4) was selected as the preferred tool as it provided flexibility in analysing data both qualitatively and quantitatively. An overview of QDA Miner is provided in Appendix E QDA Miner was used to store, collate, code and analyse the datasets. It is a suite of tools that handles mixed model integration analysis. It combines *WordStat* (a quantitative text analysis package) and *SimStat* (a statistical data analysis package) to analyse data (Lewis & Maas, 2007). It can manually or automatically code text, and can code words, sections or larger elements within a document or use multiple codes, which allows for detailed coding on specific issues (Bobier, 2006). This allowed for integrating analysis methods using a variety of techniques, while retaining the integrity of

[18] Other documents were also collected which included detailed presentations, reports and attachments, totalling over 5,500 documents.
[19] AltasTi, MaxQDA, SPSS and Nvivo.

utilising one tool. Lewis and Maas (2007) sum up the benefits of QDA Miner by stating that not only are the main selling points of QDA Miner its mixed model data handling and analysis capabilities, but the coding and analysing text pages capability are central to its design and usability. Figure 4-3 provides an overview of the QDA functionality.

All datasets were stored on a secure server at the University of Melbourne's engineering department. Original copies of the source data from the Regional Rail Link project are archived in accordance with relevant government archiving policy[20].

4.4.6 Step 6 - Shaping hypothesis

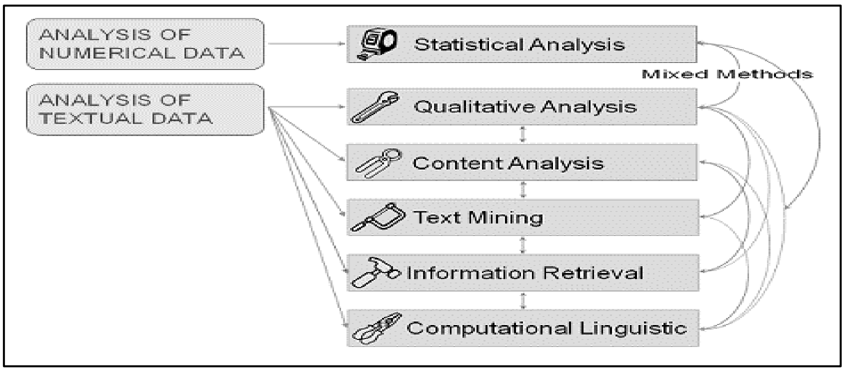
This step represented a distinct change in direction from refining the research and analysing data to now commencing the process of comparing theory and data. This is where the iterative process of logic and evidence search for theory that closely fits with the data occurred. During previous steps, especially through the cross-data analysis technique, impressions, tentative themes, concepts and relationships between variables emerged. Eisenhardt concluded that a close fit of theory and data is important for building good theory, as it takes new insights from the data and is supported by an empirically valid theory. Shaping a hypothesis can be done through sharpening constructs that were created in the early stages of the methodology, by undertaking a two-part process of:

1. refining the definition of the construct;
2. building evidence which measures the construct in the case.

Tables are often used to summarise and tabulate evidence of the constructs, as no one technique can be used to collapse multiple indicators into a single construct. This technique was extensively used, as it was indeed difficult to collapse the qualitative data into a single construct, and the use of tables conveyed the complexity and multitude of the project governance issues discovered. A verification process step can be used to test the replication logic of the case, which is used to confirm or dis-prove a hypothesis. Eisenhardt reinforces the importance of using qualitative data to support the '*why'* of what is occurring, as it is important to understand the theoretical reason for the relationship. If the examination dis-confirms the relationship, there is rich ground for refining and extending theory. This step results in theory building research on measuring constructs and verifying relationships (Eisenhardt, 1989, p. 543).

[20] See www.prov.vic.gov.au/search_journey/select?keywords=regional%20rail%20link%20project

Figure 4-3: Overview of QDA Miner (Provalis, 2018)



4.4.7 Step 7 - Enfolding the literature

This step involved comparing and contrasting the current literature. Confirming literature with similar findings is important, as this can tie together findings not normally associated with each other and can result in stronger internal validity. On the other hand, discussing conflicting literature can be used to gain deeper insight into emergent theory, and conflicting literature can sharpen the limits of the generalisability of the research. This conflict forces the research to discover the underlying reason for the conflict. The overall challenge in using a case study for theory building research is that the literature must be tightly linked to the results, because the findings are often based on a limited number of cases. To allow links to be further enhanced, a special chapter which focusses specifically on megaprojects and megaproject governance (Chapter 3) was key in being able to demonstrate these links in adequate detail. A further enhancement was the need to validate Phase 3 results using a Delphi. The Delphi approach is considered and discussed in Chapter 6.

4.4.8 Step 8 - Reaching closure

The final step requires consideration of two issues: when to stop, and when to stop iterating between theory and data. While there is no ideal number, Eisenhardt suggests that four to ten interactions usually work well. With more than ten, the complexity becomes difficult to manage; and with less than four, it can be difficult to generate theory with much complexity, as empirical grounding can be unconvincing. A counterweight to this number is to have a single case with several mini-cases within it. For the present research, the mini-case approach used three perspectives within the case, validated through the Delphi. At the outset of the research, four separate megaprojects were planned to be studied, but due to the inability to gain access to sufficient data for one of the megaprojects, that constraint dictated that the focus revert to one megaproject case only.

The second issue resolves when saturation occurs. In effect, the return on investment from the incremental improvements becomes less and less. The final product from building theory may be presented in the form of concepts, a conceptual framework, a proposition or a mid-range theory[21]. The downside is that the final product may be disappointing as it simply replicates prior theory or there are no clear patterns. In the present research, such a downside did not occur. The literature review clearly demonstrated that the research in the field of project management was divergent from practices, and the specific topic of project governance was identified as a distinct area that required exploration. New governance arrangements are addressed in Chapter 7.

4.4.9 Research approach rationale considerations

In the fields of business administration and management, it has been well recognised to appreciate cases over rules, with an emphasis on case-based practical teaching (Flyvbjerg, 2004). This is reinforced by Harrison III (2013) when discussing the use of mixed methods in business research. Harrison suggest that mixed methods research, whereby qualitative and quantitative components are used in a single study, is linked to pragmatism as a philosophy, and pragmatic inquiry includes induction, deduction and abduction. Providing guidance on when it is best to use the approach, he identified sixteen design types. One of the rationales, *triangulation*, was described as a convergent design type where the components are combined to triangulate findings to be mutually corroborated (Harrison III, 2013, p. 2154).

In this thesis, the early approach to the methods development and implementation explored the use of Mixed Methods Research (MMR). MMR uses a combination of two or more methods, which has been identified as being "useful when the phenomena being studies is complex and requires multiple methods to investigate it" (Drouin et al., 2013, p. 383). At its core, MMR combines and uses both qualitative and quantitative approaches, and it was anticipated that for this research two stages of analysis would be used (Stage 1 and Stage 2), which might otherwise be called a sequential approach

In order to corroborate findings in this research, content analysis was used. Content analysis systematically evaluates the symbolic content of all forms of communication (Kolbe & Burnett, 1991, p. 243). The board minutes were collected and systematically analysed free from any bias, other than that created through the coding process. Kolbe and Burnett identified that any direct method of enquiry can yield biased responses. For this thesis, the board meetings were time bound, and the method allowed for results to be considered within a specific environmental and economic timeframe. The analysis and coding method were also successfully replicated for the board sub-committee documents. Along with data collected and analysed through board member interviews, the results were able to be triangulated, and further understood in order to test the findings against theory.

This research pursued the sequential approach until it was discovered that the case study could produce knowledge within itself. The iterative approach that occurred during the research was an important learning step, as well as resulting in richer research outcomes, which are described in Chapter 4. As a consequence

[21] Primarily used to guide empirical inquiry: theory that lies between minor working hypotheses that evolve in abundance through to an all-inclusive unified theory. See Merton (1949).

of the discovery, the methodology selection did not comprehensively use mixed methods, as the single case study methodology in itself, stood on its own.

Part of the overall research learning process identified a significant opportunity to develop new skills in order to undertake sound research. The approach to the methods development allowed for a detailed review the methods available, and then presented the reasons for selecting the methods, which is the approach suggested by Evans (2011, p. 128).

4.5 ETHICAL CONSIDERATIONS

Elements of this research involved an ethical approval process as members of the project board were to be interviewed. Ethical considerations included a review of the literature on case studies, and ethical considerations in social science and in using qualitative data. Stake (2010, p. 206) identifies that social research dangers are almost never physical but mental, including exposure, humiliation, embarrassment, loss of self-respect and loss of standing at work. The methods used for this study were approved by the University of Melbourne’s Engineering Human Ethics Advisory Group (EHEAG), under ethics project application number 1647013. The risk assessment of the application, and subsequent check list questions in the application guided the conduct of interviews with the board members and the application of the Delphi approach.

The ethical requirements on undertaking this research included the development of a plain letter statement, which was given to all interviewees prior to their participation. This statement invited the participants to engage in the research, and outlined that they were free to choose whether they would participate or not. The information given to participants included a clear and succinct description of the project and the nature of their participation. Chapter 2 of the National Statement on Ethical Conduct in Human Research (NHMRC, 2018) guided the general requirements for consent. Participants were provided with the questionnaire prior to the interview in order for them to understand the questions in the interviews and reflect on potential answers. A consent form was provided, and before the interviews commenced, the individuals signed a consent form. The EHEAG assessed the application as a minimal risk type, with five risks requiring a risk management plan to be developed. One risk related to the relatively small sample size of the board. This was mitigated by replacing the candidate’s identity using a coding system, and analysing their responses collectively and not by the individual. De-identification steps were addressed in the plain letter statement and the consent form. Regular supervisor meetings were held to ensure adherence to procedures, and to plan for and monitor ethical requirements. Copies of the plain letter statement, consent form and the questionnaire are located at Appendix F.

4.6 LIMITATIONS OF THE METHOD

The use of a case study has limitations, and in particular in the present study, five limitations are identified and discussed, which cover:

1. the number of cases used;
2. data access and volume;
3. context setting;
4. context analysis;
5. the methodology.

4.6.1 Number of Cases Used

An ideal way to pursue this type of study would be to observe multiple megaproject cases from the same and different sectors with a mix of successful and failed megaprojects. Having such a comparison would broaden the application of theory testing on a much larger dataset. This constraint was demonstrated in 4.4.2) in the case selection where only one of the four shortlisted projects was able to guarantee access to data.

4.6.2 Data Access and Volume

Gaining access to the board minutes and the board members presented its own issues. In the early stages of the research, once permission was granted to access the project board information, in 2014, a number of '*gatekeepers'* were intent on the restricting access to certain files. During the discovery stage, while I was able to search for files on the project documentation management system, I was only granted access to see the file names, and not view the content. The impact of this constraint was that I was had to identify which files I wanted to view without knowing the actual substance behind the file name. A number of requests were made for wider access, but these were initially blocked due to the perceived commercial nature of the content and some distrust from some of the gatekeepers. Although confidentiality agreements had been signed and staff were directed by the highest authority to provide full access, this process was quite slow and cumbersome, requiring escalation on a number of occasions to gain access to necessary files.

On the flip side, the sheer amount of documentation created by the project was significant – for every board meeting there was a board pack and multiple reports and attachments. On average, there were 12.6 documents in a board pack, with up to 44 documents in one meeting pack including a number of presentations as well as the board agenda, minutes and action items. The sub-committee had a 50+page report every month, mostly containing very detailed tables and status actions; and the sub-committee had a further eight separate working group committees, each with their own monthly suite of documentation and status reporting.

All electronic data, including interviews, were stored on a secure University of Melbourne Engineering Department server, and at Australia's Academic and Research Network (AARNet), a site that provides ultra-high-speed internet and communications services to the Australian research and education sector. Field notes and hard copy documentation were stored securely in a research office. All other digital recordings were deleted.

4.6.3 Context Setting of the Case and Coding

In attempting to fully understand the number of variables associated with the project, context of the project was identified as a key issue to understand. Qualitative analysis was used to "gain a detailed understanding about a particular situation" (Stake, 2010, p. 65); but by gaining a detailed understanding of only one case, there was risk that this could introduce bias and result in early wrong conclusions being drawn about what was being observed. Determining which data to use or discard, and what to analyse, were ultimately judgement calls. This is a limitation of the research, but necessary as these decisions impacted on the direction the research took. One control taken to assist in ensuring that objective analysis occurred (as far as was possible) was to use the multi-methods information system tool to store, manage, code and analyse the data. Without the assistance of this database tool, it would have been very difficult to analyse such a large amount of data in a consistent manner. Using a computer-aided tool can also introduce bias, such as how the algorithms are produced, the inherent bias with the tool, and any researcher-initiated errors that may have been created during the coding and analysis processes. Extreme care was taken during these steps, including a number of verification steps which are outlined in Chapter 5.

4.6.4 Method Selection - Content Analysis

Selecting content analysis as a method has its own limitations. Content Analysis for qualitative analysis first extracts the relevant parts of the text (or material) and then analyses them. Because of this process, the method can only be used if the text itself is not the subject of examination (Kohlbacher, 2006, p. 20). The nature of the coding, which required classification of the content of the board minutes using a coding book is recognised. A total of 233 codes were developed and used. The list of codes and classifications are included in the analysis chapter, Chapter 5. In this research, one researcher undertook all of the coding. The interpretation of codes and their application could be strengthened through having multiple researchers coding the same documentation and then comparing the coding similarity. Many tools, including the one that was used, have such functionality, allowing for multiple-coder similarity analysis to be a relatively straight forward task, but would have required additional coding resources.

A limitation of content analysis is that it is often limited to reporting specific elements of communication (Kolbe & Burnett, 1991, p. 244). In this case, the actual board meetings were summarised in the minutes, which were the primary document for analysis. Content analysis often results in categorical data, rich in descriptive and identification, but less sensitive to the subtleties in communication from other research methods. To address this weakness, the third phase, of interviewing board members, both directly and individually, was used to mitigate the limitations, and strengthen the overall analysis.

4.6.5 Limitations of Case Studies

The iterative nature of theory building using a case study has been discussed. This approach strengthens the ability to generate novel theory, although Eisenhardt (1989) highlights that there is a myth surrounding the approach, whereby the process is considered to be limited by the investigators' preconceptions. This was confirmed in this thesis research as a myth, as the iterative process allowed for the moving between data and theory in order to gain new insight. While there were a number of preconceptions about 'good project governance' and 'project board success', the data were able to both confirm and dis-prove some of these views. The iterative process allowed for a new stream of investigation to occur which would not have been the case if the research started with a theory and then used the data to identify new constructs.

A good concluding place on the limitations of using a case study rests with Yin (2014), who is one of the biggest advocates of case studies. He sees the lack of systematic procedures for case study research as traditionally being the greatest concern. As noted by Bennett and Elman, "mainstream qualitative methodologists are optimistic about the probative value of studying a single or few cases*"* (Bennett & Elman, 2006), and March et al. (1991) had similar views in their work, '*Learning from Samples of One or Fewer*', where they consider situations in which organisations are able to learn, based on very small sample sizes. Even though samples may be small, they can provide valuable detailed insight. This is reinforced by Flyvbjerg's (2006) five misunderstanding about case study research, where he advocates that social science research should be undertaking more good case studies.

4.7 CONCLUSION TO CHAPTER

This research investigated the impact of the project governance on a successfully delivered megaproject. On one hand, a single case study does not allow for comparison to another similar project. A project is by definition bound by a timeframe, has a budget and delivers a unique set of deliverables. Other projects' performance can be inferred or benchmarked, but the actual results of the case study in the present research cannot be changed by reviewing variables. The virtue in selecting this case is the successful delivery of the megaproject. This case is thus a rare type of megaproject: one that was successful, and where participants were willing to share data and their experiences. The outcome of the research was that a series of new governance arrangements have been able to be developed.

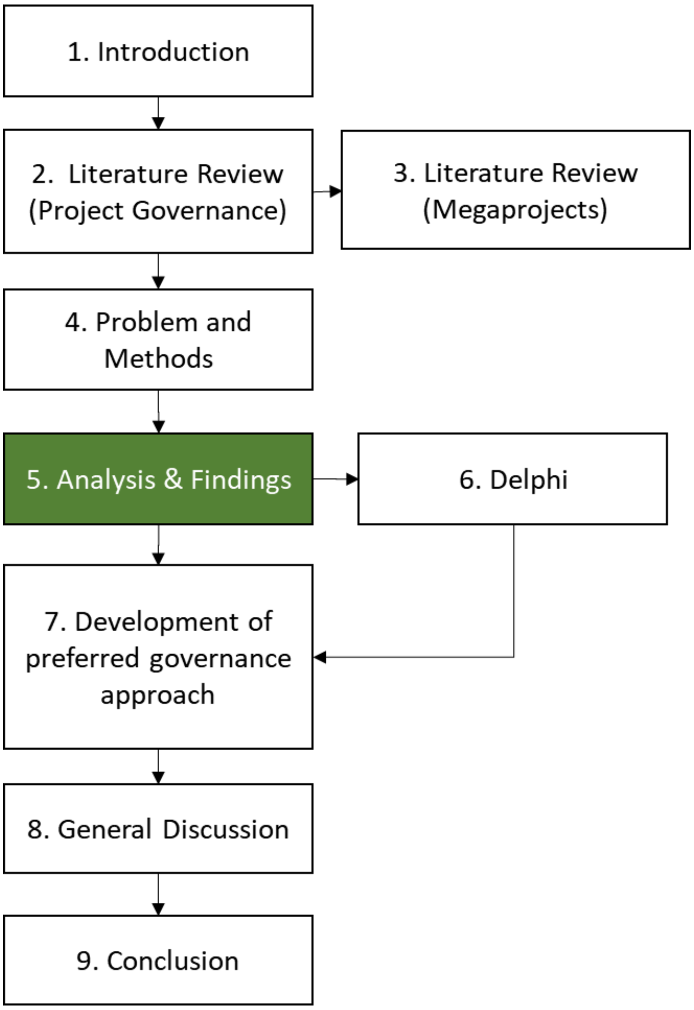
In order to gain a detailed understanding of the project governance impact, the logic was as follows. Most megaprojects fail to some degree, resulting in them being either labelled as a 'challenged' or a 'failed' project. One of the key areas in the literature is poor governance. Therefore, the first conjecture was that having '*good'*, or even '*adequate'* governance controls in place should result in megaprojects being successful. The current literature and megaprojects' ongoing performance does not support this position. It would be naïve to believe that a project board would intentionally set out for such failure to occur, therefore the second conjecture is that if a successful megaproject did indeed have 'good' governance, did it *'do* *something different?'* or unique in comparison to a normal governance arrangement for a megaproject. The question is, therefore, what was the '*something different*' element?

To understand the impact of governance on a successful megaproject, the Regional Rail Link case was studied in detail. To research the project governance impact was a challenging task: where to start; questions concerning whether governance was indeed the core issue that resulted in the project's success; and considerations of methods for how the results could be disproved or be challenged, were all issues that required careful consideration even before commencing the analysis. The research used triangulation through content analysis coding methods in order to yield a suitable data set that could be analysed. This resulted primarily in qualitative data being produced, which were used to describe the decisions of the board, and the types of decision and issues the board considered. Quantitative analysis techniques allowed for the large and complex data set to be analysed in a way that provided an overall simple, big picture perspective which could have easily been missed (see Chapter 5).

The relationship between theory testing and the data in the present research was a highly iterative one. This allowed for new issues to be discovered, and for different viewpoints to be considered.

The next chapter will now turn attention to the analysis of the data collected from the case.

Chapter 5 Analysis and Findings



> “Project management can be difficult and the project manager needs to be focussed on the task at hand, leaving it to other people fulfilling other governance roles” (Turner et al., 2010, p. 116)

5.1 INTRODUCTION

The previous chapter described the research framework and the methods in order to gain a solid foundation of understanding on project governance and the overall phenomena of megaprojects. It positioned this Type-1 case study with a focus on the relationship between corporate governance and project governance.

The governance required for a megaproject is quite different to that of a traditional project, but lacks a mature body of knowledge, guidance and theory that considers project governance. This chapter will now turn attention to the data analysis of the case. The method used to analyse data was undertaken in a three-phase process, with the addition of a Delphi, which will be addressed in Chapter 6. The findings from Chapters 5 and 6 will be used to present a series of new governance arrangements in Chapter 7.

The composition of the Project Board saw three different board structures implemented during the lifecycle: the Project Steering Committee (PSC) was the first, which occurred from August 2009-May 2010 during the project's development and business case approval; the second was the Regional Rail Link Authority (RRLA) Project Board, Sep 2010-May 2014, which constituted the primary project governance arrangement for the project (during the procurement and delivery); and the third was the handover of the project into service, whereby the project governance arrangement was terminated and governance control handed over to the end user. The project governance arrangements are outlined in Section 5.2.1, and the three phases of analysis are summarised in Table 5-1. Phase 1 was the analysis of the PSC and RRLA project board minutes, which held a total of 51 formal meetings over the project lifecycle. The second phase was analysis of the project board's sub-committee, the Joint Coordination Committee (JCC). The JCC was a novel arrangement which integrated multiple contracting parties together commercially, in order to ensure that all project work packages cooperated. The final phase, Phase 3, involved individually interviewing the board members. Collectively, the three phases of analysis were triangulated to develop findings, and were then further validated through the use of a Delphi.

The RRLA's sole purpose was to deliver the megaproject; and due to this focus, the RRLA corporate governance board was also the 'project board', the common nomenclature in project management literature (APM, 2004, p. 5). The Phase 1 and 2 results were presented at the 2016 Engineering Project Organisation Society (EPOS) annual conference in Seattle, USA (Pelham & Duffield, 2016). The Phase 3 and Delphi validation findings were presented at the 2018 EPOS annual conference in Croatia (Pelham & Duffield, 2018).

The results reinforced the importance of an active, persistent and proactive approach to project governance, with the need for a constant focus on project status reporting and the active management of project risk. The findings reveal that the project board contributed significantly to the success of the megaproject, and that the project board effectively managed numerous issues and risks by implementing a consistent reporting and risk management framework. More importantly, the project governance structures for this case study were far more dynamic than previously understood in the literature. The governance arrangement formally changed three times over the project's life, to effectively respond to the high volume of issues, topics and risks raised at various stages, which required different governance structures to adequately respond to them.

Table 5-1: Phases of Analysis

Phase	Stage	Description
Phase 1. Board Minutes	1	Analysis of the Project Steering Committee (PSC) minutes. The project governance arrangement was within a government department, during which the strategy and project development occurred, resulting in a business case being developed and the project receiving full funding approval.
	2	Analysis of the Project Board minutes (the Regional Rail Link Authority). This stage constituted the primary project governance arrangement for the project, which occurred during the procurement and delivery/construction.
Phase 2. Sub-committee reports		Analysis of the board's sub-committee monthly report. The Joint Coordination Committee was a novel structure that integrated multiple contracting parties together commercially in order to integrate all project work packages.
Phase 3. Board Member Interviews		This phase saw each of the Board members individually interviewed about their views and opinions on the governance of the project that they were responsible for 12 semi-structured questions were used to collect responses.

While Chapter 4 outlined the methods used to frame the case study and the subsequent method design, this chapter is focussed on the three phases of analysis, which allowed for the triangulation of data. This chapter is structured as follows:

- Section 5.2 provides a background on the case study;
- Section 5.3 present the in-depth analysis of the three phases;
- Section 5.4 presents consolidated observations and initial findings;
- Section 5.6 concludes with findings to support Chapters 6 and 7.

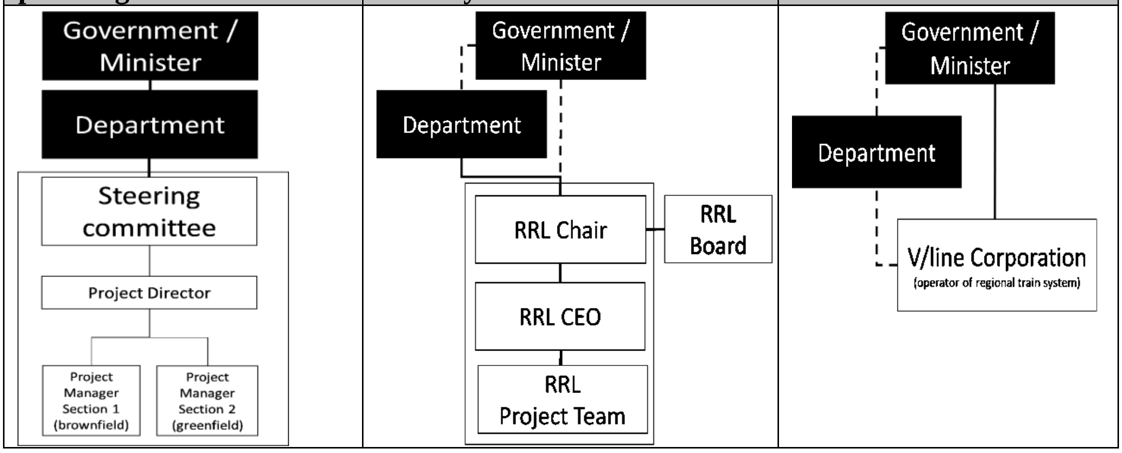
5.2 THE CASE STUDY

5.2.1 The Changing Governance Arrangements over the Lifecycle

While the governance structures developed over time, there were three distinct and evolving governance structures implemented over the lifecycle, which are outlined in Figure 5-1. The evolving governance structures are referred to as Stages 1, 2 and 3. The first stage addressed the early element of the project, whereby the strategic alignment, development and planning were undertaken in order to seek funding to initiate the project. Stage 2 was the translation of the strategy and planning stage, which created the business case and full funding, and led into the procurement and construction phase of the project. The procurement and construction delivery phase constituted the bulk of the project lifecycle, and was a rich source of documentation. Stage 3 occurred with the physical completion of the project and the hand-over to operations and maintenance. The Stages 1 and 2 project governance documentation was analysed, as the project governance was completed at the end of the stage 2 and handed over to a different organisation for the operations and maintenance phase. The RRL project board was also disbanded at that time (2014).

Figure 5-1: RRL project governance structures

Project Governance Stage 1 - strategy & planning	Project Governance Stage 2 - procurement & delivery	Project Governance Stage 3 - service delivery



Delivered over a seven-year period, the project involved multiple delivery agents; and over the project life, the project governance structure evolved significantly. In order to drive successful outcomes throughout the various stages of the project, it was necessary for the governance arrangements to establish a structure capable of responding to the various challenges arising from the complex and fluid project environment. The early governance body (Stage 1) identified that the project would require a Stage 2 project structure that allowed for efficient and timely decision-making, especially due to the demands of the project's ambitious program and delivery requirements. To achieve an effective project governance, a focus was placed on project structure setting and the reporting requirements for the project board. The three different project governance stages are summarised in Table 5-2, outlining the focus and governance types used to create, deliver and operate the project over its lifecycle.

The Stage 1 governance structure saw the project initiated as part of a Government department, where the alignment and strategic development of the project was undertaken. For the purpose of this research, corporate governance in this context considers the sponsoring organisation of the project to be undertaking business as usual activities, which includes developing and considering new projects. The Stage 1 project governance arrangement placed a priority on the planning process, where it developed the project proposal (over a number of years) for funding consideration. It is during this Stage that the corporate governance and project governance arrangements overlap, as outlined in Figure 2-2. As will be shown in later analysis, only five formal project board meetings were held during this phase.

Table 5-2: Institutional governance arrangements for the RRL project

	Stage 1	Stage 2	Stage 3
Year	**2008-2010**	**2010-2014**	**2014-ongoing**
Focus	• Strategic planning • Project development • Project funding	• Procurement • Project Delivery	• Asset owner / operations • Responsible for operating and maintaining the assets
Governance type	Corporate / Project Governance	Project Governance	Corporate Governance

The Stage 2 arrangement saw the creation of a completely new entity, the 'Regional Rail Link Authority', with the unique use of legislation to create an Administrative Office which had the sole purpose of delivering the project. The Stage 2 governance was in place for the longest of all the stages (5 years).

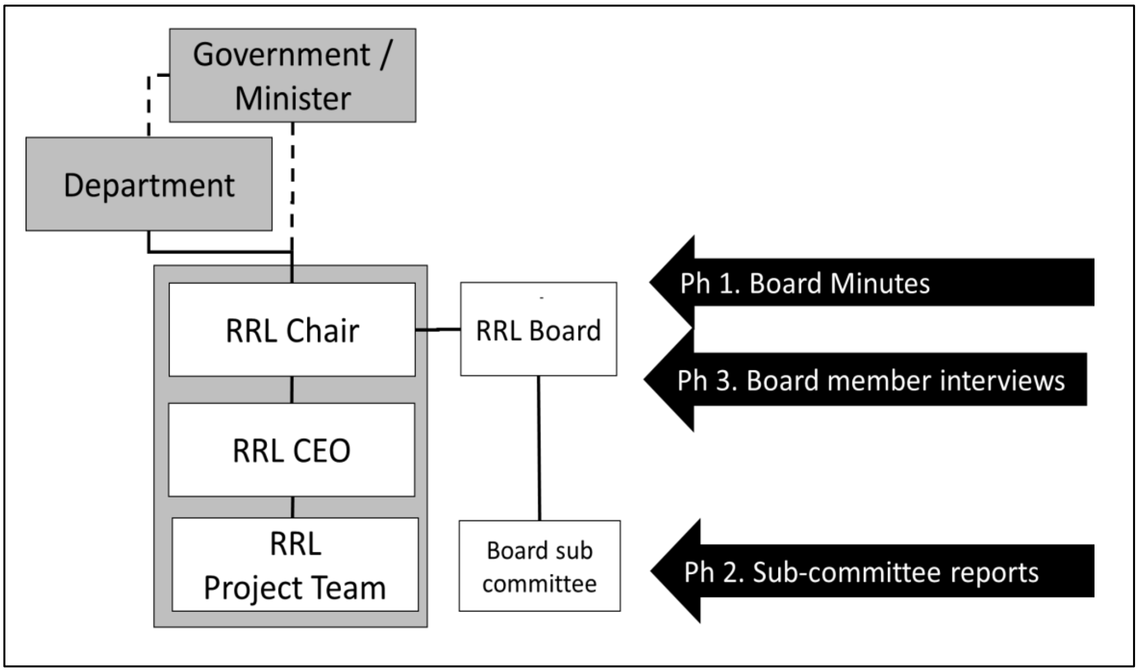
The Stage 3 governance arrangement was enacted when the project had been delivered. During the handover from Stages 2 to 3, a smaller project team remained in place to close out the project and attend to defect rectification and administrative arrangements to close the Authority.

The Stage 2 project board was disbanded in September 2014 and then handed over to the user of the assets, V/line Pty Ltd. V/line is the operator of all regional passenger services in the State of Victoria, and are the primary beneficiaries of the project, along with the public. Using conventional PRINCE2 language, V/line were the End User.

5.2.2 Triangulation

The case explored the functioning of a project governance organisation by analysing the detailed minutes of the project board and its primary sub-committee. Three perspectives were analysed to allow for triangulation to answer the Research Questions. The approach is outlined in Figure 5-2, which involved analysing the minutes of the project board (Phase 1) and the monthly reports prepared by the project board's sub-committee (Phase 2). Collectively, these two phases provided the grounding for the development of a set of interview questions to enable Phase 3 to be executed. Phase 3 saw each of the board members individually interviewed to answer 12 semi-structured questions on aspects of the project's governance (see Chapter 4, and Appendix G). The first two phases were analysed separately, then combined to triangulate findings.

Figure 5-2: Methods analysis steps (Phases 1, 2 and 3)



5.2.3 Application of a Success Criteria Framework (SCF)

In order to further understand project success, a framework was developed in order to understand how megaproject success could be evaluated in a contemporary setting. This was tested on the shortlisted projects identified in Chapter 4, and a wide search was undertaken based on literature, project type, media coverage and publicly available audit reports. Apart from the case study, the other three shortlisted projects had significant amounts of data highlighting the problems associated with the development and/or delivery of each project.

One of the difficulties in investigating project success factors is that, "in spite of extensive research…., there has been a limited convergence, let alone agreement on the ingredients and causes of project success", as suggested by Shenhar (2002, p. 111). While the *ingredients and causes* are not necessarily the ultimate solution to a project being delivered more effectively, the criteria used to assess the success are highlighted as an emerging subject within project management and delivery spheres; and such criteria are not necessarily set. In addressing this shortfall, Lech (2013) previously undertook a study to explore project success from the perspective of the adopting organisation and not just the project delivery organisation. This framework tested the Standish Chaos Report (1995) criteria for a 'challenged' project by suggesting that project evaluation should consider both organisational and project management success. The work resulted in the development of an evaluation matrix as outlined in Table 5-3**Error! Reference source not found.**. In the matrix, organisational and project criteria were determined by considering the success of the end product, as well as the performance of the project during the project delivery.

Table 5-3: Project success criteria (Lech, 2013, p. 273)

Success Criteria	Success Category
1. Business Goals	Product success
2. Organisational goals	
3. Functionality (quality)	Product / Project success
4. Budget	Project success
5. Schedule	

The Lech evaluation criteria are a leading and innovative way to assess the performance of the projects used in the present study. They incorporate the views of the adopting organisation ('end users'), as well as of the delivery organisation. While the model was applied specifically to the ICT sector, there is merit in using the criteria in non-ICT projects. The model criteria were enhanced as a framework by taking the evaluation summary and categorisation of Lech and merging these to form an evaluation matrix. This is represented in Table 5-4.

Table 5-4: Success evaluation matrix (based on Lech)

Business / Organisational goals achieved	**Functionality achieved**	**Budget achieved**	**Schedule achieved**	
Product success[22]	**Project management success**[23]			**Evaluation**
Yes	Yes	Yes	Yes	Successful Project
Yes	No / Partial	No	No	Challenged Project
No	n/a	n/a	n/a	Failed Project

To confirm that the projects were suitable for evaluation, the 4 megaprojects' performance was assessed against the evaluation matrix criteria. The 3 non-case projects were assessed as either being 'failed' or 'challenged' from the Product and Project Management success perspective (see Table 5-5). While the results confirmed the initial views in the literature, it was identified that the business and organisational goal criteria assessment required a degree of subjective assessment, and more critically, that this assessment was largely time-dependant (the period of time since the project had been completed was critical to

[22] Definition - goals (i.e. the project outcome fulfils its role in the organisation), and business goals (i.e. the project outcome provides the expected value to the organisation).

[23] Note – under this criteria, functionality/schedule/budget can be modified in a controlled manner to account for uncertainty not understood during initial stages of the project plan.

ultimately determine success or failure), and required an extrapolation of 'success' by the adopting organisation, either through business goals, and or functionality. The subjectiveness and time-dependency issue are highlighted as issues of deficiency of the matrix.

Table 5-5: Success criteria framework results

	Product success	**Project Management success**			**Classification**
Project	**Business / Organisational goals**	**Functionality achieved**	**Budget achieved**	**Schedule achieved**	**Category (failed, challenged, successful)**
MYKI project	no	no	no	no	Failed
Waratah Trains Project	Partially achieved	yes	no	no	Failed/ Challenged
Alice Springs to Darwin Railway Project	no	yes	yes	yes	Failed
Regional Rail Link Project	Yes	Yes	Yes	Yes	Successful

5.3 IN-DEPTH ANALYSIS

This section describes the three phases of analysis as outlined in Table 5-1:

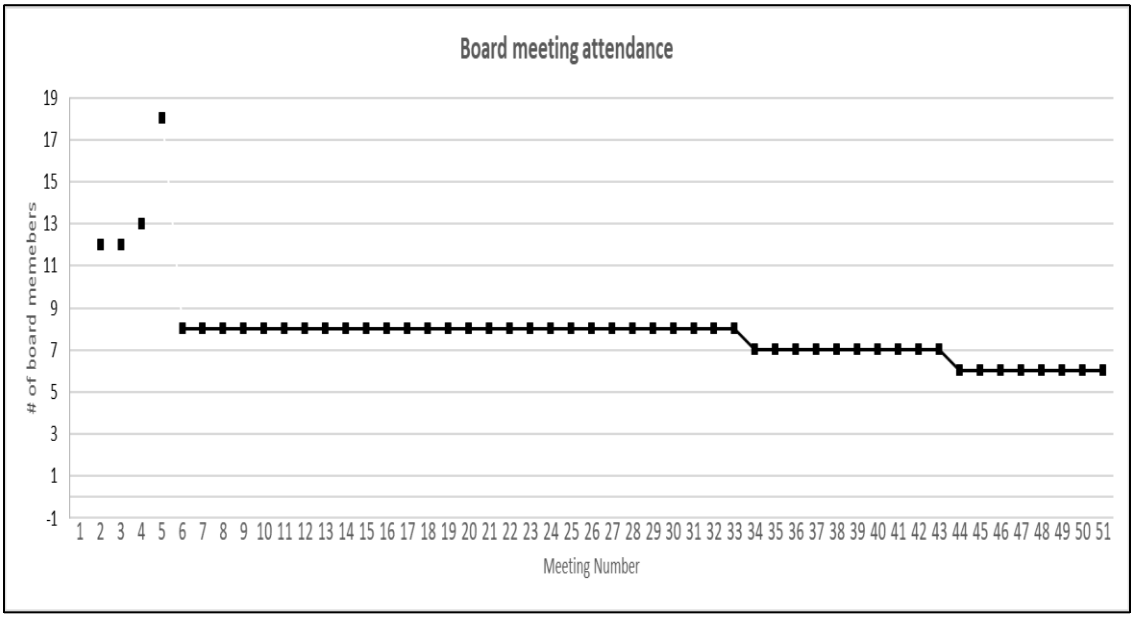
- Phase 1 – analysis of project board minutes (Stages 1 and 2 documents);
- Phase 2 – analysis of the sub-committee reports (the Joint coordination committee);
- Phase 3 – analysis of board member interviews.

5.3.1 Phase 1 – Project Board Minutes

By reviewing the Board minutes, new insights into the operation and decision making of the board occurred. In total, the Project Board sat formally for 51 meetings, and during those meetings a number of decisions were made. The analysis focussed on both the type of subjects addressed and the content of the subjects. Due the richness of the data source, core themes were identified. This analysis alone would not have been substantial on its own, but this phase did provide a solid basis of being able to accurately gain initial insights, provided legitimacy, test the methods, and identify a need to appropriately move on to Stage 2.

While this section describes the first phase, the second phase involved analysis of the monthly summary reports created by the sub-committee, the Joint Coordination Committee (JCC). The JCC reports were provided to the Board as a monthly report. Phase 1 had two stages: the first analysed the Project Steering Committee minutes; and the second, the RRLA Project Board minutes. During Phase1, at Stage 1, while the project was governed within the Government Department, there were between 12 to 18 representatives on the Project Steering Committee, and they convened a total of 5 meetings over a six-month period. For Phase 1, Stage 2, the Regional Rail Link Authority was created, and the Board operated from 2010 to 2014. The RRLA board had a composition of 8 members, which reduced to 6 during the latter part of the project. Over that period, 46 board meetings were held. As Figure 5-3 demonstrates, attendance over the first five meetings progressively grew, and at Meeting 6 (representing the start of the RRL Board) the board member participation was rationalised to the RLL Project Board, consisting of the 8 members[24]. One member resigned at Meeting 34 and another at Meeting 43. While not specifically documented in any of the sighted Board documentation or minutes, the Board did not seek replacement board members for the vacancies. Due to the small sample size of the board, and the confidentiality required to ensure board member anonymity during the interview phase (Phase 3), investigations into the significance of board size changes was not pursued, nor into the circumstances of the resignations or the decision to not replace those board members.

Figure 5-3: Number of project board members[25]

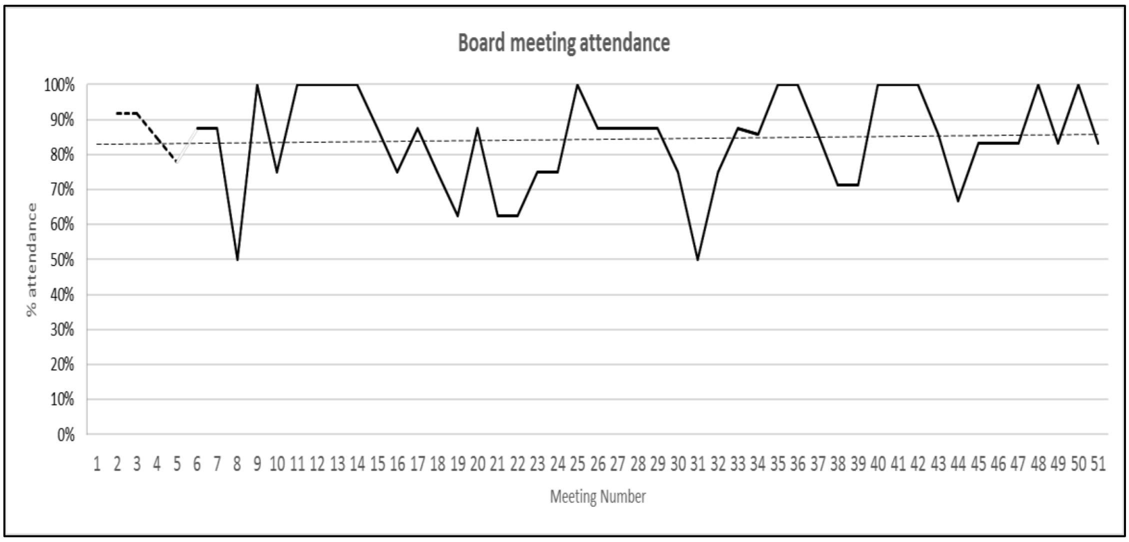


Board member attendance is an important variable in the effectiveness of a Board. In most listed companies, attendance of Board members is reported in Annual Reports. The attendance of the RRL Project Board is provided in Figure 5-4, demonstrating a high and consistent level of board attendance at the monthly meetings over the life of the board. During Stage 1, attendance averaged 86%; and during Stage 2, the average board attendance was 84%. Over the entire period of the project, board attendance also averaged

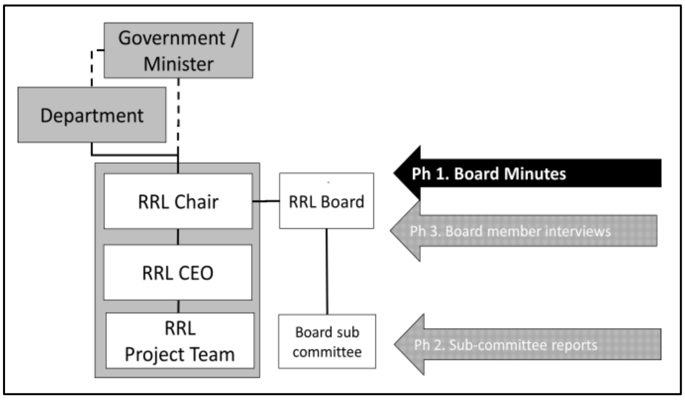
[24] Note – there was a 7-month gap between Meeting numbers 5 and 6, as the Regional Rail Link Authority was being created.

at 84%. The calculations for attendance also took into consideration the departure of board members at Meetings 34 and 43. Each board meeting was scheduled for between 2.5 hours and 3.5 hours. Based on the total board meetings held, this equates to between 855 to 1,197 hours of formal project board meetings (mean = 1,041 hours).

Figure 5-4: Board attendance (% attendance)



5.3.1.1 Phase 1 coding



The coding methodology used is outlined in the following steps: each set of minutes was read; and then each set of minutes was coded, one at a time. This approach was modified after an initial 10% review point (after coding minutes 1-5). The coding process was changed to focus on one individual section of the minutes, which was coded; and then, instead of moving on to the next section within that set of minutes, the next set of minutes was opened, and the same section was coded. By way of an example, 'Section 3' of the minutes generally had the headings '*Executive Update'* and *'Risk and Issues'*, with the occasional *'Project Progress'* heading. As these headings appeared in most of the minutes, coding of all the 'Section 3' data then occurred in one sitting across the entire data set (i.e. minutes 6-51) to ensure that the coding was consistently being applied.

By coding each of the same sections one after the other, this reduced potential coding error, especially interpretive errors by the coder using alternative, different or wrongly interpreted codes. This improvement resulted in a far more consistent coding technique, minimised interpretation coding risk, and ensured a high level of coding application across all sections being coded. A comparison between the content of different sets of minutes is summarised in Table 5-6. This table shows a high level of consistency of the content, especially for items 1 (previous minutes and actions items), 2 (safety), 3 (executive update), 7 (other business) and 8 (next meeting).

The change in the coding method at the 10% review point resulted in an improvement, by ensuring accurate coding capture occurred. This resulted in the researcher not having to continually decide which of the 233 codes to use from the code book, instead being able to work with a smaller sub-set of codes relevant to the section being analysed. This change ensured that coding fatigue was also adequately managed. Figure 5-5 is a screen shot of the QDA tool which shows displays of how a specific document is coded. On the top left-hand side, the documents, or ‘cases’, are arranged, and the coder can click on each case to bring that document up in the centre panel. The code book and variables are identified in the left-hand panel (under the ‘variables’ and ‘code’ headings). The codes used for the analysis, including the coded text, are shown on the right-hand panel. Across the top screen ribbon, a toolbar, similar to that used on most PCs, allows the user to create files for coding and undertake various forms of analysis using the ‘Retrieval’ and ‘Analyse’ functions. Further details on the tool can be found at www.provalisreseach.com. A full listing of all codes used in Phases 1, 2 and 3 are found in Appendix G.

5.3.1.2 General analysis of phase 1 (Stages 1 & 2)

In 2008, a Project Office was created within the Department of Infrastructure to govern the development of the project. From the records, the project governance arrangements were not formalised until later in 2009, at which time a Project Steering Committee (PSC) and Executive Steering Committee (ESC) were created. For the purpose of the analysis, the PSC and ESC were the ‘*project governance arrangements*’ for Phase 1, Stage 1. During Phase 1, Stage 2, an Administrative Office (AO) was created with the appointment of an external Chair and independent Project Board, all of whom had not been formally involved in the Phase 1, Stage 1 governance arrangement.

For Phase 1, the project governance arrangements convened 51 board meetings over the period 9 October 2009 to 27 May 2014. As described previously and in Table 5-7, while there were three separate governance arrangements, there were only project board minutes that cover Stages 1 and 2. The Phase 1 governance arrangements generated a large amount of data; and one of the challenges with analysing so much data is the manner in which results are presented. The tables and graphs thus have been used extensively to convey the findings. Both stages addressed different priorities and governance functions. Table 5-7 provides detail on the volume of board meetings under each Stage of governance, and its duration. Table 5-7 also identifies the different governance types across each stage, and the differing names of the project governance arrangements.

Table 5-6: Sample of project board minute headings

Minute Headings				
Meeting 5	**Meeting 10**	**Meeting 15**	**Meeting 30**	**Meeting 40**
1. Previous minutes	1. Previous minutes 1.1 Action items	1. Previous minutes 1.1 Action items	1. Previous minutes 1.1 Action items	1. Previous minutes 1.1 Action items
2. Cost estimation	2. Safety 2.1 Quarterly contractors report 2.2 Due diligence checklist 2.3 Contractor Management strategy	2. Safety 2.1 Safety report (month) 2.2 Due diligence checklist 2.3 Board safety training	2. Safety 2.1 Safety report (month) 2.2 Project Safety Performance statistics 2.3 Due Diligence	2. Safety 2.1 Safety report (month) 2.2 Safety Indicator trends 2.3 Due Diligence
3. General Business	3. Executive update 3.1 Monthly status report 3.2 Optimised schedule 3.3 Noise Issues 3.4 Occupations 3.5 Industrial Relations	3. Executive update 3.1 Monthly status report	3. Executive update 3.1 Monthly status report 3.2 Scope issues	3. Executive update 3.1 Monthly status report
4. Next Meeting	4. Work Package Evaluation	4. Project Budget	4. Comms and Stakeholder relations	4. Sustainability Policy
	5. Change Management Process	5. Lessons Learnt	5. Sustainability	5. Lessons Learnt
	6. Contingency Strategy	6. Liability and Insurance	6. Transport Integration Act	6. Other Business
	7. Comms 7.1 Comms Activities 7.2 Comms Sub-Committee	7. Other Business	7. Lessons Learnt (to date)	7. Next Meeting
	8. Indemnity and Insurance	8. Next Meeting	8. Other Business	
	9. Other Business		9. Next Meeting	
	10. Next meeting			

Figure 5-5: Genercic screen shot of QDA software and coding (QDA, 2017)

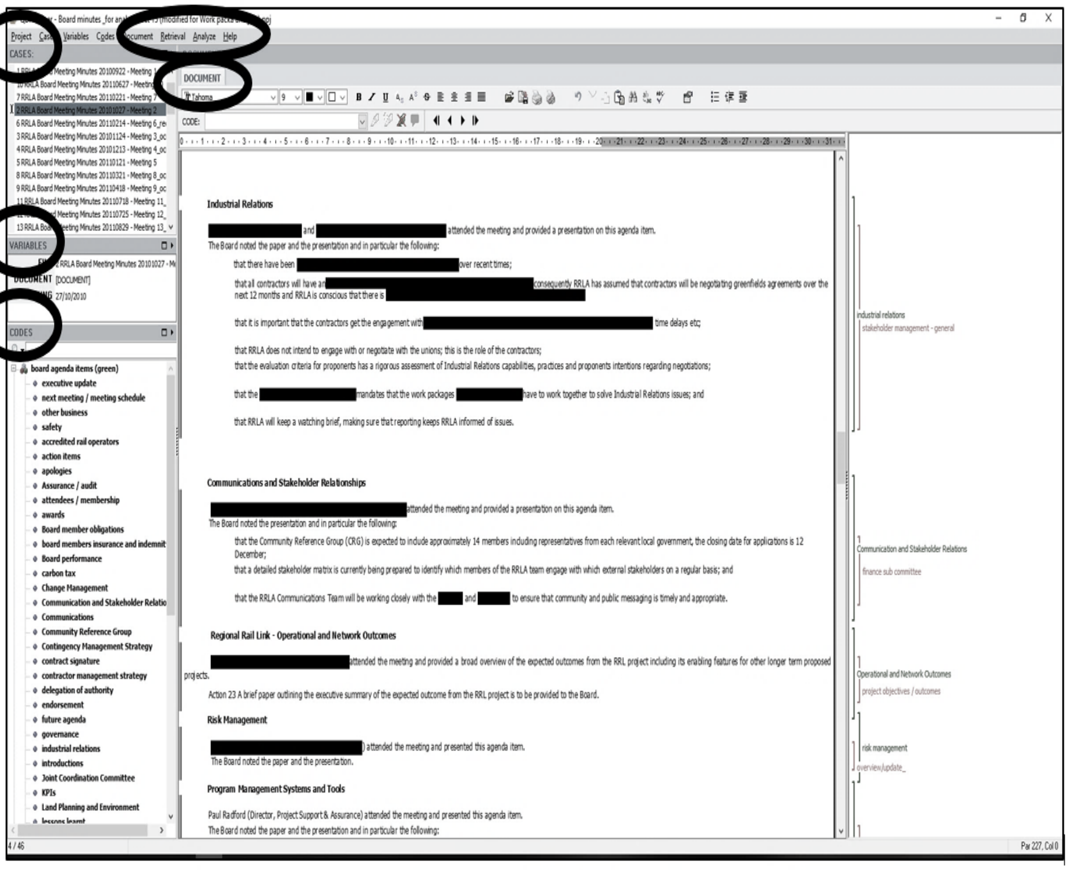


Table 5-7: Board meetings and duration

	Project Governance Stage		
Governance Stage	**Stage 1**	**Stage 2**	**Stage 3**
Governance type	Government Department	Administrative Office	Statutory Authority
Project Board name	Executive Steering Committee/ Project Steering Committee	Project Board	n/a (end user)
Duration	Oct 2008 – Mar 2010	Sep 2010 – May 2014	n/a
# of board meetings	5	46	n/a
# of sets of minutes	5	46	n/a

The Stages 1 and 2 project governance documents were coded as stand-alone and separate cases. Separate code books were also created, due to the significantly different content of the minutes, and the form in which the minutes were recorded. Copies of the code books are at Appendix H. For each of the board meetings, there was an agenda, attachments, and a set of minutes issued. To analyse the minutes, all the board papers were converted to optical character recognition (OCR) PDF format and loaded into QDA Miner. A qualitative analysis approach was used to analyse the contents of the documents, using two coding approaches:

1. The first approach considered the <u>Subject</u> of each agenda item (‘*subject heading’*). This involved coding the minutes by the heading of each agenda item;

2. The second approach considering the <u>Issue</u> within each Subject (‘issue discussed’). This involved coding the content of the minutes by identifying each issue within the minutes. Where multiple issues were discussed, each issue was coded separately.

The Phase 1 results were analysed using a *frequency count* to identify which codes occurred most frequently. For a frequency count, the use of a tornado plot conveyed the volume and priority of the codes. Results were presented in a number of plots in order to allow for comparison. Each plot is analysed (by subject heading, and by issue discussed), in Sections 5.3.1.3-5.3.1.7, and a meta-analysis of the overall results completed in Section 5.3.1.8.

5.3.1.3 Coding by *‘Subject Heading’*

Each set of board minutes was read by the researcher to gain a general overview of the structure and content and to develop an initial set of commonly occurring codes for both *subject headings* and *issue discussed*. The commonly occurring codes formed the basis of the initial code books and were pre-populated into QDA Miner. A coding-logic process was also developed to code against. Only one coder (the researcher) undertook the coding. The information to apply a code was found in the heading of each section of the minutes. If the heading was unclear, the content was contextualised by reviewing the text within the section of the minutes. As this process progressed, an early observation was that the project board minute reporting template and format was very consistent during the Stage 2 governance arrangement, with little overall change to the structure and format of the minutes. This was of significant benefit for coding, as the consistency allowed for efficient coding application across all the sets of minutes, with minimal interpretation required for content. The consistent template also identified a key input of a successful project governance: the earlier governance planning process identified the reporting requirements for the project; and these were successfully used over a 4-year period, with little change to the format in Stage 2. A redacted example of the board minutes is provided at Figure 5-6.

As a more comprehensive list of codes was developed, the QDA Miner tool allowed for new codes to be added during the process. One of the benefits of QDA is that it allows for new codes to be created at any time, and for codes to be merged where later it is revealed that code types were similar (for example, terms such as 'time' and 'schedule' were separately created in the initial code book; but as they had a similar meaning, the two codes were later merged) without losing any data integrity. The first five board minutes (Meetings 1-5) were coded in one session in late 2014 over a 3-hour period, representing a 10% sample of the total number of board minutes to be analysed. At this point, the overall coding was stopped, and an informal review occurred to consider whether the coding process was effective and applied consistently, by running sample analysis reports in the QDA tool.

During this review, it was confirmed that the coding was resulting in a consistent coding approach and producing reports that would be useful for future analysis. The internal functionality of 'coding similarity' was run in QDA Miner, and also a 'content analysis' using WordStat, which is the quantitative content analysis and text mining tool in the QDA suite of tools. The outputs produced promising results, with functions such as frequencies (frequency, case occurrence, dictionary ending, keyword order), extraction (document, paragraph, sentence) and co-occurrence reports (dendrograms, mapping, link analysis, proximity plot, statistics–similarity, agglomeration) producing usable results; while also providing an opportunity to become more familiar with the functionality of QDA.

When coding is done manually by individuals, interpretation of different codes by different people can occur, no matter what processes and rules are put in place. QDA allows for assessing '*inter coder agreements*' which can assess the reliability of coding rules between multiple coders or individuals. For multiple coders, they are asked to code the same content; or a single rater codes the same document at different times. The results can be used to uncover differences in interpretation, clarify rules, and quantify levels of agreement.

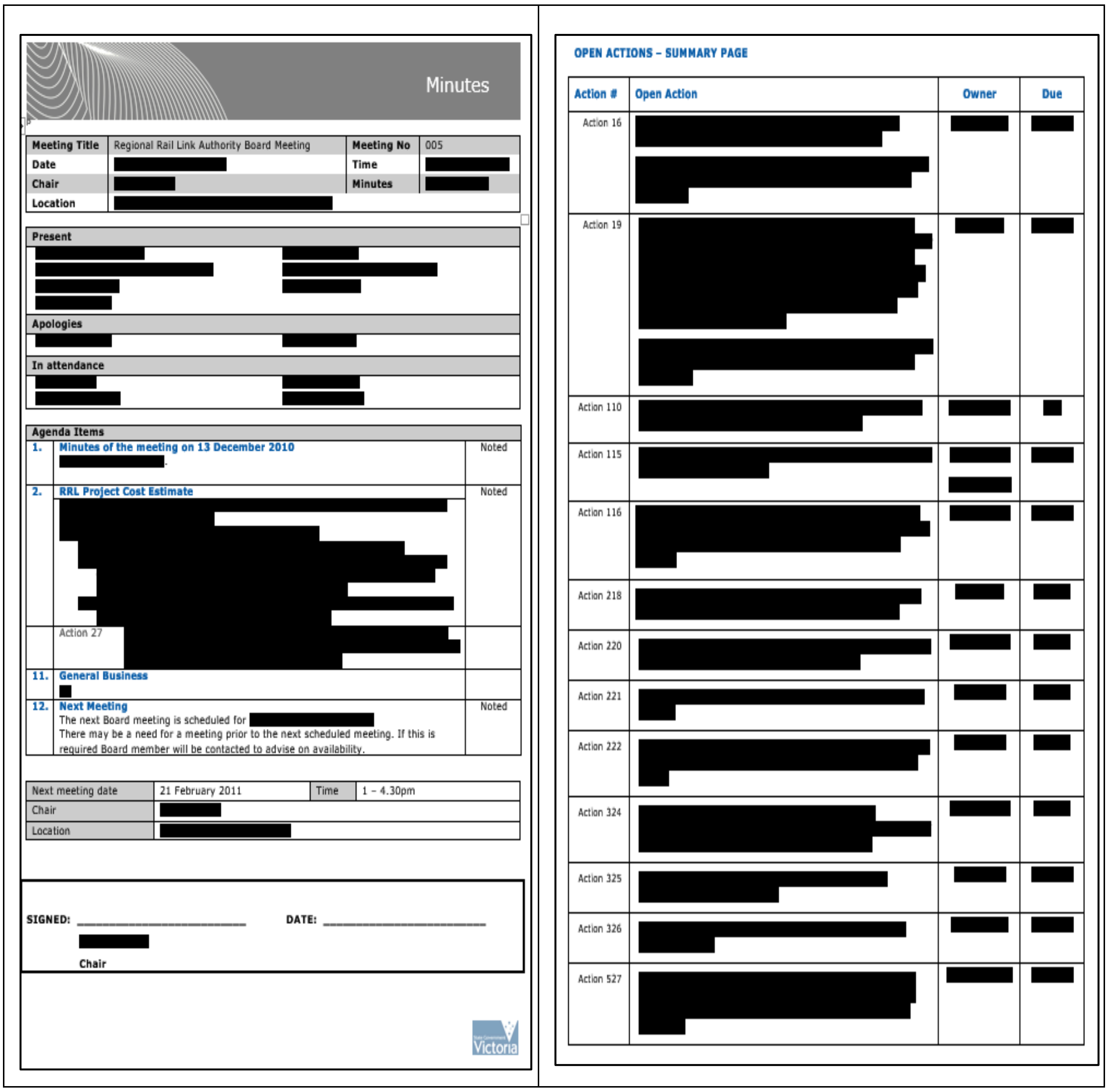
Once the total coding process was completed, the QDA tool was used to generate and present results. Results are presented by the two categories of '*subject heading'* and '*issue discussed'*.

5.3.1.4 Results by '*Subject Heading*'

Results for *subject heading* are presented in two graphs. The first (Figure 5-7) displays the frequency counts for Stages 1 and 2. The second (Figure 5-8) combines Stages 1 and 2 results into one graph, to provide an overall view on the subject headings for Phase 1, over the 51 meetings. For Stage 1, there were a total of 22 different codes used; while for Stage 2, a significantly higher and more diverse range is found, with 54 different headings in total. For Stage 1, there are 5 subject heading codes that have a frequency >3, and for Stage 2 there are 5 codes with a frequency occurrence >30. Frequency drops off significantly after these points for both.

To gain further insight from the case into the frequency of board agenda items, a pareto analysis was used. The pareto principle has become a mainstream technique in management sciences (Craft & Leake, 2002), and allows for the efficient and effective gathering of information instead of collecting as much information as possible (Cervone, 2015). Applying this technique to the case data, the data set was filtered, which presented the top 25 codes of the overall issues (by volume), representing 80% of all the subject heading codes.

Figure 5-6: Example of format of RRLA board minutes[26]



Minutes

Meeting Title	Regional Rail Link Authority Board Meeting	Meeting No	005
Date	[redacted]	Time	[redacted]
Chair	[redacted]	Minutes	[redacted]
Location	[redacted]		

Present

[redacted]

Apologies

[redacted]

In attendance

[redacted]

Agenda Items		
1.	**Minutes of the meeting on 13 December 2010** [redacted].	Noted
2.	**RRL Project Cost Estimate** [redacted]	Noted
	Action 27 [redacted]	
11.	**General Business** [redacted]	
12.	**Next Meeting** The next Board meeting is scheduled for [redacted]. There may be a need for a meeting prior to the next scheduled meeting. If this is required Board member will be contacted to advise on availability.	Noted

Next meeting date	21 February 2011	Time	1 – 4.30pm
Chair	[redacted]		
Location	[redacted]		

SIGNED: ______________________ DATE: ______________________

[redacted]
Chair

OPEN ACTIONS – SUMMARY PAGE

Action #	Open Action	Owner	Due
Action 16	[redacted]	[redacted]	[redacted]
Action 19	[redacted]	[redacted]	[redacted]
Action 110	[redacted]	[redacted]	[redacted]
Action 115	[redacted]	[redacted]	[redacted]
Action 116	[redacted]	[redacted]	[redacted]
Action 218	[redacted]	[redacted]	[redacted]
Action 220	[redacted]	[redacted]	[redacted]
Action 221	[redacted]	[redacted]	[redacted]
Action 222	[redacted]	[redacted]	[redacted]
Action 324	[redacted]	[redacted]	[redacted]
Action 325	[redacted]	[redacted]	[redacted]
Action 326	[redacted]	[redacted]	[redacted]
Action 527	[redacted]	[redacted]	[redacted]

There are no strong correlations between the Stage 1 and Stage 2 results. This demonstrates that, for each of the stages, the two project governance arrangements had very different focuses, and reinforces the changing priorities that the governing bodies had depending on the stage in the project lifecycle. While not presented in the table, there were a number of codes that returned a zero-frequency count. This anomaly was investigated, and after reviewing the data it was concluded that the zero count codes were those codes created in the early stages of developing the master codebooks. As the codes were not used, they were removed from the code book and subsequent analysis.

[26] Due to confidentiality, sensitive data are blacked out.

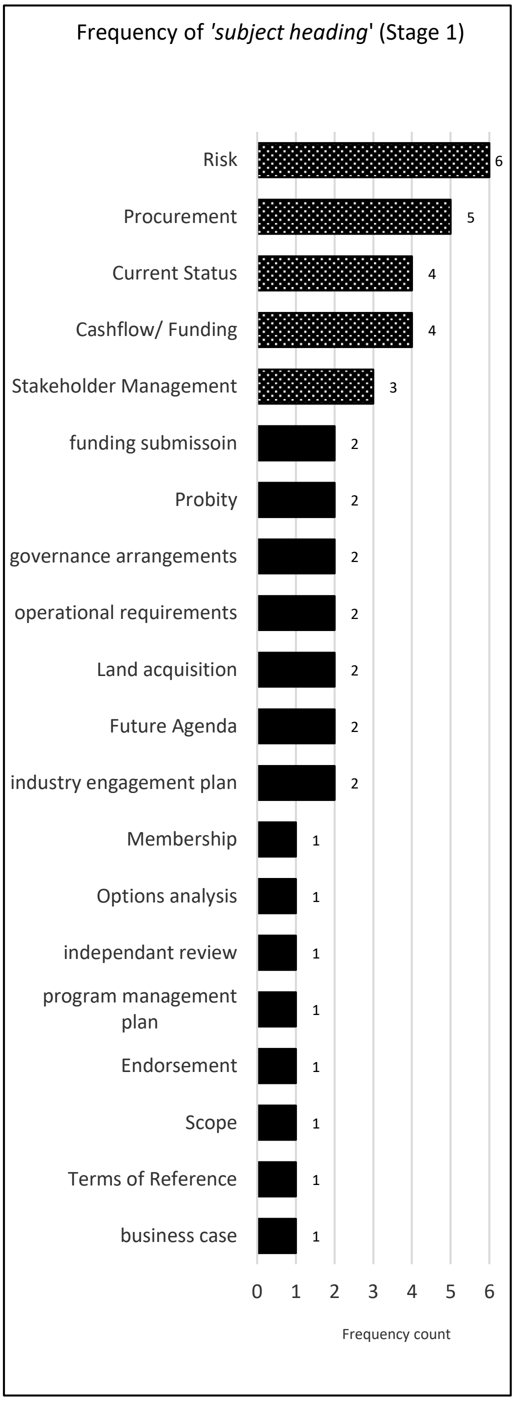
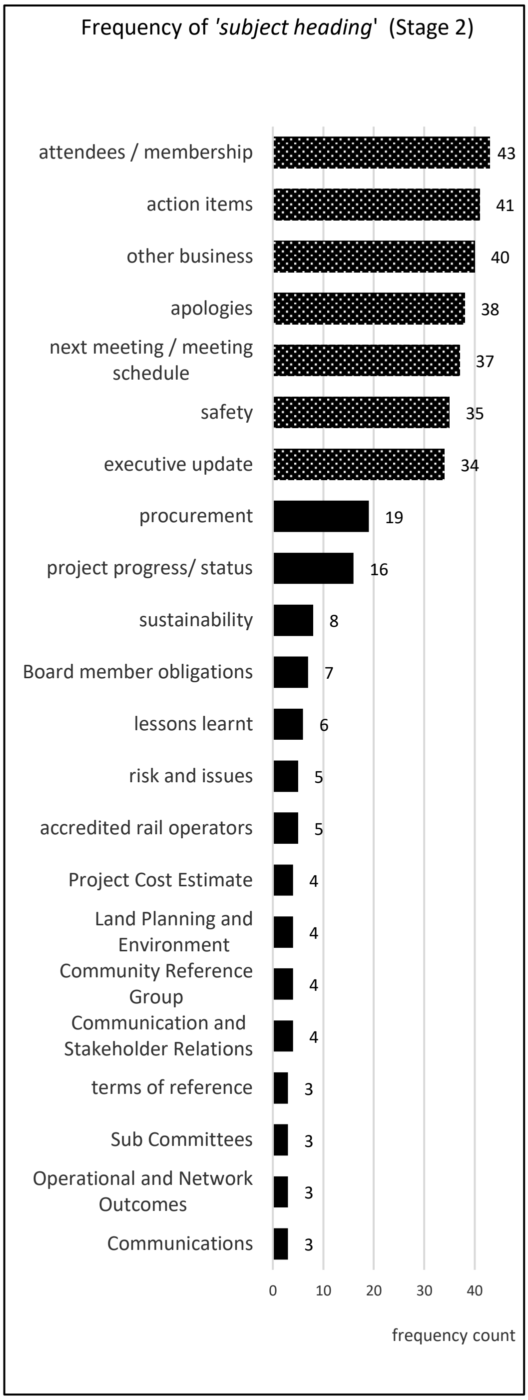
The most common occurring code from Stage 1 was the 'risk'-related code. In Stage 2, the equivalent code ('risk and issues') was rated as the 13^{th} most commonly occurring heading. When the two stages were combined to produce an overall frequency graph, the risk code was rated as the 10^{th} most frequent code (see highlight bar in Figure 5-8). The most frequent headings for Stage 2 focused on administrative governance actions, which included actions such as noting attendees and membership, reviewing action items, other business, and noting apologies. These *administrative code types* will be addressed in more detail in the next section. The most frequent Stage 2 code was '*attendees / membership'*. The first non-administrative code heading was *safety,* which ranked at #6. Figure 5-8 presented the combined results for Stages 1 and 2, which followed an overall similar trend to the Stage 2 profile. There were only 5 subject headings commonly occurring in both Stages 1 and 2:

- #1 - Attendees/ membership;
- #2 - Action items;
- #8 – Procurement;
- #11- Risk and issues;
- #14 – Stakeholder management;
- # 16 – Terms of reference.

5.3.1.5 Coding by '*Issue Discussed'*

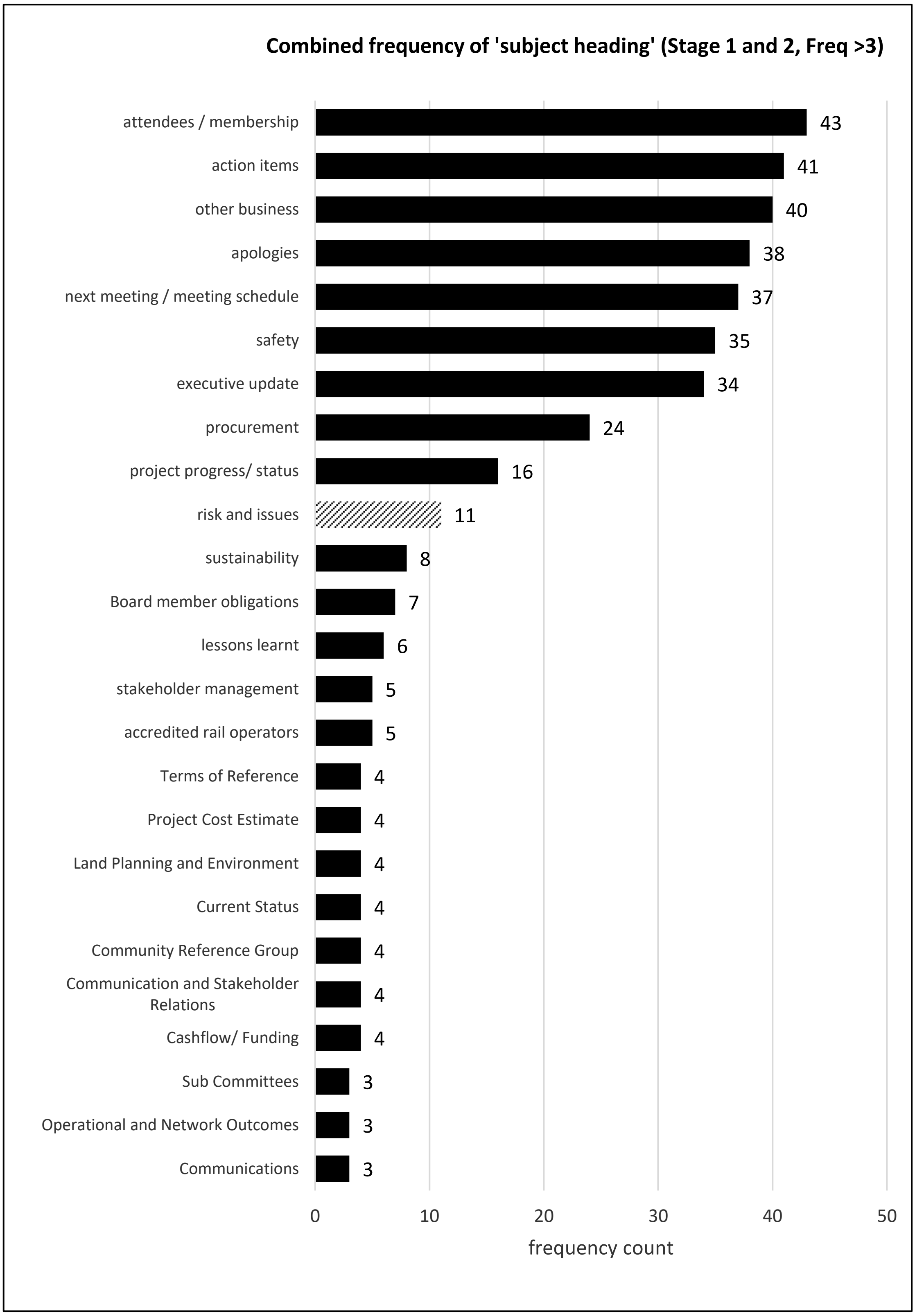
The same analysis process as 'subject heading' was undertaken for the content of each of the headings. This coding had far more codes used than the 'subject headings' coding, with a total of 145 different codes applied to the contents of the minutes. This dataset held a very large quantity, and a disparate range of information that was recorded, summarised, discussed and actioned within the minutes. The process used the same coding approach for the '*subject heading'*, and using the experience gained from the first step, the coder compiled an initial list of commonly recurring codes as the '*issue discussed'* codebook. As with the previous coding step, codes later identified as similar or duplicated were renamed, merged or deleted.

Figure 5-7: Most frequent code occurrence of 'subject heading' by Stage

Phase 1, Stage 1 (Steering Committee)	**Phase 1, Stage 2 (Project Board)[27]**
	

[27] Note: Codes with frequency <3 excluded (total excluded is 31)

Figure 5-8: Combined occurance of ‘subject headings’ for Stage 1 and 2, (f>3)



5.3.1.6 Coding by '*Issue Discussed'*

The same analysis process as 'subject heading' was undertaken for the content of each of the headings. This coding had far more codes used than the 'subject headings' coding, with a total of 145 different codes applied to the contents of the minutes. This dataset held a very large quantity, and a disparate range of information that was recorded, summarised, discussed and actioned within the minutes. The process used the same coding approach for the '*subject heading'*, and using the experience gained from the first step, the coder compiled an initial list of commonly recurring codes as the '*issue discussed'* codebook. As with the previous coding step, codes later identified as similar or duplicated were renamed, merged or deleted.

5.3.1.7 Results by 'Issue Discussed'

The same analysis process was undertaken for the content of the minutes, which is categorised as the 'issue discussed'. This analysis had far more codes used than the 'subject headings'; with a total of 145 different codes used to code the contents of the minutes. Results are presented in two graphs. The first (Figure 5-9) displays the frequency count separately for Stages 1 and 2. The second (Figure 5-10) combines Stages 1 and 2 results into one graph to provide an overall issues discussed over the 51 meetings of Phase 1.

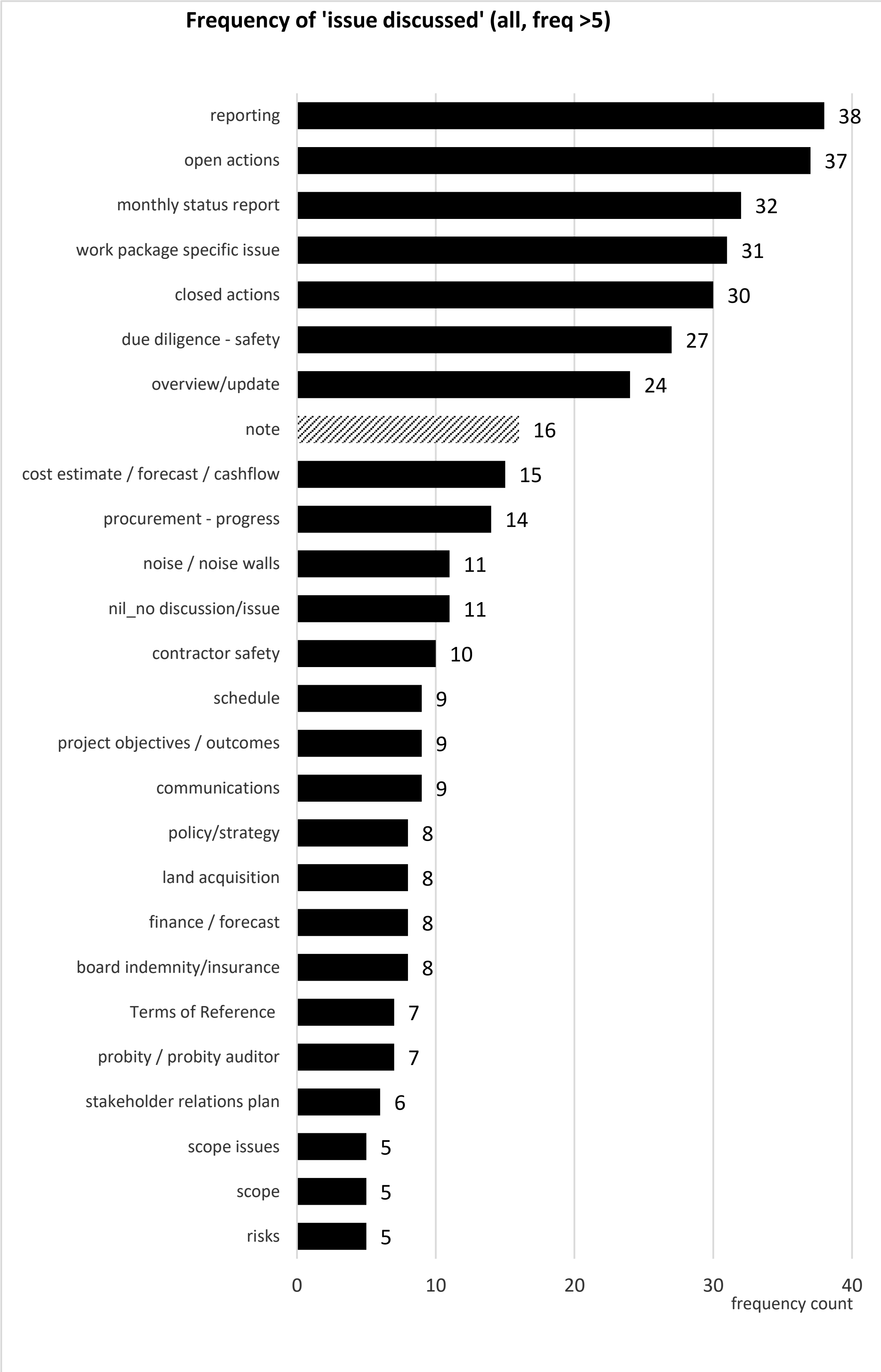
For Stage 1, there was a total of 33 codes applied; and for Stage 2, a total of 112 codes. There are 56 codes that returned a coding frequency of less than three for the combined figure, which include codes that returned a zero-coding count. For the purposes of the analysis, the zero-count codes were deleted from the QDA tool and overall results. Similar to the tornado shape of the curve for the 'subject headings', there is a significant drop-off in the frequency after the first code for Stage 1 and after 7 codes for Stage 2. The results for 'subject headings' similarly show no strong relationships between the priorities in Stages 1 and 2, reinforcing and demonstrating the different focus each of the governance arrangements had.

As with earlier analysis, the volume of frequency and spread of issues is far higher in Stage 2, with the most frequent issue from Stage 1 being the 8th most frequent in the combined result for Stage 1. These results confirm that Stage 1 focussed on setting up the project governance, while Stage 2 focussed on the procurement and delivery of the project, which required more progress monitoring and status reporting.

Figure 5-9: Most frequent code occurrence of 'issue discussed' by Stage

Stage 1 governance (Steering Committee)	Stage 2 governance (Project Board)28
	

Figure 5-10: Combined occurrence of 'issue discussed' for Stages 1 and 2, (f>5)



[28] Note – codes with frequency <5 excluded (total excluded is 79)

5.3.1.8 Meta Interpretation and findings from Phase 1 (Stages 1 and 2)

The datasets from Stages 1 and 2 were analysed using a cluster frequency, which listed and prioritised the number of occurrences of each code by category. This provides a detailed insight into which of the agenda items occurred most frequently, and provides a detailed understanding of which issues were being considered most commonly by the project board. As the Project Steering Committee's (Stage 1) and Project Board's (Stage 2) lifecycles were multi-year, the insight provided a longitudinal perspective relevant to gaining an understanding of the decision making over the life of the project board. Table 5-8 presents the number of unique codes created during the coding process for '*subject heading'* and *'issue discussed'* by both stages.

Table 5-8: Phase 1 code summaries

	Code type (count frequency)		
	'subject heading'	**'Issue discussed'**	**Total**
Stage 1 – (Project Steering Committee)	22	33	**55**
Stage 2 – (RRL Board)	54	112	**166**
	76	**145**	**221**

The overall Phase 1 results are compelling and provide insight into the decision making and volume of actions of the board. Firstly, from the master codebook tables, while there is a large and varied number of subjects, the topics (issues) within the subjects are even more varied. In total, 221 different codes were created to describe the project board function and the governing of the project activities for Phase 1. The results were distinctly different between each of the stages, with Table 5-9 summarising the different project board priorities during the two stages. Stage 1 results for the '*subject heading'* show that the most frequent issues considered were Risk and Procurement, while the actual issues discussed focussed on the board members noting a number of issues, with a specific focus on the three issues of Stakeholder, Project Schedule and Risk. Stage 2 showed a shift in the project governance focus, with the subject headings being far more administrative, whereby there was a large focus on recording who was at the meetings, the status of actions, and the timing of the next meeting.

The only non-administrative subject that occurred frequently was Safety. The project's overall safety outcomes performed well above rail industry standards: the project's Lost Time Injury Frequency Rate was 0.6[29]. The industry benchmark in 2014 was 4.61 (OFSR, 2017)[30]. Total Recordable Injury Frequency Rate was 10.4 (industry average 12.61, 2014), with over 14 million man hours worked in total (RRLA, 2014a). The priority placed on safety by the board and the results imply a positive relationship, however there may

[29] The number of lost time injuries occurring in a workplace per 1 million hours worked. An LTIFR of 10, for example, shows that 10 lost time injuries occurred on the project for every 1 million hours worked.
[30] Office of the Federal Safety Regulator.

have been other contributing factors. While safety was a very high priority issue for the board, the board minutes showed there was more of a focus on recording administrative issues as the most frequently occurring event. The actual issues recorded within Stage 2 minutes indicate that the board spent the bulk of its time on being updated, and reported to, on the status of project-related issues.

Table 5-9: Board priorities by Stage and Subject/Issue

Stage 1 (Steering committee)		Stage 2 (Project Board)	
Subject	**Issue**	**Subject**	**Issue**
1. Risk	1. Note	1 Attendees	1. Reporting
2. Procurement	2. Stakeholder	2. Action items	2. Open action
3. Current status	3. Schedule	3. Other business	3. Monthly status report
4. Cash flow/ funding	4. Risk	4. Apologies	4. Specific work package issue
5. Stakeholder management		5. Next meeting	5. Closed actions
		6. Safety	6. Due diligence/ safety
		7. Executive update	7. Overview update

While the Stage 1 governance was in operation for only 5 meetings, compared to the Stage 2 governance which held 46 meetings over a 4-year period, the volume of subject headings vs issues discussed is relevant. During Stage 2, the volume of issues considered went from 33 to 112, which represents over a 300% increase in the volume of issues considered. Carpenter (2008) suggests that (corporate governance) Boards spend up to four-fifths of their time dealing with the '*trivial many*', whereas if the Board focused on those vital few issues, the board could create upwards of 60% greater value of their output than their input. Within the context of project management, one dominant position is on the importance of front-end governance as a mechanism to improve the analysis and decision making at the start of a project, in order to reduce implementation costs later in the lifecycle (Samset et al., 2006b, p. 4). This concept was further developed by Samset and Williams (2012), who outline governance aspects against four stages of a project, and identify a number of studies and research that show that the early stages of a project are where the strategic success or failure of the project actually occurs (Samset & Williams, 2012, pp. 84, 138). It is unclear whether the Phase 1, Stage 1 governance arrangement were indeed aware of Carpenter's suggestion; however, the end result was a successful project.

From a governance structural viewpoint, there were distinct and differing governance structures used on the project: the Steering Committee (Stage 1), where the project was being developed and shaped; and the Project Board (Stage 2), where the project was being procured and delivered. With the Stage 1 results (Figure 5-7), there are 5 subject headings in the minutes that have a frequency greater than 3 ($f>3$), while the Stage 2 graph shows that there are seven codes with a frequency occurrence of greater than 30 ($f>30$). Frequency drops off significantly after the first seven codes, as there is a dramatic drop-off in the coding frequency count at this point. This trend also occurred in the Stage 1 results, but the decline was not as severe, primarily as there were less codes used overall.

The results did not initially provide any significant insight, as project board minutes generally followed a standard format that did not vary much over the project period. This result could, however, be reasonably expected, as agenda items subjects generally did not change significantly. To determine whether the results could provide greater insight, a number of different, unsuccessful attempts were made, before considering Carpenter's (2008) 'trivial many' position against Pareto's 80/20 rule: "that roughly 80% of all effects stem from 20% of all causes for many events, which conceptually contrasts the contribution of the vital few with that of the trivial many" (Tanabe, 2018, p. 635). That analysis considered where the bulk of the time was spent by the board, by reviewing the results from Figure 5-7 and Figure 5-8 using the 80:20 (by volume ratio) approach. For the subject headings, 15 out of the 76 codes accounted for 80% of the volume count; and for the issues discussed, 47 out of the 145 codes. While the result does not directly translate into a comprehensive list of the 'valuable few' or high priority activities of the board, as suggested by Carpenter, it does provide insight into those items (by volume) that the board considered important across the lifecycle. Looking at the top 80% of the codes from a different perspective, each of the codes was analysed by considering the *type* and *nature* of the code. This required the identification of themes across the dataset; and by using a simple data reduction, and creating conceptual clusters, four distinct type themes were identified and defined, which are described in Table 5-10:

Table 5-10: Code clusters by theme

Conceptual Clustering Themes	Description of cluster
1. **Project status**	Those items relating to the *reporting*, *status* or *progress* of the project.
2. **Board administrative**	Those items considered as *routine* or a*dministrative governance* matters (recording attendance, apologies).
3. **Project outcome**	Those *strategic* items that were considered to ensure the project delivers the expected outcomes / benefits.
4. **Board obligations/ governance**	Those items specifically related to the *board duties, roles and responsibilities* of the board in executing their obligations.

When each of the 15 subject heading codes and 47 issue codes were categorised in to each of the 4 conceptual clustering themes, Table 5-11 was created, which identifies the percentage breakdown of each cluster. The analysis indicates that the board spent its effort on understanding the status of the project (cluster #1 – 58.6%); and while cluster #2 'board administrative' was the next most significant cluster, the specific *issues discussed* was significantly less, at only 14.9%. In terms of the content of the frequency of subject headings, there is no strong correlation between the headings for Stages 1 and 2. This indicates that the governance committees had very different focuses at the two stages of the project; but the data confirm that the board's total effort was focused on issues related to 4 distinct clusters. The Stage 1 and 2 profiles presented were thus similar; however, their content was significantly different.

Table 5-11: Percentage breakdown of code by cluster

Cluster	Code type					
	Subject		Issue		Total	
	Count	%	Count	%	Count	%
1. Project Status	8	53.3%	30	63.8%	38	58.6%
2. Project Administration	4	26.7%	7	14.9%	11	20.8%
3. Project outcome	2	13.3%	8	17.0%	10	15.2%
4. Board obligations/ governance	1	6.7%	2	4.3%	3	5.5%
Total	**15**	**100%**	**47**	**100%**	**62**	**100%**

The most commonly occurring code from Stage 1 is '*note'*, which for Stage 2 is the 8th most frequent code in the merged results; with the top result for Stage 2 and the merged results being '*reporting'*. The most common occurring code for Stage 1 is 'risk'; and in Stage 2, the equivalent code is 'risk and issues'. For the merged results, 'risk and issues' is the 10th most frequent code, which is surprising: risk is an issue that is ever-present during the project delivery phase and is identified as a top issue in the literature. The issue of active risk management will be considered in the next phase of analysis of the board subcommittee, the Joint Coordination Committee, which is where much of the project risk was considered. The results also demonstrate that, by only counting the frequency of codes, this does not provide an appreciation of the time spent on the issue, or the importance placed on certain items. While all the administrative cluster issues were present in all minutes, the time spent on them, and the importance to overall decision making, were low.

Only 4 codes were common to both Stages 1 and 2 in the graphs presented:

- Code #4 – work package specific issue
- Code #8 – note
- Code #14 – schedule
- Code #15 – project objectives/outcomes

5.3.1.9 Observations from phase 1

Key findings are now identified and, along with the analysis, a number of assertions are made about the results in relation to the governance of the project. The assertions contained in this chapter will be used in later chapters (Chapters 6 and 7) as a basis for proposing new project governance arrangements, structures and approaches.

The ability to code the documentation and present results in a meaningful way was an important milestone, to provide a contextual understanding of the volume of, and the priority that the project board placed on, issues when holding the board meetings. The results from the QDA tool were further analysed in a tabular form, manipulated, and presented in different visualisation forms including horizontal and vertical bar charts, word clusters, and pie charts. Within each of these forms, variables including frequency, number of occurrences, percentage of codes, and percentage of cases, were prepared for review and analysis. After reviewing each of the formats in QDA, it was determined that the tool had limitations in presenting results in a meaningful way, using the in-built suite of tools and graphs. The QDA data were exported to Microsoft Excel data format for further manipulation, with the intent being to improve the presentation of final results.

With complex data sets, the provision of easily understandable graphs can assist to understand complex data. Regarding sensitivity-type analysis, there are two common graphical techniques used, spider-plots and tornado diagrams. As this analysis focused on understanding the issues discussed by the project board, the data required presentation in a format that was understandable. Tornado diagrams are relatively simple; and according to some, spider-plots are often drawn incorrectly by using the same arbitrary plus and minus limits, which can distort the message (Eschenbach, 1992, 43). Presentation of the board agenda by both 'subject heading' and 'issue discussed' was undertaken using the same tornado techniques, as seen in Figure 5-7 to Figure 5-10.

The following observations are made regarding the analysis of the board documents and sub-committee documents:

- **Observation 1** – There are 4 conceptual clusters that the board focused on throughout the project lifecycle: 1) Status; 2) Administrative; 3) Outcome; and 4) Obligations.
- **Observation 2** – The board's focus changed during the lifecycle of the project, but the overall bulk of the effort was on the monitoring the status of the project.
- **Observation 3** – An ongoing and consistent approach to project governance, across the lifecycle, is a core attribute of project success.
- **Observation 4** – Stability of board membership across the lifecycle occurred. It is unclear, however, if this stability had a direct impact on the project governance success.

In total, 221 different issues and subjects were analysed using the cluster frequency function, which listed and prioritised the number of occurrences of the codes. The results were combined from both the Stages 1 and 2 analyses to provide an overall view on the subject headings over the life of the project governance. Due to the large volume of issues coded, and to present results in a manner that is readable and visually useable, those codes with a frequency of less than three are not presented. Recognising the importance in a case study of presenting complex data in a form that can be easily understood, the results of the board agenda items, the tornado plot technique was used. A number of further observations are made:

- **Observation 5** – The reporting requirements on the governance arrangement were consistent across the life of the project.
- **Observation 6** –The project governance arrangements changed to meet the needs of the project over its life. This was triggered by risk, especially change to the project environment.

- **Observation 7** – As identified in Observation 1, the four clusters represented the core issues the board required for the project governance, and ultimately the project, to be successful.
- **Observation 8** – Safety was one of the most significant key management metrics for the board.

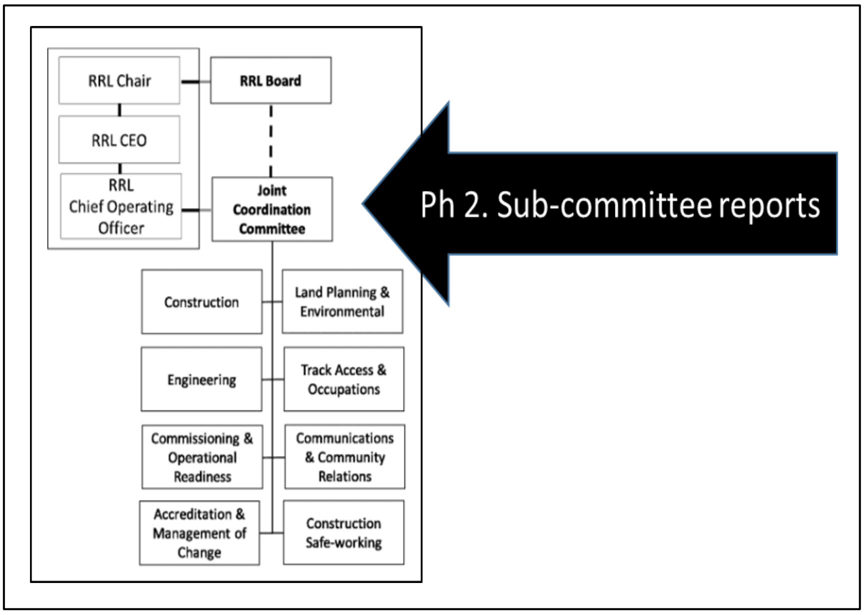
The analysis of Phase 1 is concluded; and the following section will commence analysis of Phase 2.

5.3.2 Phase 2 – Joint Coordination Committee (JCC) sub-committee reports

5.3.2.1 An overview of the JCC

Early in the procurement phase, the RRL project board (Stage 2) recognised the risk of having multiple procurement contracts working within one integrated project, and decided to create a sub-committee to mitigate future integration risks. The JCC was the primary sub-committee implemented by the project governance board, and it functioned only during the construction stage. The JCC held a total of 31 meetings for the period February 2012 to October 2014. For each meeting, there was an agenda and minutes prepared. The relationship between the JCC and the Board is outlined in Figure 5-11, and is the focus of Phase 2. The RRL Board wanted to avoid a perception that it was a bureaucracy, and aspired to maintain a high degree of flexibility with regard to implementation and actions, but wanted to measure its own performance. To achieve project-wide integration, the JCC was set the challenge to establish consistent project-wide communication to ensure that all procurement packages worked to the highest levels and managed risk as an integrated team.

Figure 5-11: JCC and sub-committees (detailed view)



The overall goal of the JCC was to behave more like a *'project-wide committee'* rather than a dispute management committee. The JCC's aim was to create high quality, project-wide performance to ensure that the project delivered the specified functionality in accordance with the performance framework, rather than simply solving issues escalated by the subject matter expert sub-committees (RRLA, 2014b). As the overall project had six contracted work packages (which were all '*projects'* in their own right), a novel approach to integration was needed, and requiring cooperation between the delivery work package parties to deliver the best project outcome. Each work package was required to appoint a single representative to the JCC. Where a work package comprised of more than one party, the work package had to collectively appoint one single JCC representative, regardless of whether it was an alliance project member or an Unincorporated Joint Venture project member, with the following special conditions:

- For the Alliance based work packages, the Alliance was required to appoint a JCC representative who was from a non-owner participant, who was responsible for carrying out construction works within the Alliance.
- Rail Operators were required to appoint a JCC representative to represent them in the capacity as a Rail Operator, and where applicable, a second representative to represent them in the capacity as a Package Contractor.

In total, there were a further eight subcommittees established below the JCC which addressed the specific issues of: Safety; Construction; Engineering; Track Access and Occupation; Accreditation and Management of Change; Communications and Community Relations; Commissioning and Operational Readiness; and Land, Planning and Environment. Each of these specialist committees provided input to the JCC. The core document produced monthly by the JCC was the '*JCC Project Summary*, which provided a detailed overview of progress of each work package. In particular, the '*Summary Page'* provided a detailed report on progression through escalation of risk items, using a '*key project items'* reporting framework (see Appendix H for an example). For the period of the JCC, a monthly report was provided to the project board on 25 key project items, which highlighted whether each item was:

- on target;
- of concern (represented as an amber traffic light);
- requiring action (represented as a red traffic light).

The corporate governance function of reporting, especially for publicly listed companies, has been a key best practice area of improvement dating back to the early 1990s. In particular, enhanced oversight and accountability was identified as core to effective corporate governance functioning (Dahya et al., 2016, p. 7). In the same manner, project progress and status reporting has been a key area of focus for project governance, and especially so for Public Private Partnership (PPP) projects (Grimsey & Lewis, 2004). The RRLA's approach to project reporting displayed a number of attributes that positively contributed to the overall success of the project. The first was the reporting template itself, which did not materially change over the life of the project. This consistency suggests that the reporting template was fit-for-purpose in its ability to convey a significant amount of complex information to the project board. Providing regular and accurate information in a transparent and consistent manner to the project board was a key source of data which ensured that the project was successful, through active risk management. The stability (of the reporting) and the regular and frequent project reporting were key project governance activities, as essential core activities for a project board to be able exercise control and execute its duties.

5.3.2.2 JCC coding

Unlike the Phase 1 coding (project steering committee and project board minutes), the Phase 2 coding used the JCC summary page, with a focus on the volume of risk in each reporting category. Each set of JCC minutes were individually reviewed, and the '*key project issues'* section of the report was identified as a rich data set[31]. This information provided the project board with a *project risk health dashboard* through use of the Red and Amber Traffic (RAT) light reporting which presented an easily identifiable view of risk across each of the work packages. To analyse the data, all JCC reports were converted into Microsoft Excel format. Each of the key reporting categories (reporting categories 1-25) marked as Red or Amber (red being a risk 'requiring action' and amber risks 'of concern') were assigned a value in order to count occurrence and undertake analysis. The 25 reporting categories are summarised in Table 5-12.

Table 5-12: JCC Reporting Categories

JCC Reporting categories	
1. Safety – Rail	14. Best for Project
2. Safety - OHS	15. Coordination issues
3. Budget (cost to deliver)	16. Approvals
4. Forecast (cost to complete)	17. Resources
5. Program milestones	18. Occupations
6. Safety (removed at meeting 17*)*	19. Operational readiness
7. Environment	20. Opportunities
8. IR management	21. Design
9. Quality and Functionality	22. Construction
10. Min. Disruptions	23. Practical Completion
11. Stakeholder and Comms	24. (Other)
12. Time	*25.* Document Management System book-in (created at meeting 23)
13. Value for Money	

Once the data were in a useable format, an anomaly revealed that, while 23 categories remained unchanged for the entire life of the JCC reporting, two categories did change. These changes were:

1. Category 6 - Safety. This category was *removed* at Meeting 17;

[31] See Appendix I - the relevant section is found in the first left-hand side column of the report. If the box was Red or Amber, the next column provided a more detailed explanation of the specific risk.

2. Category 25 - Document Management System book-in. This category was *created* at Meeting 23.

Both changes were noted, and the code categories and analysis files amended to take into account the removal/creation of codes. It was observed that, in the JCC report template, there were three categories relating to Safety – Categories 1, 2 and 6 (see Table 5-13). Analysis of these categories shows that, for the first 15 meetings, there were no risks against Category 6. In Meeting 16 (just before the category was removed at meeting 17) there were 4 RAT ratings against Category 6. There was no record of why this change occurred, but it is reasonably presumed that the JCC recognised that three separate reporting categories for safety were not needed and Categories 1 and 2 were sufficient. For Category 25, this risk category was created late the JCC reporting life. It is presumed that engineering drawings and completions became an issue as the project packages neared completion and required active risk management.

5.3.2.3 Meta Interpretation of results from Phase 2

The volume of risks '*requiring action'* and '*of concern'* were collated and are presented in Figure 5-12 (volume of risks identified per month) and Figure 5-13 (volume of risk by category). Over the life of the JCC, an average of 12 risks per month were reported to the project board. This volume shows that the project consistently reported risks to the project governance board, and that a large number required mitigation by the higher-level project governance function. Figure 5-13 shows that Category #5, '*Program Milestones*', had the most risks identified against it, with a total of 42 risks identified as 'of concern', and 9 risks escalated to the board for action.

Focussing on Month 3 in Figure 5-12, and then months 17-30, this period showed a higher-than-average number of risks that *'required action'* from the project board, with a total of 76 risks escalated, representing an average of 4.75 during those periods. A deep-dive analysis of those specific periods identifies that the risks identified in month 3 related to a specific risk across a number of work packages (which were resolved); however, during months 17-30, the risks identified continued to be reported for a number of consecutive months. Due to confidentiality of the datasets, the specific details of the risk are not permitted to be released. The research did not intend to investigate how the board and sub-committee specifically dealt with the individual risks, as the intent of the research was to analyse how issues and risks were governed, considered and managed. The research delved briefly into the risk treatments, but these were not pursued in any detail, as this distracted from the main focus. While previous arguments demonstrated that the case study megaproject was a success, the JCC risk escalation process nevertheless provides evidence for the actual volume of risks that still required active management by the JCC and, ultimately, the Board. This demonstrates that, although the project was successful, significant project board effort was still required to ensure that risks were effectively mitigated and not realised

Figure 5-12: Volume of risks raised to the Board by month

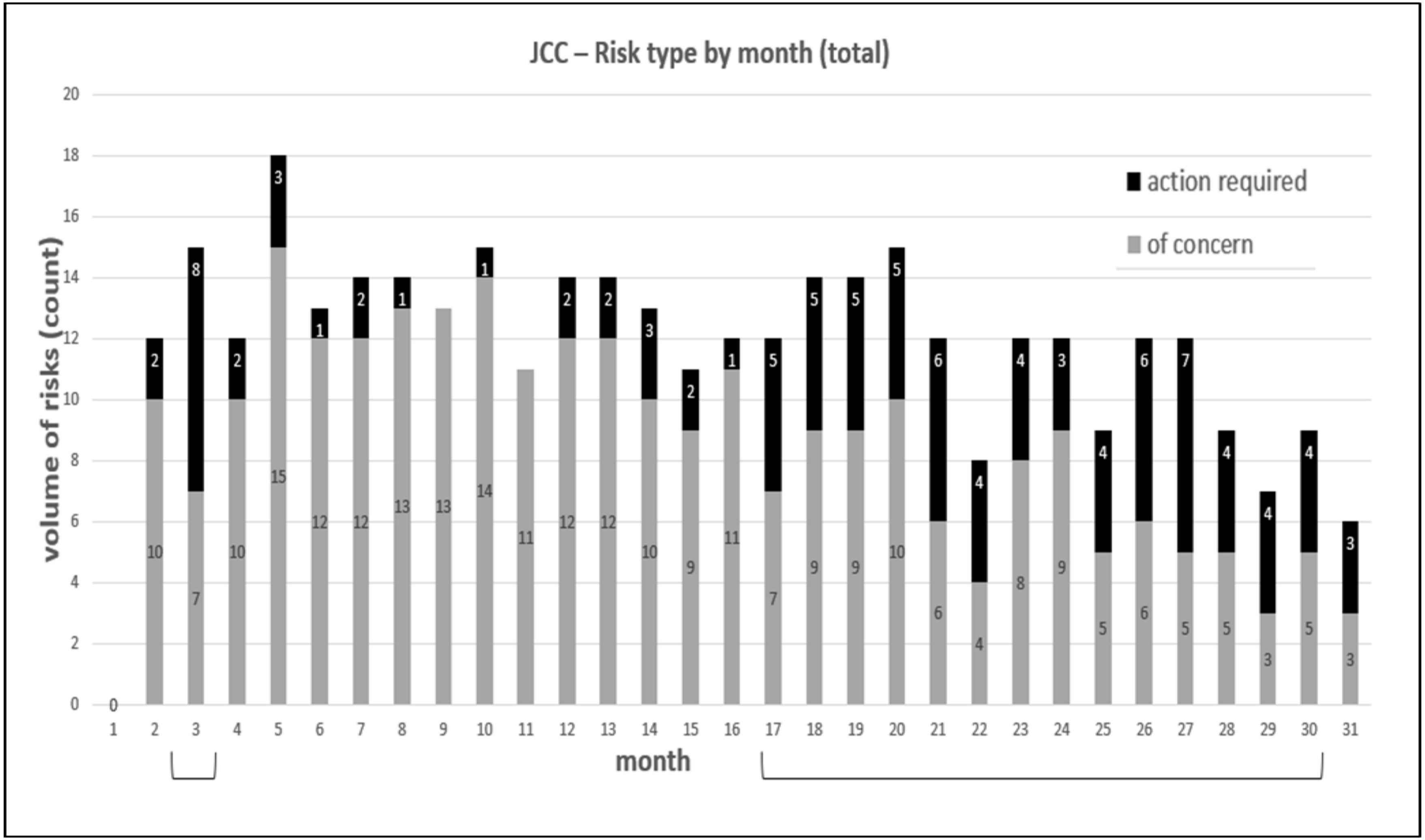
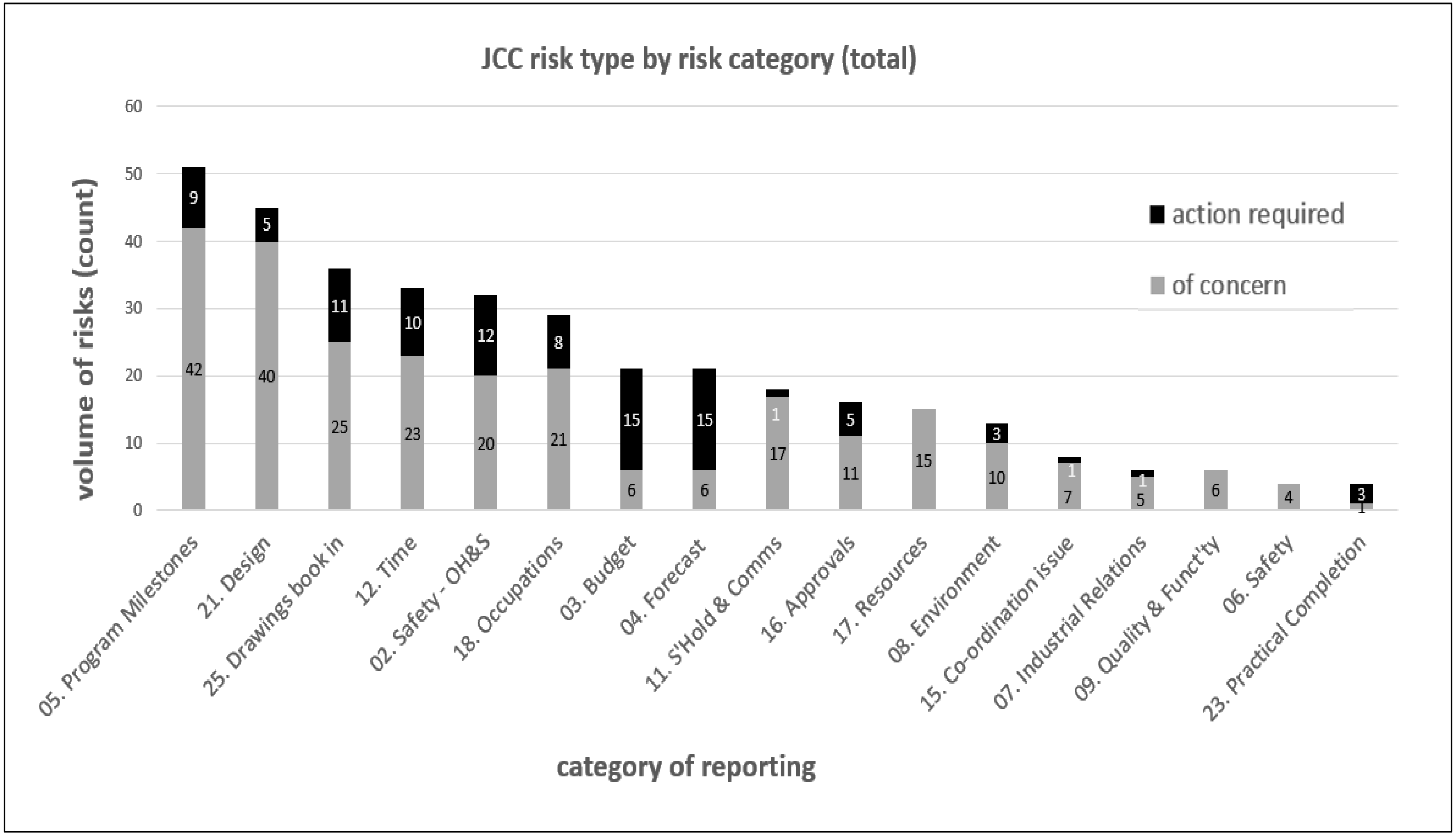


Figure 5-13: Volume of risks raised to the Board by category



5.3.2.4 Key findings for phase 2

The board created the JCC to utilise a proactive approach to reporting of risk. The JCC, which was only in place during the construction phase of the project, escalated a total of 364 potential risks. Of those, 27.2% required action to be taken either by the JCC or the Board (see Table 5-13).

Table 5-13: JCC total risks identified and escalated

Occurrence	JCC code subject headings (count)	
	Issues of Concern	**Issues Requiring action**
Count	265	99
%	72.8%	27.2%

The escalation of risk highlights the importance of proactive risk management for a megaproject. It is implied that the project board was not able to allocate project risk to the party best able to deal with the risk, and that the project board had to actively manage project risk. Risk management was highlighted as a core issue that required consistent and ongoing attention by the project board, from the Phase 1 results. For a megaproject to be successful, risks have been demonstrated to require active risk monitoring; however, in this case study, the project board took on less direct intervention by using a sub-committee to manage risk. This is also reflected in the results of Phase 1, Stages 1 and 2 (Figure 5-10), whereby the volume of risk issues was not a subject that required significant board discussion.

For failed megaprojects, one theoretical position could be used to interpret this as the project governance function failing to effectively manage project risk. Figure 5-12 shows that risk was ever-present throughout the life of the case. While the volume of risks was generally consistent across reporting periods (an average of 12 risks per month), by having a project governance culture that valued risk reporting, and putting in place a committee and contractual process to manage this, risks did not materially affect the overall project outcome. The evidence suggests that the reporting template used by the Board and JCC was both fit for purpose and able to convey a significant amount of complex information to the Board in a digestible but manageable form. These results also provide a basis for making five further observations, drawn from the impact of project governance arrangements, from a risk perspective:

- **Observation 9** – Use of a sub-committee was an effective risk control function.
- **Observation 10** – Consistent and regular risk reporting is an essential project governance function for a project board. A culture of consistent and open reporting, via escalation, is a key activity of the project board.
- **Observation 11** – Regular risk review is a key project governance activity. Categorising risks as '*areas of conce*rn' and escalating those risks that '*require attention'* provided the board with different treatment options and priorities.

- **Observation 12** – Risk management was an activity that was present across the entire project lifecycle.
- **Observation 13** – Risks identified later in the delivery stage tended not to be resolved in a timely manner and continued to require ongoing board attention.

5.3.3 Phase 3 - Board Member Interviews

The Phase 1 (board minutes) and Phase 2 (JCC sub-committee) analyses provide new insight into the functioning of the megaproject governance and decision making. One of the limitations of Content Analysis concerns the accuracy and completeness of the recorded documentation. As was outlined in Chapter 4, in order to confirm the findings from Phases 1 and 2, Phase 3 was designed to validate the Phases 1 and 2 results with the project board. Individual board members were presented with 12 project governance dimension questions that were derived from the results in Phases 1 and 2 and observations. This method allowed the board members to both provide their views on the project governance arrangements and confirm the validity of the earlier findings.

Phase 3 involved individually interviewing each of the board members, and through use of a semi-structured questionnaire, gaining an understanding from each of them on their perspectives on the decision making and insights. A minimal risk human ethics application was required for this Phase (HEA Ref 1647013.1). Board member names and their details were available during the data collection stage in the Project office. The board members were initially contacted by email, with follow-up phone calls to organise interview meetings.

The RRLA Board was designated as an Administrative Office through the Public Administration Act (Victoria, 2004). It did not provide for the project board to operate as company directors, as the Act only recognised a *Head* of the organisation. The RRLA Chair (as the Head of the organisation) was the Senior Responsible Officer for the project, and Board members were technically advisors to the Chair. An extract from the RRL Insights Series project documentation (RRLA, 2014a) describes the Board's role and skills (see Appendix I). The RRL Insights Series was a suite of 16 volumes of lessons learnt documentation which describes the development, planning, procurement, delivery and commissioning.

5.3.3.1 Board member participation

Interviews were conducted over a 13-week period (20 February 2016 – 17 May 2016). Each interview was recorded on a digital recording device, and field notes were used to summarise and capture responses to the questions asked during the interviews. Field notes were hard copies of the questionnaire with notes taken during the interviews. Interviewees were de-identified using a coding system (Interviewees A through K) to ensure anonymity and confidentiality. Due to the small size of the sample (n=11 interviews), any references to personal information that might allow someone to guess the identity of the interviewee was removed[32].

The participants were invited to answer 12 semi-structured open questions (see Appendix J). The questions were developed based on the knowledge gained from the first two phases, including for developing a deeper understanding of the observations, and to iteratively assist in confirming relevant findings and insights that had been observed. Either a question or statement was made that considered 12 dimensions, as outlined in Table 5-14; and the design required confirmation by the project board members.

Table 5-14: Phase 3 project governance dimensions

Project Governance Dimension
1. Primary Role (of the board)
2. Success criteria
3. Governance structure (differences)
4. Governance Effectiveness
5. Governance Improvements
6. Measuring Governance success criteria
7. Governance design
8. Need for Governance
9. Key governance decisions
10. Board member contributions
11. Accountability
12. Future improvements

Interviews were transcribed using the digitally recorded responses and field notes. The intent of the data collection was to understand collective responses of board members, and not necessarily the individual nuances or specific individual's analysis; therefore, transcribing word-for-word was not considered a worthwhile activity for the present research purpose. The field notes were used to provide context of the individual responses and to capture the overall intent of the interviewee responses. The original recordings and PDF versions of field notes were transferred to a secure University of Melbourne Engineering Department server, and access to these files was only granted to relevant research participants. All other digital recordings were deleted.

The time commitment for board members was estimated to be 75 minutes per participant, which allowed for covering introductions, questions and closeout. Participants were provided with the list of 12 questions prior to the meeting, to allow for them to collect their thoughts, reflect on the project, and consider possible answers. Due to the seniority of all the participants, as industry leading infrastructure specialists, the

[32] To the fullest extent possible; i.e. removing reference to 'the Chair' or a specific function.

interviews were completed at a convenient location for the participants. At the time of interviews occurring, the project had been completed and the board disbanded for more than 18 months; thus, as this time had passed, this provided board members an opportunity to reflect on the overall success of the megaproject.

5.3.3.2 Coding of responses to survey questions

To facilitate coding and data analysis, all responses were transcribed in summary format to capture the intent of candidate's responses. Participants were individually interviewed, and responses de-identified the individual by replacing their identity with a unique identifier code (e.g. Candidate A). The data were converted into optical character recognition (OCR) PDF format and loaded into the QDA Miner software tool, as outlined for previous stages. The coding methodology adopted a similar process as in Phase 1. One variation to that coding methodology, unique to this phase, was that the dataset contained responses to individual questions; thus, to accurately analyse each question using the tool, each question required additional coding layers to identify each question number (i.e. unique codes for question 1, question 2 and so on). An example of the coding is visually represented in Figure 5-14. This was important to allow for separate analysis of each question or in aggregate using the QDA functionality.

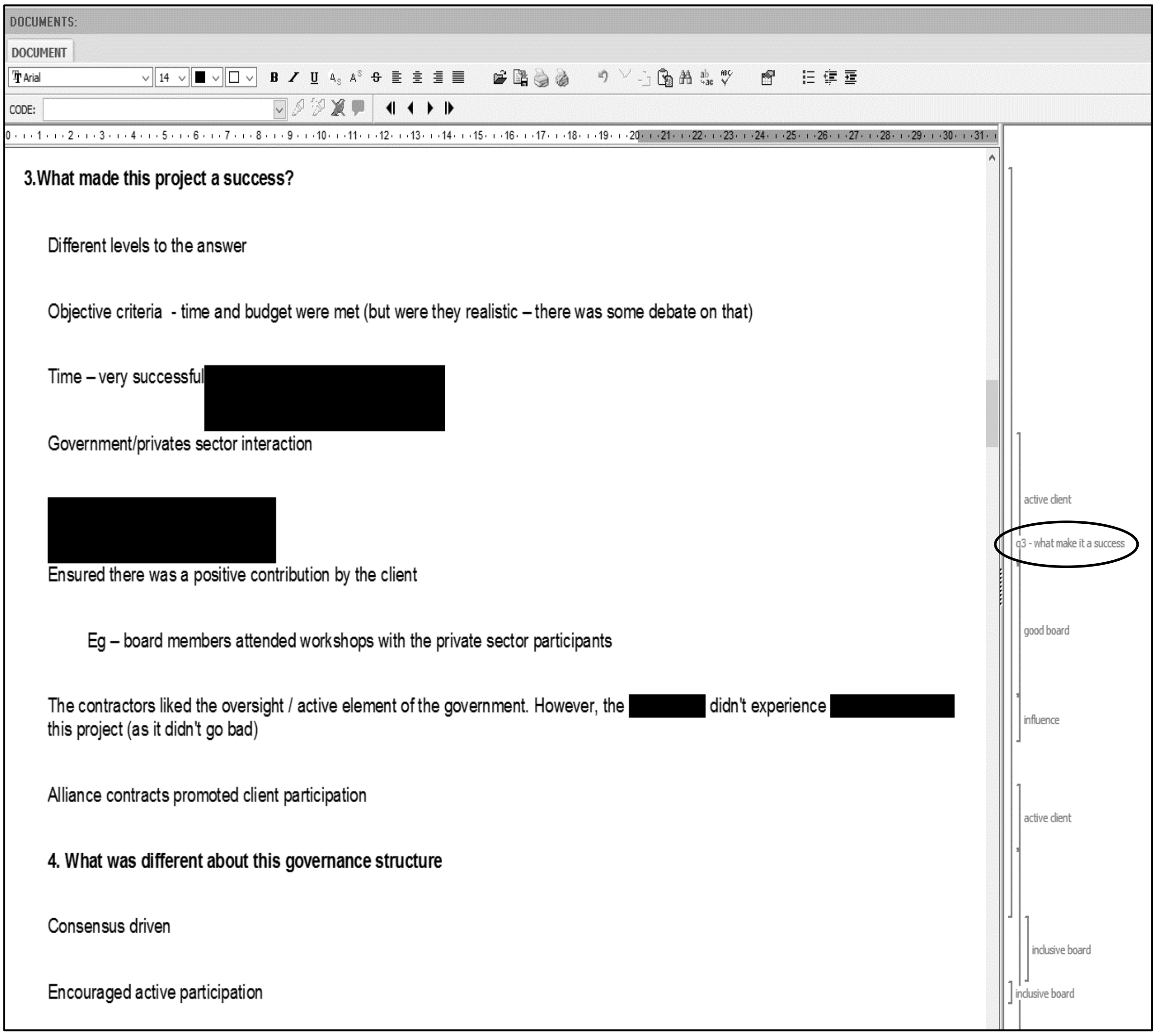
The board minutes were qualitatively coded using the coding book developed during the earlier steps. The individual board member responses were reviewed and re-read in order to become familiar with response types and to develop a consistent coding method. New codes were developed as the coding progressed. A multi-variable analysis provided different layers of perspectives. Analysis of the responses used techniques including coding frequency, and cluster analysis including co-occurrences, code sequencing, code variables and similarity/divergence. While it was expected that there would be a degree of similarity to results in Phase 1, the hypothesis was that the Phase 3 responses would highlight which decisions the board considered to be *'more significant'*, which was not necessarily apparent from the board minutes themselves.

The list of codes was iteratively developed as the reviewer coded each section of the interviewee responses. To ensure a high degree of consistent coding, the codes uses were organised and grouped by the question number, using the QDA hierarchy function. This allowed for easy identification of each question, to identify each coded response.

5.3.3.3 Analysis of Board member responses

A total of 11 interviews were conducted, comprising the 8 board members and 3 interviews of individuals not on the project board but who were significant stakeholders. All 11 interviews were initially transcribed and coded in QDA Miner. At the end of the coding process, the three non-board member interview responses were removed. While those interviews were very useful in terms of providing a broader understanding of the decisions made by the board from the perspective of a *key interested party*, the research's core focus was on the decisions within the board. The three interviewee transcripts and the

Figure 5-14: Example of a Response to a Phase 3 Survey[33]



associated coded files were deleted from QDA, and separately filed. One of the impacts of this deletion identified that a number of codes only applied to those three interviewees, resulting in those codes then having a zero-count response. Those zero count codes were deleted from the working analysis codebook files. Responses to each of the 12 questions are provided in Appendix J.

Responses to each of the 12 governance dimension questions resulted in a total of 149 different codes being created. A summary of the Phase 3 codes against each dimension is provided in Table 5-15, and a complete listing of codes in the Phase 3 codebook is in Appendix G[34].

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[33] Sensitive data or data that could identify a participant are blacked out.

[34] A number of duplicate codes were created to allow for analysis against each question. For example: cost and cost1, risk and risk1 were created when needed, as QDA required unique coding. For the purposes of the table, items such as cost1 and risk1 were considered duplicate codes and considered as one for the total number of codes.

Table 5-15: Phase 3 Board interview codes

Project Governance Dimension	# codes
1. Primary Role (of the board)	15
2. Success criteria	26
3. Governance structure (differences)	15
4. Governance Effectiveness	2
5. Governance Improvements	13
6. Measuring Governance success criteria	10
7. Governance design	2
8. Need for Governance	6
9. Key governance decisions	21
10. Board member contributions	15
11. Accountability	3
12. Future improvements	21
Total	**149**

5.3.3.4 Cluster Case Analysis of Board responses

A cluster analysis provided analysis of the board member responses in aggregate. While responses to individual questions will be considered further in Chapter 6, to test theory against the findings, the coded contents of all the board interviews were analysed using coding co-occurrence to investigate similarities and divergence of the Board member responses. A coding co-occurrence maps similarity in responses using a number of different analysis techniques (clustering within a case, segment overlap, windows of *n* paragraphs and same-segment) by utilising the index functionality listed in Table 5-16. This was advantageous to identify and outline which were the most frequently occurring codes across all the board member responses.

Cluster cases analysis uses a distance matrix for clustering and multidimensional scaling, and is determined by scaling the cosine coefficients on the relative frequency of the codes. The more similar two cases are, in terms of the distribution of codes, the higher the coefficient will be. The following is an extract from the QDA website that describes the analysis functionality further:

> "QDA Miner allows you to further explore the relationship among codes by providing various graphic tools to assist the identification of related codes. These tools are obtained through the computation of similarity or co-occurrences index and the application of hierarchical cluster analysis and multidimensional scaling on all or selected codes. Results are displayed in the form of dendrograms, concept maps and proximity plots. Cases may also be clustered based on their content similarity using the same statistical and graphic tools." *(QDA, 2017)*

Table 5-16: Cluster Case Analysis Techniques Used (QDA, 2017)

Index	Description
Jaccard's coefficient (occurrence)	Coefficient is calculated from a fourfold table as *a/(a+b+c)*, where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is found but not the other. In this coefficient, equal weight is given to matches and non-matches.
Sorensens co-efficient (occurrence)	Coefficient is similar to Jaccard's but matches are weighted double. Its calculating formula is *2a/(2a+b+c)*, where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is present but the other one is absent
Ochiai's co-efficient (occurrence)	This index is the binary form of the cosine measure. Its calculating formula is *SQRT(a^2/((a+b)(a+c)))*, where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is present but not the other one.
Cosine theta (frequency)	Coefficient measures the cosine of the angle between two vectors of values. It ranges from -1 to +1.

Using the coding co-occurrence features, the relationships between key words were analysed using a large number of iterations and tolerance variation settings. The feature uses 'proximity of codes' to explore relationships amongst cases, obtained through the computation of *similarity*. The results present clusters[35] that can be grouped and analysed at different cluster sizes. The built-in function provides a default optimal cluster size, dependent on the dataset being analysed. The recommended default level for this dataset analysed was six. A number of alternative sized clusters (1, 3, 12, and 20) were also modelled to check for suitability. The default cluster size was found to be the most suitable scale, with the second most useable cluster size being a 12-cluster model. The major difference was that the 12-cluster model only split 2 of the 6 clusters into smaller groupings. The 1, 3 and 20 clusters produced either too much or too little differentiation. The 6-cluster dendrogram was analysed using Jaccard's coefficient to determine key themes for the board interview responses. The coefficient is calculated from a fourfold table in Eq. 5-1, as:

Equation 5-1: Jaccard's Coefficient

$$\boldsymbol{d} = \frac{\boldsymbol{a}}{(\boldsymbol{a}+\boldsymbol{b}+\boldsymbol{c})}$$

where *a* represents cases where both items occur, and *b* and *c* represent cases where one item is found but not in the other. In this coefficient, equal weight was given to matches and non-matches. The results were

[35] A cluster facilitates the identification of functional relationships between related codes and groups that are more similar to each other than those in other clusters.

further represented using a cosine theta which measured the cosine of the angle between two vectors of value which ranged from -1 to 1. The closer the cosine theta is to 1, the closer the angle (or similarity). Using the coding co-occurrences, the dendrogram described the clustering of overall responses, with tolerances set at 0.00001 and use of 500 multi-dimensional scaling options. The 6 clusters were tabulated in order to identify the volume of codes captured in each cluster, as seen in Table 5-17.

Table 5-17 : Coding co-occurrence clusters

Cluster #	# of codes in the cluster
1	11
2	65
3	29
4	19
5	9
6	27

The output of the 6-cluster model is displayed in the form of a dendrogram as an overview in Figure 5-15[36], and in detail in Appendix L.

5.3.3.5 Interpretation of the Phase 3 clusters

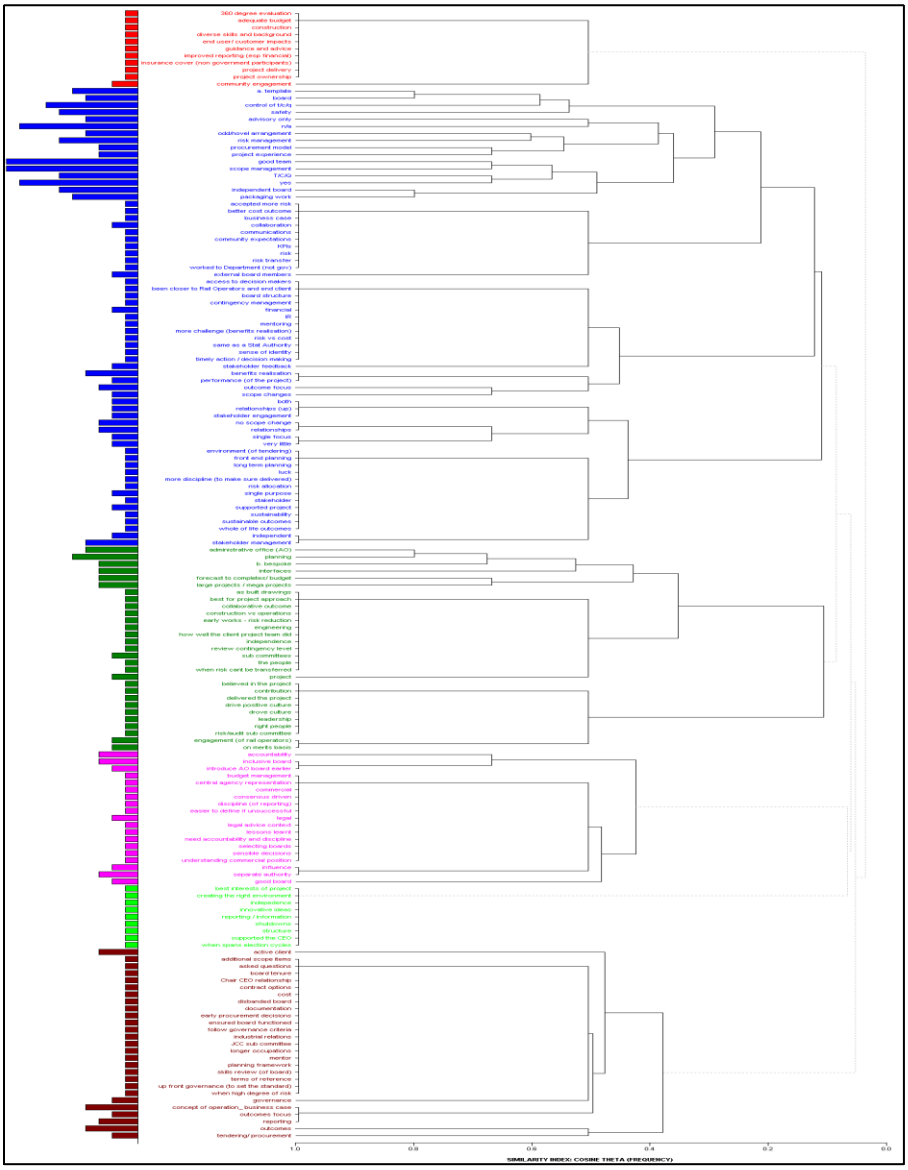
The analysis was qualitatively focused, but a benefit of QDA was its seamless ability to be a multi-method analysis tool. While Table 5-15 and Table 5-17 provided a limited insight into collective board member responses, it did not give sufficient insight into what the groupings represented, or identify the importance of decisions and responses made by the board. The six-cluster dendrogram was exported to another analysis tool within QDA, WordStat, for further analysis. WordStat is a text analysis tool that integrates SimStat (the statistical analysis tool), QDA miner (the qualitative data analysis tool) and Stata (statistical software) to provide Text Analysis relating content of structured information (QDA, 2016).

Each of the 6-cluster data sets were separately exported to WordStat (v7.0.9), and analysed using clustering parameters set to a keyword/category using parameter settings of:

- Occurrence - Same paragraph;
- Index - Jaccard’s coefficient;
- Type - Work co-occurrence (1st order);
- Multidimensional scaling - classical scaling.

[36] Note: the colour coding in Figure 5-15 represents the 6 different clusters from Table 5-15.

Figure 5-15: Overview of 6-cluster Dendrogram[37]



WordStat was executed to run the analysis utilising *tolerance controls*. The output was a network diagram which presented the cosine score between all keywords in each cluster. The newly formed network diagram clusters were able to be manipulated to show all links or filter link-strength reduce to a specific number of relationship links. For each of the 6 clusters, the network diagram filter was reduced to identify the single most important key word within the links. The key links were identified through the a*ssociated strength number* (between 0-1), with Figure 5-16 providing an example of a network diagram: the left-hand side

[37] A plot of a hierarchical binary cluster that connects data points in a hierarchical tree using an average-linkage hierarchical clustering method to create clusters from a similarity matrix. The result is presented in the form of a dendrogram, also known as a tree graph. In this type of graph, the vertical axis is made up of items, and the horizontal axis represents the clusters formed at each step of the clustering procedure. Codes that tend to appear together are combined at an early stage, while those that are independent from one another, or those that do not appear together, tend to be combined at the end of the agglomeration process.

shows all the relationships in a dendrogram form, while the right-hand side identifies the key link within the cluster[38]. Each network diagram was further manipulated to identify the key links between the key words and the key link (Figure 5-17).

Figure 5-16: Screenshot of a QDA Network Diagram

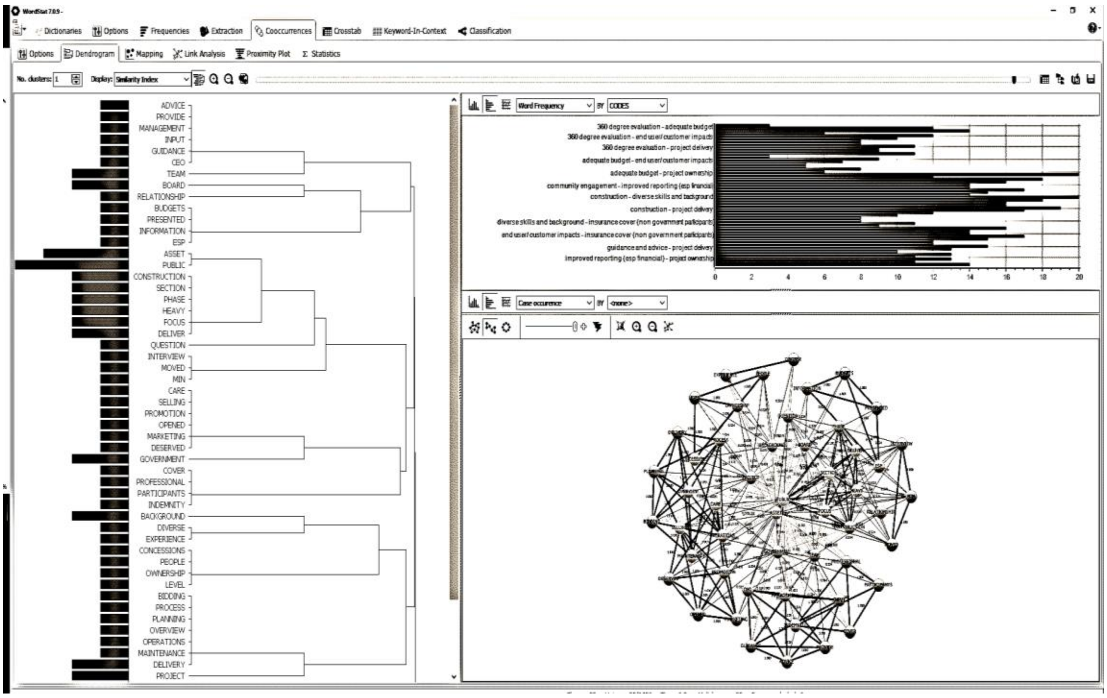
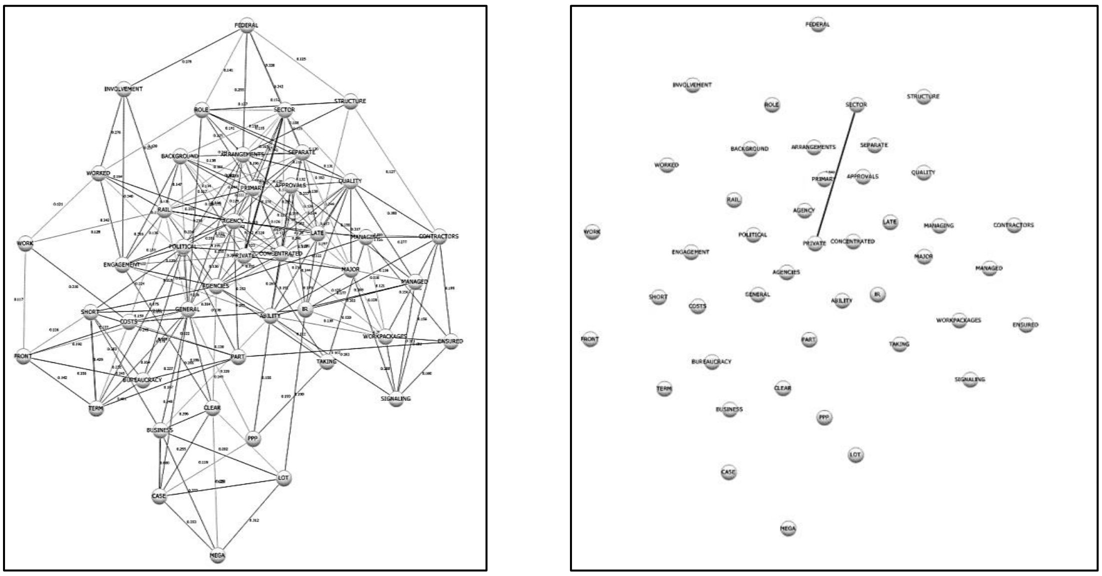


Figure 5-17: Keyword cluster network diagram (all links and key link)



All links in a cluster	Key link in the cluster

[38] Within the WordStat tool, the number of links can be filtered between the two extremes outlined in Figure 5-17.

For each of the clusters (1-6), a network diagram was produced; and for each of the clusters, a dominant keyword was identified. Each cluster was given a cluster name for ease of recognition (refer to Table 5-17). A detailed Network Analysis Diagram for each of the clusters was created, and these are presented in full in Appendix L. Figure 5-17 provides an example of the output from a Network Link Analysis that identifies relationships, represents the relationships between the sets of strongest word associations, and provides the statistical relationship scores between those associations.

5.3.3.6 Relationships between the 6 dominant keyword clusters

Each of the six clusters produced a *dominant keyword* within each cluster. The dominant key link (or keyword in the cluster) for each is presented in Table 5-18.

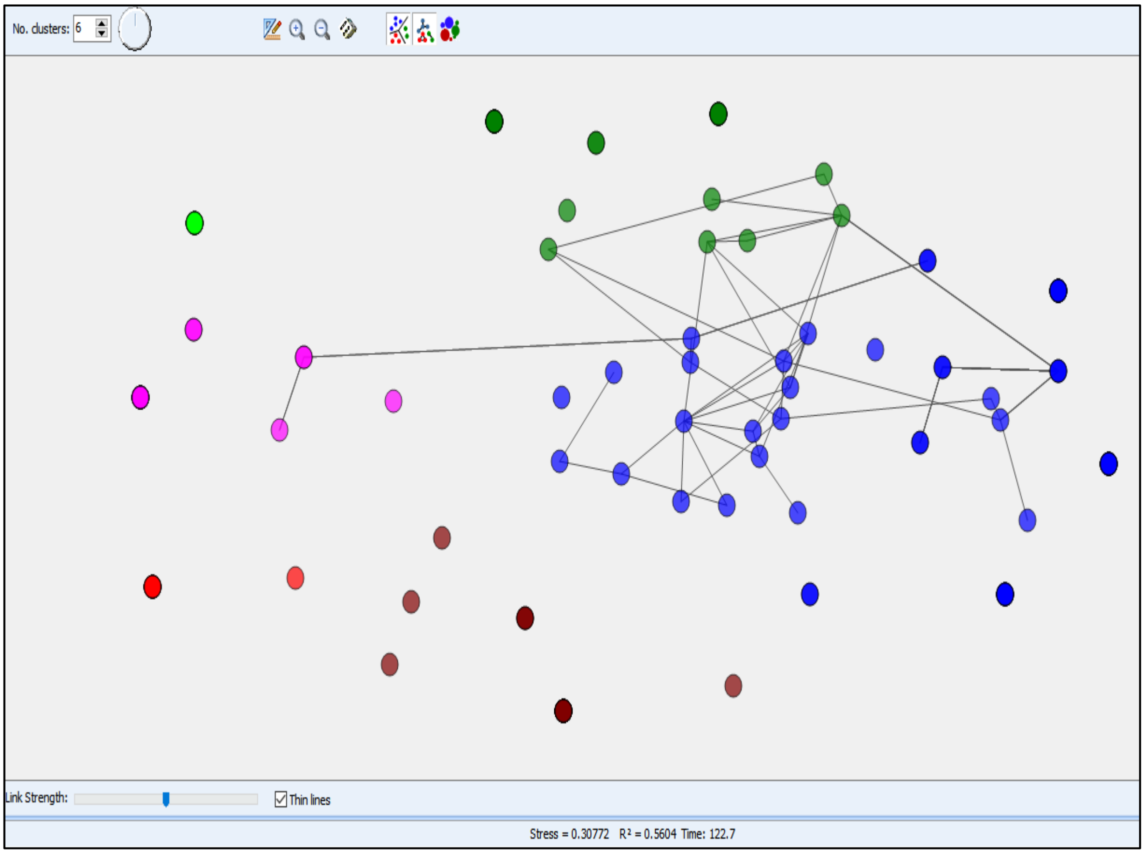
Table 5-18: Dominant key word in each cluster

Cluster #	# of codes in the cluster	Dominant keyword
1	11	Advice
2	65	Ability
3	29	Accountability
4	19	Accountability
5	9	Project
6	27	Active

The next analysis step investigated the relationships *between* the six clusters. Understanding the strength of relationships at the meta-governance level provided a further interpretation of relations between keywords identified in the previous step. A cluster analysis scenario was modelled, this time using a '*case similarity'* function, with configuration scaling using a random configuration of points. To reduce the density of the complex result, the links were aggressively filtered in order to provide a visual view to identify the strongest key relationships in the cluster (see Figure 5-18, and Appendix M for a full presentation of the relationships and links in each of the keyword clusters).

Link Analysis (2-d conceptual plot) allows one to visualize the connections between keywords or dictionary items using a network graph. It offers a high level of interactivity, allowing one to explore relationships as well as detect underlying patterns and structures of co-occurrences using three layout types: a multidimensional scaling, a force-based graph, and a circular layout. The 2d conceptual plot is initially associated with clustering features and a dendrogram, such that selecting a specific cluster in the dendrogram will result in a network view of its elements. Each element is represented as a node, while the relationships are represented as a line connecting those nodes (referred to as an 'edge'), the thickness of this line representing the strength of the relationship. The plot provided a stress value of 0.31 and an R^2 value of 0.56. The plot shows that the strongest overall relationship is between Cluster 2 (blue) and Cluster 3 (green), which are the '*accountability'* and '*ability'* dominant keywords. The next strongest link was cluster 4 (pink - *accountability)*. The regression result of 0.56 indicates that the data set has neither a high nor a low correlation across the data set. The R^2 value is a measure of how close the data is to a fitted regression line, with the ideal result being as close to 1 as possible. Regression scores that involve human interactions do not normally provide high regression score, which explains the result here. The model's analysis, therefore, didn't provide any additional significant conclusions about the results in aggregate. It did, however, indicate that there was a divergence of results between each of the board members, and therefore provided a new avenue for future exploration.

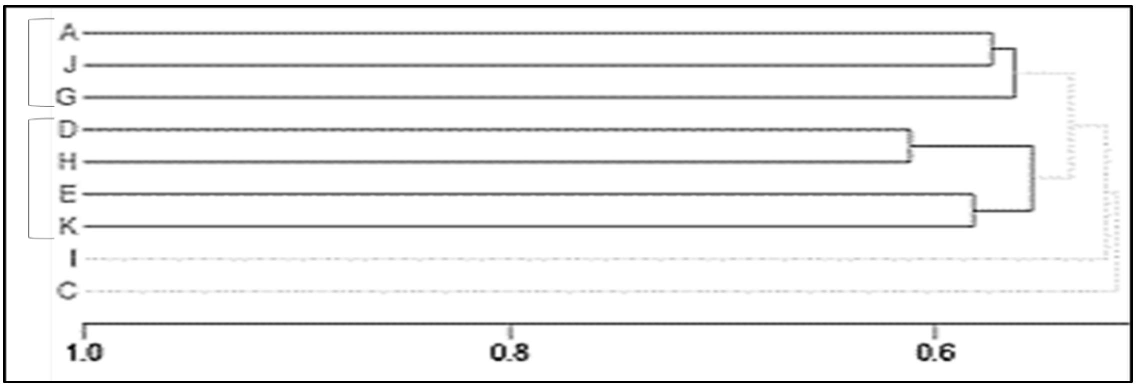
Figure 5-18: - Example of a 2-D Conceptual Plot Relationship with Default Link strength



5.3.3.7 Comparison of Responses of Board Members (Similarity Index)

The previous step's conceptual plot highlighted some divergence in individual board member results, suggesting that the relationships between clusters are neither weak nor strong, but co-existing. This provides a position that board similarities needn't be consistent, as an insight into the collective view of the board members, and also demonstrates that there was small number of strong, and dominant keywords common across the board members responses. The 6 dominant keywords will be considered further in Section 5.3.3.9; however, the next interpretation of board survey results was to analyse the 'case similarity' *between* board member. This was achieved by comparing the case similarity of *individual* member responses, as compared to the previous step of collective co-occurrence analysis. The analysis is presented in the form of a dendrogram which indicates the relative strength against each of the board members, as seen in Figure 5-19. In this graph, each of the letters (A-K) represents the board members.

Figure 5-19: Board Member Similarity Index dendrogam

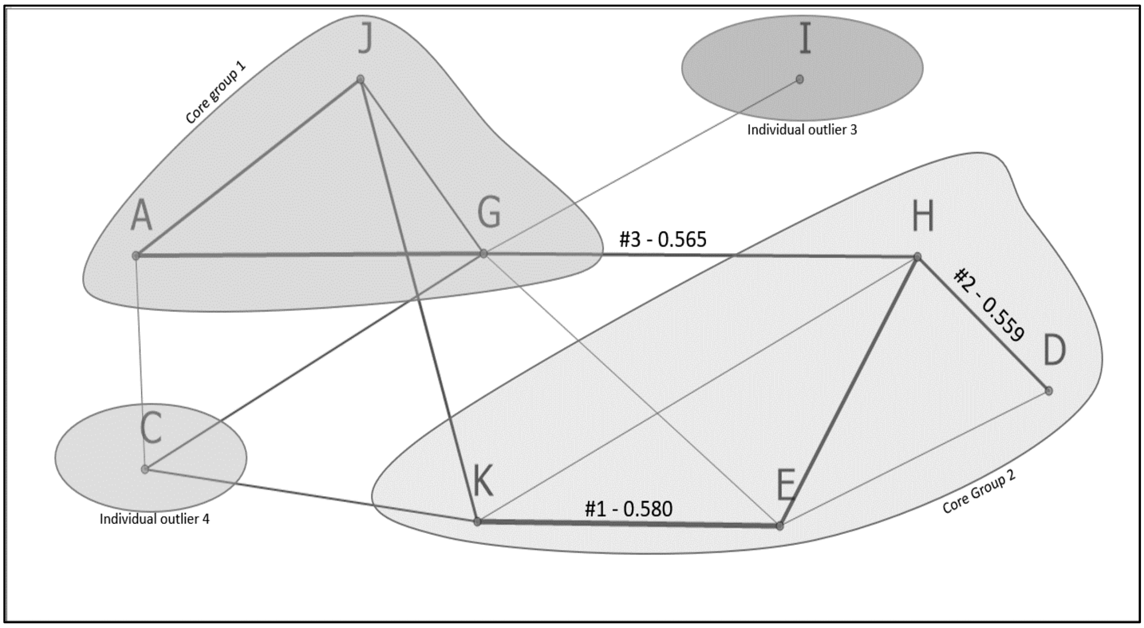


The dendrogram shows the strength of relationship between each of the responders, with the higher the score, the stronger the similarity. This allows for the identification within the responses of four distinct groupings, consisting of 2 core groups and 2 individual outliers, these being:

1. Core groups:
    - Group 1 (consisting of Board members A, J and G);
    - Group 2 (Board members D, H, E and K).
2. Individual outliers:
    - Group 3 (Board member I);
    - Group 4 (Board member C).

The dendrogram shows that there were board members who responded similarly (i.e. core groups 1 and 2), while two groups (groups 3 and 4) provided lower similarity. A number of simulations were run to further understand the relationships, using 2-d conceptual plot approaches. The plot went through a number of reductions in order to produce a representation that differentiated the strongest relationships from weaker ones, while ensuring the plot had, at a minimum, relationships identified between all responses. Each simulation considered the individual question responses and plotted the relationship strengths; and once individual questions were analysed, the key relationship strengths were identified. The result was a combined plot with each of the four groupings mapped using an agglomeration to compare nodes (Figure 5-20). The higher the number, the higher the similarity index. The similarity index for the strongest node (K-E) was 0.580, the second between H-D, and the third between G-H which connected groups 1 and 2.

Figure 5-20: Case Similarity & Agglomeration Similarity Index



5.3.3.8 Overall Phase 3 findings

The methods considered the collective responses of the board members as a single entity made up of individuals. While 0 provided the results by each individual question, attention is drawn to some specific questions in the results. Firstly, and not surprisingly, the response to question 5 (*was the governance effective on this project?*) resulted in a 100% agreement by all board members. For question 12 (potential governance improvements), the most significant item identified was that they would have introduced the project board earlier (in this case, creation of the Administrative Office for the Stage 2 governance). The responses to question 1 (*what did you consider to be your primary role?*) show a strong consensus on the need to focus on delivering the overall project outcome. The board described the governance arrangement as functioning as an independent board with a novel governance structure; even though the board was only appointed in an advisory capacity to the Chair. Finally, the board members credited the success of the project to four topics:

1. having adequate planning;
2. managing the project management outcomes of scope / time / cost / quality;
3. receiving a sound business case from the sponsoring organisation with an adequate budget and risk provision;
4. ensuring that they had strong engagement of stakeholders and end users.

In terms of the key decisions made by the board, questions 8 and 9 provided significant insight *(Q8. What were the key decisions the board made on the project; Q9 What were the biggest contributions you believe you made on the project?)*. From the board member perspective, understanding how the project's scope of work would be delivered, and ensuring that the scope was controlled and adhered to, were key. When there were scope change proposals provided to the board, they had to carefully decide whether the change benefitted the project outcome or not. Table 5-19 summarises the most important issues of the Phase 3 results in relation to the key board decisions and their identified biggest contributions.

Table 5-19: Board key decisions and contributions

Key decisions made (Q8)	Biggest contribution made (Q9)
1. Packaging of the work	1. Oversight of managing the forecast-to-complete and the budget
2. Ensuring there were no scope changes	2. Stakeholder management
3. Considering scope changes	3. Safety
4. Maintaining an outcomes focus	4. Ensuring collaboration of all parties
5. Risk management	

For a megaproject, converting a business case into the procurement and then delivering the works is complex. There are multiple work packages, competing demands, and more than one procurement method, as was the case in this project. Therefore, the key decisions that were confirmed in Table 5-19 reinforce the importance of the project governance function in understanding what needs to be delivered and how to go about the delivery. The questions asked the board member to identify their biggest contributions, confirming the importance of risk management at the board level. Ensuring the project delivered within its budget was a key project management metric for success; however, the next three most important contributions were risk management-related issues, which without adequate governance, could have resulted in the project being delivered late or over budget:

- keeping stakeholders aware and engaged with the project ensures that they support the overall project;
- ensuring that those delivering the project are safe ensures that the project is not slowed down by an incident;
- creating a collaborative environment ensures that conflict, risks and boundaries can be resolved in a proactive manner.

5.3.3.9 Comparisons against best practice frameworks and emerging project governance concepts

The meta-analysis of the dominant keywords demonstrates that, across the board member responses, there were a number of consistent and interrelated responses. The six clusters (identified in Section 5.3.3.6) demonstrates that there are a number of complex issues that the board considers. In order to consider applicability of the results against broader governance frameworks, the keywords were compared against five leading corporate and project governance sets of principles (see Table 5-20). This was undertaken in order to confirm similarity between corporate and project governance principles, thereby demonstrating that megaproject governance is highly aligned to both. The 5 sets of governance principles were analysed and cross-checked for word matches (similarity) captured in each framework. The results demonstrate that, against the first two frameworks, there is a strong correlation between the dominant key words, the principles and the case. The third framework, Sarbanes-Oxley, is a rules-based and legislative reporting instrument; and because of the focus on rules or compliance, as opposed to principles, there is a lower level of correlation.

Table 5-20: Dominant keywords against leading governance principles

	Document source				
	OECD (1999, 2005)	**ASX (2003, 2014)**	**SOX (2002)**	**APM (2004, 2011)**	**ISO21505 (2017a)**
Dominant Keywords (from Table 5-18**)**	Was the dominant key word addressed in the governance document?				
1. Advice	Yes	Yes	No	Yes	No
2. Ability	Yes	Yes	Yes	Yes [39]	Yes[11]
3. Accountability	Yes	Yes	Yes	Yes	Yes
4. Project	No	No	No	Yes	Yes
5. Active	Yes	Yes	No	No	Yes[40]
Correlation level	**High**	**High**	**Low**	**High**	**High**

A number of other keywords were identified in the key governance principle documents (N=13) that were not identified in this case study (see Table 5-21). The significance of the 13 other keywords will be discussed in Chapter 8.

5.3.3.10 Key Findings for Phase 3

The Phase 3 board interviews sought to confirm earlier findings in Phases 1 and 2 and gain new insights into the collective decision making of the board, by individually interviewing each member on their views on the decisions made during the project's lifecycle. As was demonstrated in the earlier two phases (the Minutes and JCC sub-committee documentation), the datasets provided two distinct views on RRLs project governance: a documented, and a formal, view on the written Board minutes and the sub-committee reports. Both datasets were evaluated based on the written documentation that was systematically and consistently recorded over the period of the project.

[39] Equivalent keyword = capability.
[40] Equivalent keyword = proactive.

Table 5-21: Other dominant keywords idenitified in leading governance principles

	Document source				
	OECD (1999, 2005)	**ASX (2003, 2014)**	**SOX (2002)**	**APM (2004, 2011)**	**ISO21505 (2017a)**
Keyword[41]	Was the dominant key word addressed in the governance document?				
1. Oversight	Yes	Yes	Yes		Yes
2. Auditor independence			Yes		
3. Corporate responsibilities	Yes	Yes	Yes	Yes	Yes
4. disclosure / reporting	Yes	Yes	Yes	Yes	
5. Conflict of interest			Yes		
6. Shareholder/ stakeholder	Yes		Yes	Yes	Yes
7. Structure (to add value)		Yes		Yes	
8. Risk	Yes	Yes	Yes	Yes	Yes
9. Project based activity				Yes	
10. Strategy alignment / plan				Yes	Yes
11. Approval				Yes	Yes
12. Project closure				Yes	
13. sustainability					Yes
count level	**(5/13)**	**(5/13)**	**(1/13)**	**(9/13)**	**(7/13)**

The Phase 3 perspective, from the board members themselves, focussed on the actual views of decision makers of the project, and their perspectives on the key decisions made. A total of 149 different responses to the 12 questions were identified. The third perspective triangulated the two earlier-phase results, allowing for a comparison of the collective individuals' decisions against those that were recorded in the documentation. Based on the results provided by the data, the following observations are made in relation to the Phase 3 findings:

- **Observation 14** – There is a significant overlap between principles of project governance and corporate governance. Whereas a megaproject is time-bound, the project's output forms part of an organisation's new (or ongoing) corporate governance operation.
- **Observation 15** – The project governance structure adopted by this megaproject was novel. There was a Head of the organisation, and the board were engaged as technical advisors to the Head. The

[41] From the 5 governance principle documents.

board did not have traditional corporate governance responsibilities associated with a corporate governance board.

- **Observation 16** – The skill sets of the project board were diverse, and addressed skills relevant to the project. Skills included construction, engineering, transport (rail) experience, government relations, financial/cost management, and stakeholder relations.
- **Observation 17** – Dominant keywords regarding the project governance resulted in 5 key areas, of Ability, Advice, Accountability, Project and Active.
- **Observation 18** – The board members responses had a high similarity index score that confirmed the success of the project governance; but also showed that there were both divergent and complementary responses to the 12 questions. This supports a corporate governance view that a balanced project board requires a variety of skill sets and perspectives.
- **Observation 19 –** The biggest contributions that the project board identified related to managing the cost forecast, stakeholders, and safety, and introducing a collaborative approach between all parties involved in the project.

5.4 PRACTICES AND PROJECT ORGANISATIONAL STRUCTURES

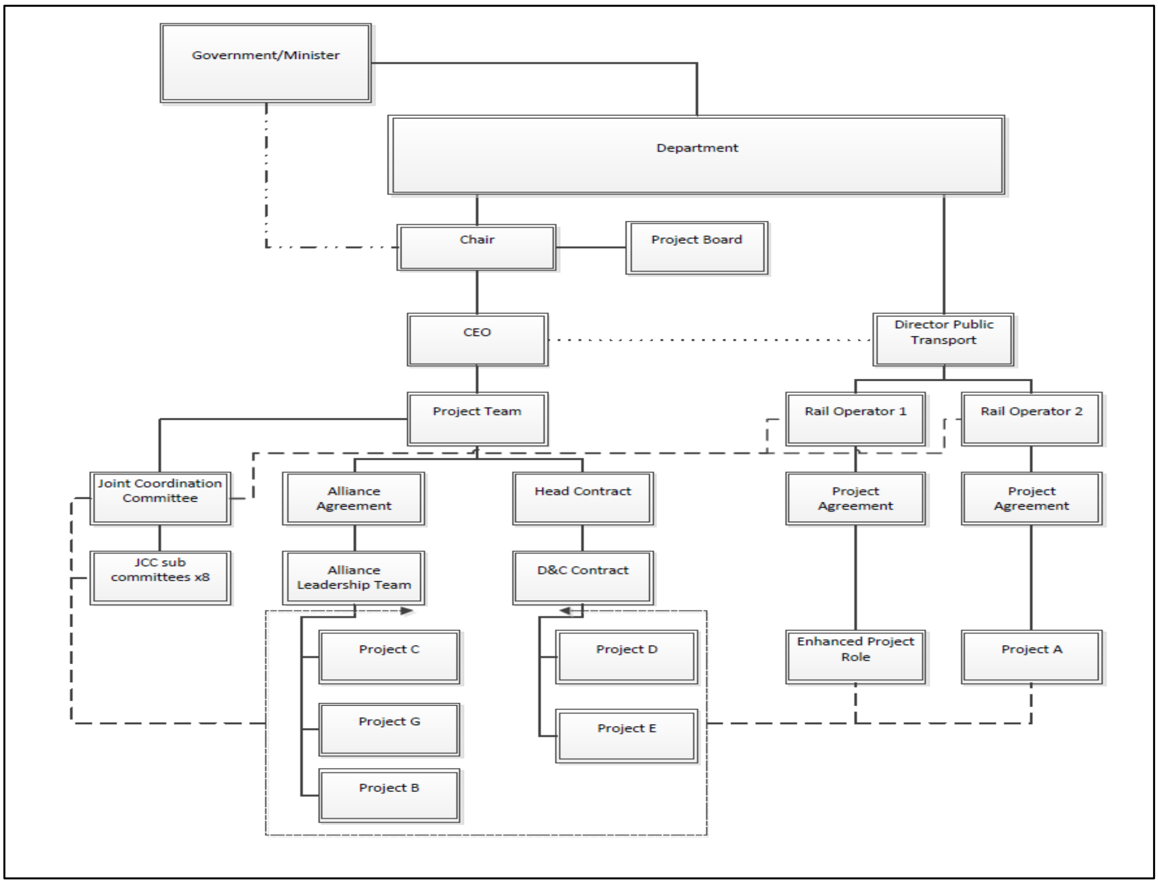
5.4.1.1 Governance Structures

The Stage 2 arrangement saw the creation of a new entity, the Regional Rail Link Authority, as a separate Administrative Office. It had the sole purpose of delivering the project through the procurement and delivery phase. The Stage 2 project governance was in place for the longest of all the stages (5+years). The Stage 2 project governance was novel on two structural issues. Firstly, the board was appointed to act as an advisory board only. Traditionally, a project board would be accountable for the project, but in this instance the board was advisory. Special legislation was required for the RRLA which did not provide for the project board to operate as 'Directors', only recognising the 'Head' of the organisation. The Chair (the 'Head' of the organisation), therefore, was the responsible officer for the project, and Board members were technically advisors to the Chair.

The second structural difference was the somewhat unique sub-committee structure, which was given delegation to resolve project integration risks before being escalated to the Board for resolution. Corporate governance board structuring is well documented, understood and implemented. Corporate governance frameworks generally suggest the use of sub committees, and best practices are regularly updated and reported against in annual reports, with significant guidance, such as the Financial Aspects of Corporate Governance (Cadbury, 1992), the OECD Principles of Corporate Governance (OECD, 1999), and the ASX Principles of Good Governance and Best Practice Recommendations (ASX, 2003).

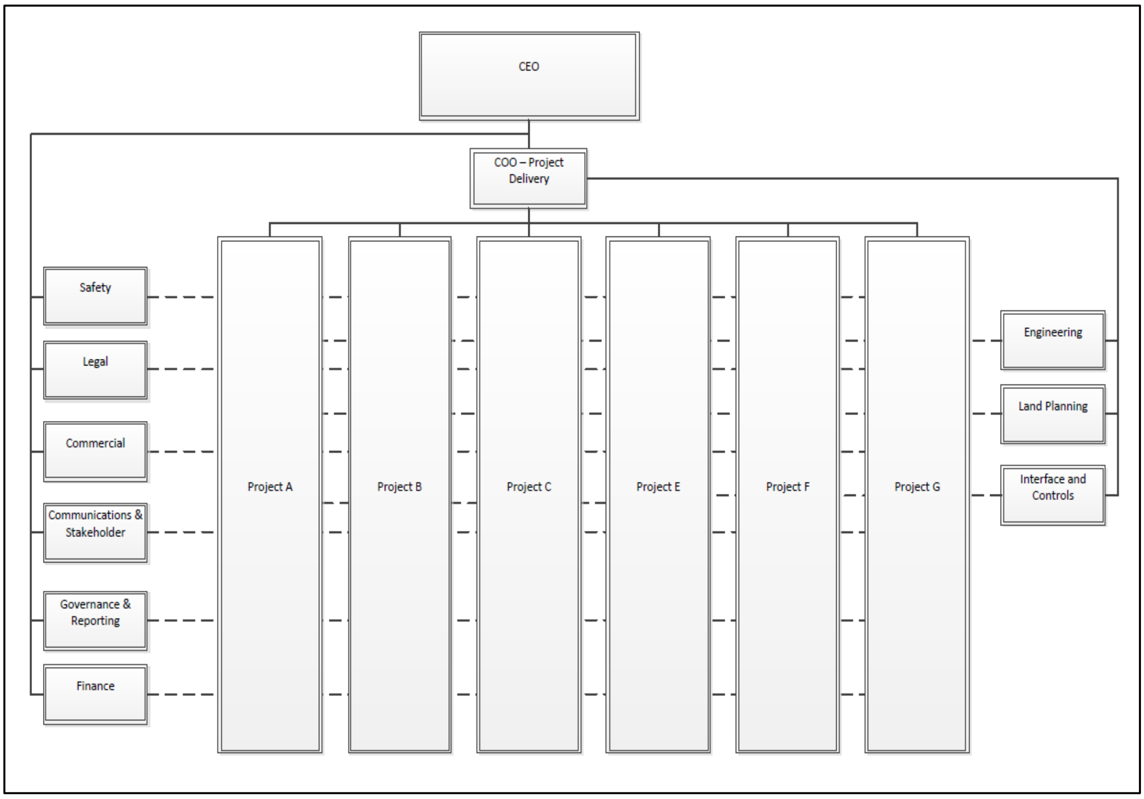
While earlier project governance representations of the project provided a simple and high-level view on the governance arrangement over the project life, Figure 5-21 provides more detailed structural representation within the governance arrangements during Stage 2. In particular, the corporate governance, project governance arrangements and other project interfaces are included. The corporate governance relationship shows that there is a relationship between the overall Department and the Government and sponsoring Minister. Also included in the interfaces is the Director of Public Transport, who worked within the Department and was responsible for contract management of the two rail operators, both of which impacted the delivery of the RRL project. The rail operators were also members of the JCC. The figure also introduces the complex and differing procurement approaches used on the project, which included alliance agreements, head contracts (D&C), and project agreements with the rail operators.

Figure 5-21: Detailed RRL project governance representation



Within the project, the project delivery team arrangement provides an insight into the structuring 'within' the project during Stage 2. In earlier representations, this was referred to as the 'project team'. Within the structure, the CEO has 7 functional reports (see Figure 5-22), with the Chief Operating Officer (COO) responsible for delivering six discrete project work-packages, as well as having three support functions of engineering, land planning, and interface and controls. Combined, the relationships of this megaproject are far more complex than, for simplicity, were earlier outlined. This phenomenon, of multiple representations of megaprojects, was outlined in the Chapter 3 (Literature Review) on the Crossrail project.

Figure 5-22 : Project governance arrangement within the project



5.5 CONSOLIDATED OBSERVATIONS AND INITIAL CONCLUSIONS

This chapter aimed to use the case study to understand the relationship between a successful megaproject, the project governance arrangement, and the core issues the project board considered throughout the life of the project. The case was explored through the use of content analysis on 2 phases, and interviews of the board members in order to answer the questions, 'What were the core issues that the project governance body discussed to deliver a successful megaproject?' and 'Is there a relationship between a project board and the success of a megaproject?' Results from each of the three perspectives were triangulated to develop new insights and gain a far more detailed and comprehensive understanding of the project governance arrangement from the project board's perspective.

Gaining access to a detailed source of data on one megaproject, over its whole lifecycle, was a key consideration in order to provide a suitably novel case study to investigate. The case sensibly investigated the core issues that the project governance body addressed; and by interviewing the board members, it was expected to provide a unique understanding of the decision making and identify the priority they placed on certain issues. Analysis shows that there were strong correlations between the case similarity and the cluster strengths, but also highlights a number of divergent views. In particular, the 4 separate clusters of responses between the board members (Figure 5-20) confirm the importance of having diverse and different skill sets to the board. At the start of the Stage 1 governance arrangement, the board was selected using a skills matrix to determine skill sets, and to ensure that there was an adequate spread of skills. Specific skills, such as experience in construction, government relations, finance and cost, legal and compliance and stakeholder relations, were amongst the skills identified. These combined skills were also reflected in the different cluster results. Although there were similarities to responses, there were also differences, demonstrating that divergence occurred; but collectively, the board provided an overall balance, which resulted in project success and board effectiveness.

The findings are highly consistent with corporate governance theories, especially with the practices of having board members being independent of managers for large public companies. Boards members bring skills to the project board of acumen and external knowledge to decisions, and can pursue the broader needs of the shareholder (Baker & Anderson, 2010, p. 5). For the equivalent in megaproject governance, that would be to deliver the project within its constraints. The agent theory perspective on board effectiveness is that of a board which provides governance and control mechanisms for protecting shareholder interests from managers (Sur, 2014, p. 164). That perspective also supports the practice of bringing different skill sets to the board table. This is likely to be a major consideration for megaproject governance success, and for future governance arrangements and research: external and divergent skills should be explored and employed for megaproject board selection

Three perspectives were analysed to answer the overall Research Questions, and a total of 19 observations developed. These initial observations led to a number of conclusions regarding the core issues the project governance body discussed. On their own, each observation is valid; however, when viewing the list as a whole from the perspective of a project board, they do not necessarily provide any obvious or significant new guidance for project governance improvement, specific new structures, or a missing focus for a project board governing a megaproject. What does become apparent, is that, for the megaproject the volume of ongoing risk monitoring, was significant and persistent across the lifecycle. For the case, the stability of board member participation was an observation of note. When comparing project governance to corporate governance, it is still unclear from the findings how a project governance group would measure its overall success other than to use the project management tradition of time/cost/quality success.

One issue that remains outstanding is whether the observations and findings from the case could be validated on other megaprojects, or whether the observations were specific to this megaproject. Once again, however, it appears that the project governance is a necessary corporate governance control to ensure that the project manages its risks. This is especially relevant to avoid front-end project failure during the Stage 1 governance period. Having a positive culture of active risk management and consistent reporting were identified as important. However, there were several factors which were not addressed or confirmed through the triangulation, including considerations such as:

- the market conditions in which the project was developed and delivered;
- economic conditions in which the project was delivered;
- organisational requirements for which the project was responding to;

- internal project management expectations concerning scope, schedule and cost, including any benchmarking or expectations of project performance.

These considerations, to a large extent, are quite difficult to analyse sufficiently for the case. Leaving them unanswered, however, does a disservice; therefore, some initial conclusions and statements are attempted. Without adequate project governance structures being in place for a megaproject, it appears that such an omission would be a core failing in structuring a megaproject for its later success. When adequate project governance is in place, it is difficult to specifically state whether the structure is the core reason for the project being successful or just one essential part of success. To use an analogy, a perfect meal at a restaurant is a combination of many factors: the quality of ingredients, the balance of flavours, the cutlery and the company. If a major element of the meal is missing, say for example, the meat, it is quite easy to point out what is wrong. It is quite difficult, however, to identify exactly why the meal is so good. For this reason, without good governance being implemented at the start of a megaproject, it is a core project governance failure; however, with governance in place, it is a key enabler for project success. Whether project governance impacts over the life of the project is a key issue that is outstanding and inconclusive.

Similarities between megaproject governance and corporate governance have been shown to be very strong. There were also 8 relevant variables that impact on the success of the project, which were briefly identified in the project's own '*RRLA Insights Series*' (RRLA, 2014a). At the end of the project, the project office sought input from all parties to create 16 volumes of insight lessons learnt which addressed:

1. Overall Project,
2. The Board,
3. Leadership,
4. Safety,
5. Engineering and Design,
6. Planning and Environmental Approvals,
7. Land Acquisition,
8. Achieving Sustainability,
9. Project Development and Procurement,
10. Communications and Stakeholder Relations,
11. Finance and Administration,
12. Project Controls and Interfaces,
13. Contract Management,
14. Joint Coordination Committee,
15. Construction,
16. Industry Perspectives – Survey Feedback.

The production, size and detail of the lessons captured were impressive; which once again reinforces the approach taken by the project and governance arrangement to deliver the project outcomes, including knowledge capture. The project participants identified eight insights that led to the success of the project:

1. An ***informed client*** – a project team with the right mix of public and private industry experience.

2. Adoption of a ***facilitation role*** in relation to issue resolution, regardless of where formal responsibility for the risk lay.
3. ***Collaborative partnerships*** with all stakeholders, particularly Public Transport Victoria and rail operators, to agree on firm functional and operational specifications, to document relatively detailed preliminary design and scope of works as the basis for well-defined, competitive bids.
4. Development of ***a Strategic Procurement Plan*** and process that minimised risks (including market capacity, market competitiveness and industrial relations) and facilitated staged benefit realisation.
5. Leading the way for all parties in relation to ***safety management***.
6. A ***robust approach to risk*** and change management, whilst remaining focussed on the pragmatic, timely resolution of contractual issues to ensure the focus remained on delivery of the works.
7. ***Taking stakeholders on the journey*** to challenge 'business as usual' approaches, actively developing solutions to problems, which resulted in acceptance of more efficient, longer-term rail occupations.
8. Development of the ***Coordination & Interface Deed*** for the JCC, driving high performance and adopting a '*best for project*' decision-making culture amongst all work packages (RRLA, 2014a)

These 8 insights and perspectives are complementary to the observations and findings developed in this chapter. QDA analysis and coding occurred on the insight documentation; however, a consolidated list of the 19 observations and 8 findings are in Appendix M.

5.6 KEY FINDINGS, NEXT STEPS AND CLOSING GAPS

As this research has focussed in detail on one case, there is still the consideration of the applicability of the learnings from this project, and whether these could be used to govern other megaprojects. In order to establish rigour with the research method, the approach adopted required a degree of 'some authority' on the context and domain of the subject studied. The coding techniques and interpretation of the board minutes required interpretation and would have been biased based on personal prejudices, implicit values and/or preconceived ideas (Crossley, 2003, p. 36).

Although the benefits of the methodology were overall positive, the limitations are quite real. With such a large volume of available data available, there was an ongoing challenge in resisting being too complex. While the data and results proved to be rich, the overall simplicity of perspective could have been missed. To address this, quantitative measures, such as use of regression analysis, were deployed to assess the most important relationships of the results. This was especially useful when analysing the board interview data, where an aim was to understand the similarities between the board member responses. Without using regression relationship models, the results would have been detailed, but the *big picture insights* would have been difficult to identify, prove and justify.

By using triangulation of data within the case, the constructs of project success and project board impact were considered in a structured method. Joslin and Müller (2016a) advocate the use of triangulation with alternative research philosophies, especially within the practice-oriented perspective of project management. One of the limitations observed in their research was the newness of its use in the project management field. This could be seen as too large a step for project management research. This is reinforced, as discussed earlier, with Flyvbjerg's (2006) five misunderstandings about case study research, where he advocates that social science research should be undertaking more good case studies.

Corporate governance principles of board structure are well documented, understood and implemented elements of governance. Corporate governance frameworks and best practices are regularly updated, reinforced and reported against in annual reports. Significant documents including the Financial Aspects of Corporate Governance (Cadbury, 1992), the OECD Principles of Corporate Governance (OECD, 1999, 2005), and the ASX Principles of Good Governance and Best Practice Recommendations (ASX, 2003, 2014) on corporate governance, describing the importance of board composition and the functioning of board meetings.

Within the field of project management, however, such frameworks and practices narrowly focus on the development of a governance structure, process and risk management. Too and Weaver (2014) identify that, in project management, this does not represent good governance, with a focus only on the mechanism needed to achieve governance, and that, currently, project governance models have shortcomings that could result in fundamental conflicts of interest (Too & Weaver, 2014, p. 1386).

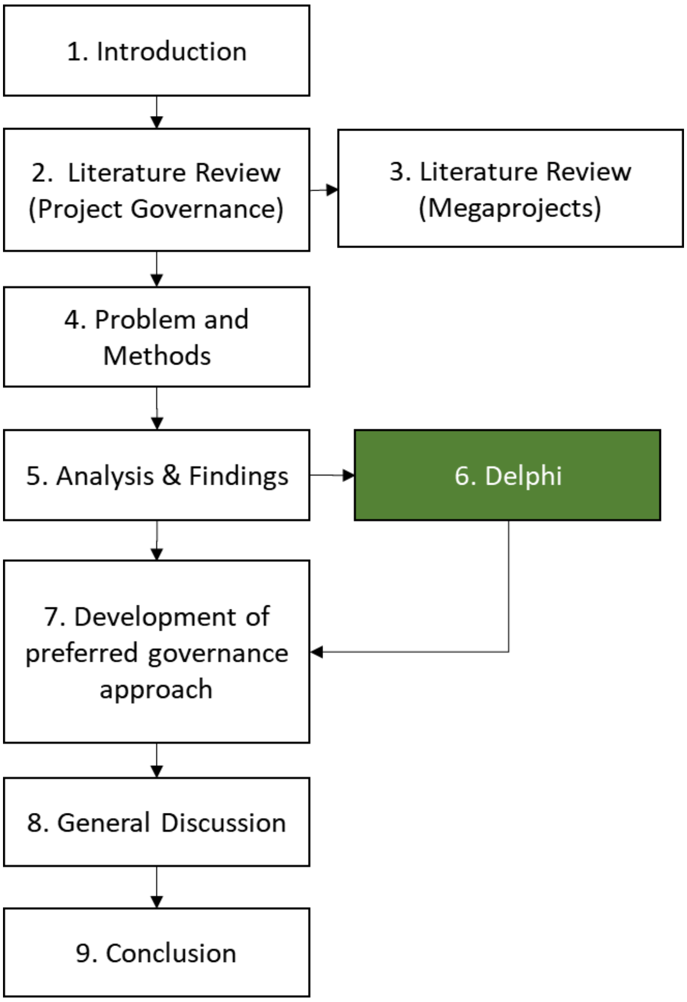
What became clearer is that, for the case studied, the board participants used a number of corporate governance principles to effectively govern their megaproject. The structural design of the RRLA, as a single purpose Authorised Office, also contributed to ensuring that the correct governance approach would be put in place. The board, in its capacity as an advisory board, had a singular purpose to '*deliver the project*'.

The findings from this chapter provide a rich source of insight into the functioning of a successful megaproject. Phase 1 identified that 221 different categories of subjects and issues were discussed over the life of the project. A conceptual theme cluster showed that the board's decisions were categorised into 4 themes, with 79.4% of the board's time being spent considering the project status and dealing with project board administrative issues. Based on the findings, 8 observations were made. Phase 2 considered the sub-committee's role in the management, and identified that, on average, 12 risks each month required action by the board, and that risks identified late in the project continued to require management for a number of months. In total, 27.2% of all the 364 risks being managed at the JCC level required escalation to the project board. Through the use of a survey, 12 questions were asked to the individual board members which generated 149 unique responses identified for Phase 3. A further 6 observations were made, and the 5 most important decisions made by the board were discovered, along with identification of the 4 biggest contributions that the board members provided while on the board. The project itself also created a large volume of lessons learnt, and this information identified 8 perspectives on why the project was successful. In total, there were 19 observations created through the analysis and 8 perspectives from the project (27 in total) that form a strong basis of understanding on why the project governance arrangements of this case were successful.

These observations will be used in Chapter 8 to support answering the research questions and provide closure to the research.

A supplementary chapter (Chapter 6 - Delphi) will validate whether the 149 collective responses to the 12 governance dimension questions represent the board’s views on the impact that project governance had on the project. Following the Delphi validation chapter, Chapter 7 will be dedicated to developing a preferred governance model for megaprojects

Chapter 6 Delphi Validation Study



6.1 INTRODUCTION

Chapter 5 provided a detailed analysis of the decision making of the case study based on content analysis of project governance documentation. The findings were triangulated using the Phase 3 questionnaire which sought out the views of the board members. These steps provided sufficient evidence to confirm and inform insights on the project's governance arrangements and decision making. While Chapter 7 proposes new governance arrangements for megaprojects, this chapter will bridge the theoretical gap between the construct of megaproject governance and the findings of Chapter 5. To do so, a modified Delphi study was undertaken with the original board members to validate the findings from earlier chapters. The board members were provided with new information based on the collective responses to the 12 questions in

Chapter 5, and then asked to individually rate their level of agreement with each of the 12 questions (*dimensions*), and against each of the responses (*indicators*) within each dimension. By collating each of the board member's responses by importance, collective results were used to determine consensus levels considered as the most important. Using a Delphi, the results generated independent levels of member consensus by limiting potential biases resulting from undertaking a traditional or group interview method. Such an approach is a suitable technique to validate the findings from Chapter 5. For a listing of the 12 dimensions and a breakdown of the 100 indicators, see Section 6.2.4 and Table 6-5.

The interpretivist theoretical position accepted that a megaproject is a hybrid of an organisation and a project, and that good project governance improves project performance. However, the governance arrangements required for a megaproject are quite different from those of traditional projects. This chapter will use the results of the Delphi study to demonstrate what the important factors for the successful governance in the case. In total, 12 dimensions and 100 potential indicators were identified; and the results of the Delphi will show that, while all 12 dimensions remained relevant, 81 of the 100 indicators were agreed by the board as being very relevant. More importantly, the Delphi study supports the position that the project governance structure for this case was novel, successful, contributed to the overall success of the project, and was far more dynamic than literature previously has suggested. The governance arrangements changed over time, and the focus of the project board remained on delivering the project management concepts of time, cost and quality, ensuring the overall performance of the project.

6.2 USE OF DELPHI AS AN ANALYSIS TECHNIQUE

6.2.1 Delphi Overview

The use of Delphi analysis usage is traced back to the 1950s; but although it has a long history, the knowledge about the use of Delphi is divided. Mullen (2003) argues that some hail it as a well-established technique while others imply it is not widely known (Mullen, 2003, p. 37). Within the wide range of definitions of a Delphi, at its core it involves a questionnaire being sent to participants, whereby the responses are collated and recirculated, and participants are asked to confirm or revise their responses based on new information. It is an alternative to conventional surveys that allows for additional layers of feedback, as it asks participants to consider their initial responses when presented with additional information.

This technique was used to validate the original findings of Chapter 5. While it is not the intention to discuss in detail the pros and cons of the use of the Delphi approach, this chapter details the steps undertaken and the process for achieving the goal of the study through analysing the results. According to Loo (2002, p. 763) a Delphi has five major characteristics:

1. the sample consists of a 'panel' of selected experts;
2. participants are usually anonymous;

3. the 'moderator' constructs a series of questions and feeds back reports for the panel over the course of the Delphi;
4. the process is iterative or involves multiple 'rounds' of questionnaires and feedback reports;
5. there is an output typically in the form of a report with the results.

While Loo (2002) identifies that other group decision-making methods have been developed, there are several advantages of a Delphi. The first is that the Delphi is individual, anonymous and independent. It avoids interpersonal conflict and communication issues, as there is no interaction between members. The third is a practical consideration, as travel to complete the questionnaire is not required, therefore coordination, cost and reliability of participation variables are removed. A final benefit is that, due to the use of successive rounds, the moderator can build upon earlier results and sharpen the focus of the study (Loo, 2002, p. 764). For application in the present case study research, benefits were realised as the Delphi allowed the board members, who were the subject matter experts in relation to the governance of the case study, to individually reflect on the project, avoiding any group interaction or influences.

One risk that required management was that the project board had been disbanded at the time the Delphi was to be undertaken, and board participants no longer met or interacted. There was a risk that board members would not participate; but this risk did not materialise, with 100% participation.

6.2.2 Use of Experts, Expert Panel Size and Participant Selection

One of the key elements in conducting a Delphi study is to recruit a group of individuals with expertise in the subject being researched. Jorm (2015) identifies that, ideally, there should be a clear understanding of what constitutes expertise, and in using a sampling strategy for locating experts. A second consideration is the size of the panel, one view being that, the larger the panel, the more stable the results. Mullen (2003) reflects that many of the pioneering Delphi's used very small panels, but notes variation in the size of panels, from small studies to those "involving several thousand people" (Mullen, 2003, p. 41). For the Delphi in the present study, only members of the project board were used as subject matter experts. If a wider group of participants were used, there would be a lack of understanding of the decision making undertaken by the board, as external participants did not participate as board members. If an extended group of participants were involved, the Delphi would rely on participants *generalising* about their reality of what occurred within the boardroom. By limiting the Delphi to the project board participants, the results were focussed, participants highly engaged, and the results accurately used to confirm the important activities of the case.

6.2.3 Consensus and Questionnaire Design

A defining feature of a Delphi is the ability to use anonymity. This removes the effect of status, powerful personalities and any group pressure (Mullen, 2003). In the case, board members had completed their term on the project board and the project had been completed. Each board member completed their phase 3 questionnaire individually, and they were not aware of the other board members' responses. Because of this, there is no disclosure, and no individual is accountable for their own responses. This was identified as a potential weakness, as no one is accountable for the responses or results, and it could be argued that lack of accountability leads to embodying a circular buck-passing (Mullen, 2003, p. 47). Consensus can be a defining element of why a Delphi is conducted. In the present study, the Delphi was used to determine to what degree the project board members agreed on the dimensions and indicators. For some of the Phase 3 questions, participants were asked to select a binary response, such as '*was the governance of the project effective? yes or no'*; whereas other questions asked the candidates to rank the top 5 most important issues out of a list of indicators. There were some indicators that were generally agreed on by a large majority of participants, and other indicators that were outliers. As will be shown, a majority of the dimensions and indicators were confirmed as important. The study was able to identify detailed degrees of consensus, specify the range of different positions, and provide rationale analysis behind the judgements (Critcher & Gladstone, 1998, p. 432), demonstrating the benefits of a Delphi.

6.2.4 Application of a Modified Delphi

A modified Delphi was used in this study, with the following modifications:

1. A series of 12 statements were made, and for each statement there was a list of potential *indicator* responses. The responses were from the findings in Chapter 5, Phase 3 questionnaire.
2. The participants involved in the Delphi were the members of the project board, who were the Subject Matter Experts.
3. The participants were asked to rank the indicators within each dimension that they considered as the most important. In many of the questions, the ability to rank the indicators was limited to 5 indicators (rating 1 through to 5).
4. One round of interviews, and validation of findings were undertaken.

The modified Delphi approach was useful in achieving the study aims, to measure the relative importance of each of the 100 potential indicators and each of the 12 dimensions (see Table 6-1). The construction of the initial indicators was essential to ensure that the indicator set was focussed, and during the Delphi, to ensure that the initial responses to the questionnaire could be used to determine the level of participant consensus with the initial findings. Responses to the Phase 3 questionnaire were used to develop the initial set of indictors. Having one round of validation also avoided the repetitive step of additional subject matter expertise involvement, which could have led to reduced levels of participation.

As seen in Table 6-1, the total number of indicators from Phase 3 was 149; however, during the Delphi, only 100 of the indicators were provided to the board for consideration. The remaining 49 indicators were not presented because they were either grouped with similar indicators or the indicator was not considered significant (i.e. only identified by one board member). To ensure that the board member Delphi responses were contextualised, the 12 statements from the survey questions indicated the total number of indicators and the number of responses. The board members were then asked to rate a smaller number in order of priority. This ensured that the board members were not overwhelmed with options. This design saw a 100% participation rate, contributing to the overall validity of the Delphi results.

Table 6-1: Project Governance Dimensions

Project Governance Dimension	Total number of Indicators identified in Ph3	Total number of Indicators provided in the Delphi
1. Primary Role (of the board)	15	5
2. Success criteria	26	13
3. Governance structure (differences)	15	8
4. Governance Effectiveness	2	2
5. Governance Improvements	13	13
6. Measuring Governance success criteria	20	10
7. Governance design	2	2
8. Need for Governance	6	6
9. Key governance decisions	21	7
10. Board member contributions	15	11
11. Accountability	3	3
12. Future improvements	21	20
Totals	**149**	**100**

6.3 METHODOLOGY AND RESULTS

6.3.1 Methodology and Data Collection

A classic Delphi involves the presentation of a questionnaire to a panel, to seek their opinion or judgement on a topic. The Delphi was a structured communication technique that used a panel of experts to develop a systematic, interactive consensus. The data collected, summarised and revised results created, and the panel is asked to reconsider their initial responses. This approach sees the building of stronger results from each previous stage (Keeney, McKenna, & Hasson, 2010, p. 7). In total, there were 8 individuals involved in the Delphi. All board members from the original Phase 3 interviews were provided with the initial results from that phase. The participants were asked to rank the indicators in priority relating to the degree to which they believe each were the most important (i.e. 1 through to 5, with 1 being the most important). This provided a comprehensive validation of the Phase 3 results.

The Delphi responses were analysed using participation rates and mean standard distribution. The analysis of the data followed a methodology by Quyên (2014), which considers the importance of Dimensions by considering *consensus* amongst participants. A Coefficient of Quartile Variation (CQV) was used to reflect the level of convergence in experts' opinions and the level of importance of each indicator (Eq. 6-1). A CQV is measured as:

Equation 6-1: CQV

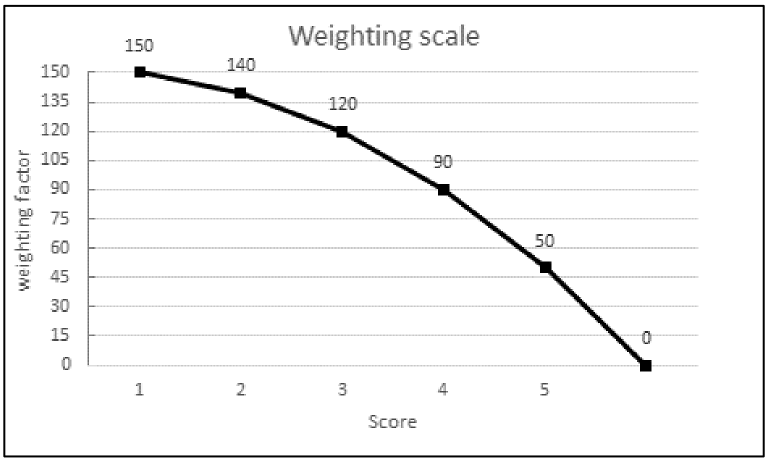
$$CQV = \frac{Q3 - Q1}{(Q3 + Q1)}$$

where Q1 is the 25th percentile of the population and Q3 is the 75th percentile. CQV is a descriptive measure of relative dispersion, and the use of CQV can be a preferred method of measuring relative dispersion in distributions that are moderately non-normal. In this case, it was used to provide an approximate confidence measure of relative dispersion (Bonett, 2006). CQV identifies both the level of convergence in opinions and the level of importance of indicators.

6.3.2 Dimensions and Indictor Weighting Factors

Each indicator that received a score within the 12 dimensions was weighted to provide a means of differentiating those indicators rated as *more important* by a majority of the subject matter experts, from those indicators that were rated only by a small number of the candidates or not at all. For indicators that did not receive any rating, a weighting factor of 0 was applied. Indicators that received a very high rating priority (i.e. 1-3) received a higher weighting to allow for clear separation of ranking. Figure 6-1 outlines the weighting factors used for each of the rating indictors. The final weighting scale was iteratively developed using different weighting factors that allowed for results to be presented, where importance and consensus are combined. When there were no weightings applied, the results did not provide sufficient spread to identify the most important and least important dimensions and indicators.

Figure 6-1: Weighting Factors of Relative Importance



6.3.3 'Importance' of the 12 Dimensions and the 100 individual Indictors

The weighted scores were used to calculate Indicator Importance Scores for the dimensions. The co-efficient of variation ($CV = \sigma/\mu$) measured the extent to which individual indictors within each dimension varied, with a higher CV value representing a bigger variation of indicators within the dimension. Data were analysed to calculate the mean of each dimension by percentage; and the results are presented in Table 6-2 with a full breakdown of results in Appendix N.

Table 6-2: Indicator Importance Level by Dimension

			Importance levels by Dimension					
Dimension	**mean**		**median (%)**					
	76.2		**EI (150)**	**VI (140)**	**RI (120)**	**SI (90)**	**IM (50)**	**NR (0)**
1. Primary role	113.56		28.89%	17.78%	17.78%	15.56%	20.00%	0.00%
2. Accountability	50		9.09%	9.09%	9.09%	9.09%	9.09%	54.55%
3. Board member contributions	50		9.09%	9.09%	9.09%	9.09%	9.09%	54.55%
4. Governance type	75		50.0%	-	-	-	-	50.0%
5. Governance effectiveness	150		100%	-	-	-	-	-
6. Governance improvements	42.3		7.69%	7.69%	7.69%	7.69%	7.69%	61.54%
7. Governance structure differences	68.75		12.50%	12.50%	12.50%	12.50%	12.50%	37.50%
8. Key decisions	78.57		14.29%	14.29%	14.29%	14.29%	14.29%	28.57%
9. Measuring governance success	55		10.0%	10.0%	10.0%	10.00%	10.00%	50.00%
10. Project governance need	87.5		25.00%	12.50%	12.50%	12.50%	12.50%	25.00%
11. Relevant governance improvements	97.5		65.00%	-	-	-	-	35.00%
12. Success criteria	42.31		7.69%	7.69%	7.69%	7.69%	7.69%	61.54%
(EI = extremely important (ranking 1), VI = very important (ranking 2), RI = relatively important (ranking 3), SI = somewhat important (ranking 4), IM = important (ranking 5), NR = not rated)								

The overall mean score for Importance of the Dimensions was 76.2. By asking each of the board members to rank the most important indictors, the results were able to provide an overall mean for each dimension, and also see the spread of results. This allowed for the identification of the dimensions that the board members rated as more important, and those dimensions below the mean. By using the 6-point scaling system, the results were grouped from ‘extremely important’ (rank 1) through to ‘not rated’ (rank 6). Spread was important, as this provides a far more considered insight into the dispersion of importance of each dimension. Of the 12 dimensions, the top three were:

- Primary Role (dimension 1);
- Project Governance Need (dimension 10);
- Relevant Governance improvements (dimension 11).

, and the three least important dimensions were:

- Accountability (dimension 2);
- Board Member Contribution (dimension 3);
- Governance Improvements (dimension 6).

Each of the 12 dimensions were, to varying degrees, considered to be important by the board members; however, by comparing each one against the mean, the relative importance of each was shown to be quite diverse. Table 6-2 provides a full breakdown of the 12 dimensions and the importance levels.

While Table 6-2 identifies the most important dimensions and the spread of the survey results, analysing the 100 Indicators within each dimension also provides detailed understanding on the relative importance placed on each Indicator. Of the 52 indicators that scored above the mean, individual indicators within each dimension were ranked in order of importance against the overall mean score. To identify the more important indicators, the indicators that scored above the mean were ranked in priority order against each other. The ranking results (Table 6-3) are useful to understand the relative importance of each indicator relevant to its own dimension, and the indicators are presented in order of importance. An analysis of Table 6-3 is undertaken in Section 6.5; however, indicators in Dimensions 1, 8 and 11 were rated highly by all board members. For some of the dimensions, such as Dimension 5, the response required a yes or no answer, therefore a ‘yes’ result would always be above the median; but what is not apparent from the table is the actual number of board members who responded yes, which will also be considered in Section 6.5.

6.3.4 Consensus’ on the 12 Dimensions and 100 Indictors

Consensus Analysis provides the level of convergence of the experts’ responses in the Delphi, providing a numerical result falling between 0 and 1. The lower the CQV, the higher the level of consensus. In this study, a low CQV indicates that there is more consensus (less spread) amongst the participants’ responses. The overall average across the entire dataset was CQV = 0.8 demonstrating that there was a low degree of consensus within the overall Delphi study by Dimension. Table 6-4 summarises the CQV by each Dimension.

Within each dimension, as explained in the previous section, the 100 indicators varied by both Consensus and Importance; and this relationship is discussed in detail to develop a complete picture and present overall findings. The results of this, and the next section, will be combined for analysis in Section 6.4. As the Delphi limited the participants to ranking their ‘top x’ responses to Indicators within each of the 12 dimensions, not all indicators necessarily received a ranking. By limiting responses, this allowed for identifying the more important dimensions, versus those considered to be the less important indicators, which was necessary in order to confirm the earlier findings.

Table 6-3: Indicators Above Mean by Dimension

Dimension	# indicators	% above indicator median	Indicators above median (ranked in order of importance
Total	**5**	**100%**	**52**
1. primary role	5	100%	Performance of the project (previous) Project experience Outcomes Drove positive culture Governance
2. accountability	3	33.3%	Both (the board and project)
3. board member contributions	11	36.4%	Safety Leadership Believed in the project Stakeholder management
4. governance type	2	50%	Template
5. governance effectiveness	2	50%	Yes
6. governance improvements	13	23%	Introduced AO board earlier Been closer to rail operators and end clients End user/ customer impact
7. governance structure differences	8	50%	Inclusive board External board members Good team Single purpose
8. key decisions	7	57.1%	Packaging work Outcomes focus Safety Risk management
9. measuring governance success	9	44.4%	Time/Cost/Quality Benefits realisation Stakeholder feedback Whole of life outcome
10. project governance need	6	50%	When a high degree of risk Large/ megaprojects Need accountability and discipline
11. relevant governance improvements	20	90%	Front end planning, Selecting boards, Risk vs cost, Chair-CEO relationship, Project ownership, Right people, Project delivery / structure, Business case, Risk transfer, Construction vs operations, Independent, Skills review (of board), Long term planning, Collaborative outcome, Reporting, KPIs, Community expectations, Board structure
12. success criteria	12	33.3%	Planning Control of time, cost and quality Good team Scope management

Within each dimension, as explained in the previous section, the 100 indicators varied by both Consensus and Importance; and this relationship is discussed in detail to develop a complete picture and present overall findings. The results of this, and the next section, will be combined for analysis in Section 6.4. As the Delphi limited the participants to ranking their 'top x' responses to Indicators within each of the 12 dimensions, not all indicators necessarily received a ranking. By limiting responses, this allowed for identifying the more important dimensions, versus those considered to be the less important indicators, which was necessary in order to confirm the earlier findings.

Table 6-4: Consensus by dimension

Dimension	CQV
1. Primary role	0.3
2. Accountability	1
3. Board member contributions	1
4. Governance – bespoke/ template	1
5. Governance effectiveness	0.0
6. Governance improvements	1
7. Governance structure differences	1
8. Key decisions	1
9. Measuring governance success	1
10. Project governance need	0.5
11. Relevant governance improvements	1
12. Success criteria	1

The detailed results are presented in Table 6-5. Of the 12 dimensions, 10 of the dimensions had at least one indicator with a high consensus score, with Dimensions 5 (governance) and 6 (governance improvement) as the outliers. For Dimension 1, there were a total of 5 indicators, and the participants members ranked the indicators from 1-5. Because all the indictors received a rating, there was strong consensus (0.3). The relative ranking of all the indictors provides a prioritised list of the most important Indicators. Table 6-5 lists the dimensions and CQV of each indicator, with indicators receiving a high CQV shaded grey. Specifically focussing on Dimension 3, there were 10 indicators, and the board were asked to only rank their top 5. Only one of the indicators had a strong consensus (item 3 – safety), as most of the board rated this item as important; however, while all the other indictors in that dimension received at least one rating by a participant, overall ratings were not given high priority, which is shown by the low consensus rating.

Dimension 4 was a binary question which required the candidates to select one of two indicators (yes or no). By design, consensus would always be distorted. The purpose of this question was to provide a specific response to how the governance was designed, as either a customised design arrangement or a traditional design. For that dimension, twice as many candidates selected ‘template’ over ‘bespoke’ as their preferred response, resulting in a high scoring CQV. This response is quite surprising, seeing that the governance arrangement was novel: the use of an Authorised Office had not been used previously, and the board was an advisory board only. Dimension 5, which was another binary question, saw 100% of board members responding the same way, and a resulting low CQV.

Dimension 6 (governance improvements) results were surprising and reinforce the value of a Delphi. While three of the indicators were identified as Important (*#1 - Introduce AO board earlier*, #9 - *Been closer to rail operators and end clients*, and #4. *End user/customer impact*), the CQV shows a low level of consensus amongst results. Within Dimension 6, there were four indicators that did not receive ranking during the Delphi validation. This demonstrates how participants' responses can change in a Delphi, when presented with new information. Due to the project being successful, it is speculated that the board may have considered any response to this dimension as merely being '*a nice to have option*', and not necessary for this project as it *was* successful.

The CQV result may give rise to future studies to analyse improvements identified from failed megaprojects, and to compare the different board responses. A similar trend was observed with Dimension 12, whereby participants were asked to define success criteria. In the first round, 13 indictors were identified; however, using the CQV to identify key indicators, only one indicator had a high consensus, and 6 indicators did not receive any ranking. With so much debate in the literature around success criteria for projects, the responses to Dimension 12 indicate that, for this case, the project board considered the traditional project success criteria of time, cost and quality as adequate measures for the megaproject governance success.

This reinforces an ongoing theme, that while there were 13 indicators initially identified and considered relatively important, there was no overall consensus that the 13 indicators were necessarily *extremely important* when presented with all the other indicators in the Delphi.

Of the 100 indicators, 81 received at least one ranking of consensus through the CQV, and within that grouping there were 30 indicators that had very high levels of consensus. The remaining 51 indicators were ranked as important by some of the candidates, but to varying degrees. The Delphi was successful in being able to show that, out of the 12 dimensions and 100 indicators, the project board members confirmed that all 12 Dimensions (100%) were relevant, and that 81% of the Indicators were relevant.

The next section will combine the Importance and Consensus results to provide a four quadrants matrix that filters by low-high consensus and low-high importance.

Table 6-5: Ranked Consensus for each Dimension and Indicator (shaded boxes represent a dimension /indicator with a high level of consensus)

Dimension (high consensus = shaded grey)	**Indicators** (high consensus = shaded grey)	**CQV**
1 Primary role	5. Drove positive culture	0.00
	3. Performance of the project	0.03
	1. Outcomes	0.03
	4. Governance	0.29
	2. (previous) Project Experience	0.29
2. Accountability	3. Both (the board and project)	0.00
	2. With the project	-
	1. With the board	-
3. Board member contributions	3. Safety	0.11
	8. Leadership	1.00
	6. Believed in the project	1.00
	5. Larger occupations	1.00
	4. Collaboration	1.00
	2. Stakeholder management	1.00
	11. Single focus	1.00
	10. Drove culture	1.00
	1. Forecast to completion	1.00
	9. Additional scope items	-
	7. Ensured board functioned	-
4. Governance – template or bespoke	2. Bespoke	1.00
	1. Template	1.00
5. Governance effectiveness	1. Yes	0.00
	2. No	-
6. Governance improvements	1. Introduced AO board earlier	1.00
	2. (would have done) very little differently	1.00
	9. Been closer to rail operators and end clients	1.00
	5. Review contingency level	1.00
	4. End user/ customer impact	1.00
	3. Central agency representation	1.00
	13. Risk/audit sub committee	1.00
	12. Improved reporting (esp. financial)	1.00
	10. More challenge (benefits realisation)	1.00
	8. Better cost outcomes	-
	7. Accepted more risk	-

Dimension **(high consensus = shaded grey)**	**Indicators** **(high consensus = shaded grey)**	**CQV**
	6. More discipline (to make sure delivered)	-
	11. Insurance cover (non-government participants)	-
7. Governance structure difference	2. Inclusive board	0.22
	7. Sense of identity	0.41
	5. Good team	0.47
	3. External board members	0.47
	8. Single Purpose	1.00
	6. Worked to the Department (not Government)	1.00
	4. Benefits realisation	1.00
	1. Advisory only	-
8. Key decisions	1. Packaging work	0.08
	4. Outcomes focus	0.25
	6. Safety	0.41
	5. Risk management	0.47
	7. Early procurement decisions	1.00
	3. Scope changes (considered)	1.00
	2. No scope change	1.00
9. Measuring governance success	1. Time/Cost/Quality	0.03
	8. Whole of life outcome	0.29
	2. Stakeholder feedback	0.29
	7. Contribution	1.00
	5. Sustainable outcomes	1.00
	4. Follow governance criteria	1.00
	3. Benefits realisation	1.00
	6. How well the client team did	-
	10. 360-degree evaluation	-
	9. Easier to define if unsuccessful	-
10. Project Governance need	4. Need accountability and discipline	0.08
	3. When a high degree of risk	0.08
	1. Large/ megaprojects	0.11
	2. On merits basis	0.29
	6. When spans election cycles	1.00
	5. When risk can be transferred	1.00
11. Relevant governance improvements	9. Front end planning	0.00
	8. Chair-CEO relationship	0.00
	4. Risk vs cost	0.00

Dimension (high consensus = shaded grey)	**Indicators** (high consensus = shaded grey)	**CQV**
	2. Project ownership	0.00
	15. Right people	0.00
	1. Selecting boards	0.00
	7. Skills review (of board)	1.00
	6. Disband board (when not needed)	1.00
	5. Independent	1.00
	3. Project delivery / structure	1.00
	20. Board structure	1.00
	19. Community expectations	1.00
	18. KPIs	1.00
	17. Risk transfer	1.00
	16. Business case	1.00
	14. Reporting	1.00
	12. Construction vs operations	1.00
	11. Collaborative outcome	1.00
	10. Long term planning	1.00
	13. As built drawings	-
12. Success Criteria	2. Control of time, cost and quality	0.41
	8. Risk Management	1.00
	7. Good team	1.00
	3. Scope management	1.00
	13. Community engagement	1.00
	11. Procurement model	1.00
	10. Tendering/procurement	1.00
	1. Planning	1.00
	6. Good board	-
	5. Engagement (of the rail operators)	-
	4. Concept of Operation / Business Case	-
	12. Influence	-
	9. Interfaces	-

6.4 COMBINING IMPORTANCE AND CONSENSUS

Results for Consensus (by CQV) and Importance (by Mean) were mapped using a four-quadrant matrix that identified high/low consensus and importance. This presentation technique is identified in the literature as a useful method to present complex and disparate analyses in a form that is easily understood. Figure 6-2 shows the matrix, where the High Importance-High Consensus quadrant represents the most important findings. When combined, that quadrant, however, reveals that only two dimensions were significant, receiving the highest rankings for both Consensus and Importance. These dimensions were:

- Dimension 1 - Primary Role;
- Dimension 7 - Project Governance Need.

The Governance Effectiveness dimension (#5), shows that all the board members believed that the effectiveness of the board was important, and followed by Primary Role where the board members provided very similar responses to the survey. Four dimensions, Key Decisions, Governance-bespoke/template, Relevant governance improvements and Governance Effectiveness also rated as Important but had low levels of Consensus. The five remaining dimensions rated as low on both Importance and Consensus. Figure 6-2 demonstrates that, at the 12 Dimensions level, there was a dispersed and overall low level of Consensus. As the Delphi was seeking out to identify which of the Indictors within the Dimensions were important, the findings only provide one aspect of the overall Consensus and Importance.

A more detailed level of analysis, at the 100 Indicator level, once again provides quite a different picture on the dimension results. While Figure 6-2 analysed the Consensus and Importance by the 12 Dimensions, each of the Indicators in Figure 6-3 are measured individually and the results show that Indicators identify a far richer detail of spread and trend around candidates' responses. Consensus and Importance were mapped against each other, as was done with the previous section, which shows a wider distribution, with each of the four quadrants being represented, and a far higher number of indictors in the high consensus-high importance quadrant. A total of 19 Indicators received a 'nil' response to the priority ranking from the Delphi validation, which shows that 81 of the indicators were considered by at least one or more board members as important. Within the 81, there were 30 Indicators that were identified above the CQV for Consensus, representing 37% of the indicators.

Figure 6-2: Consensus and Importance of Dimensions

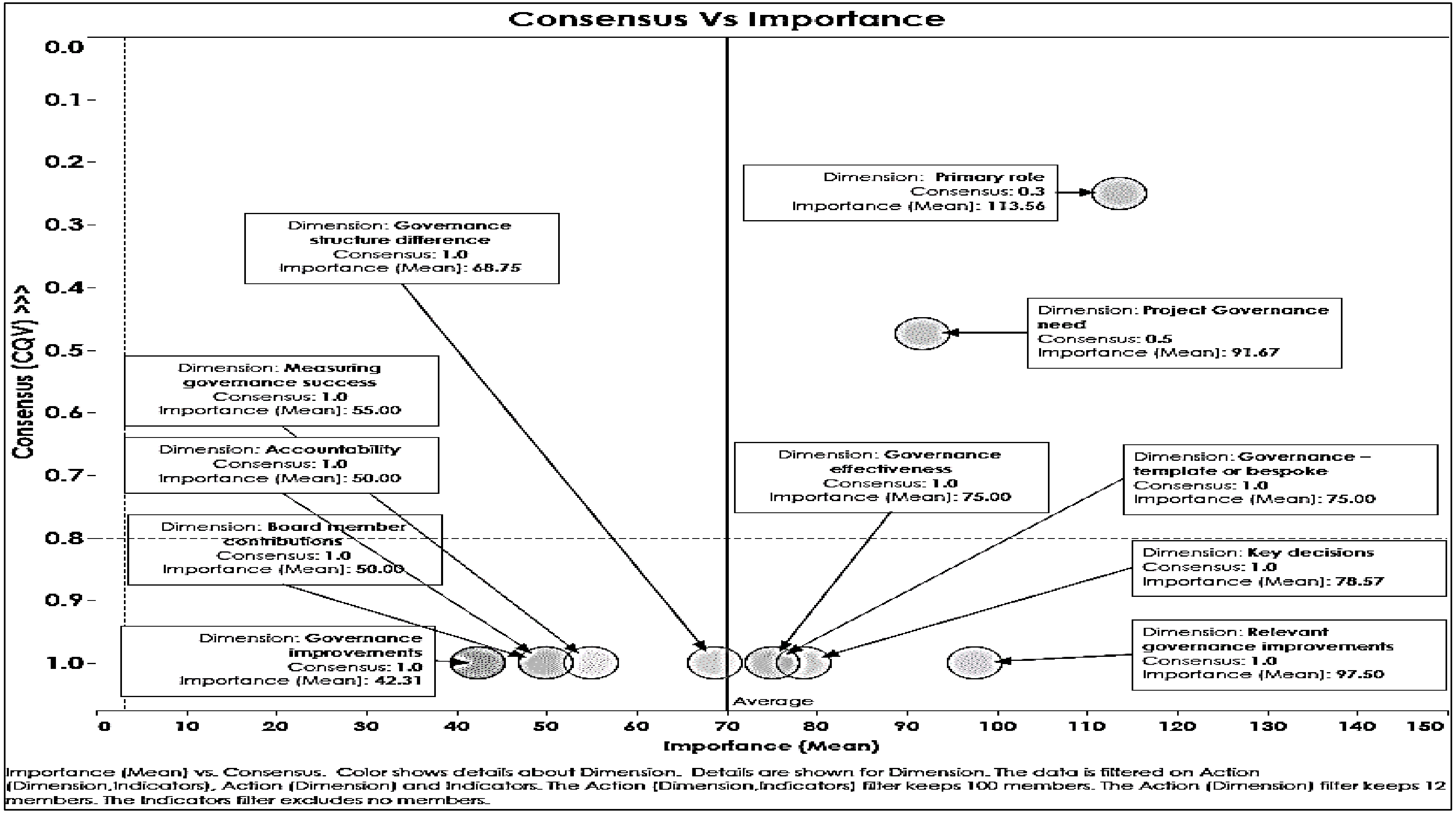


Figure 6-3: Consensus and Importance of Indicators

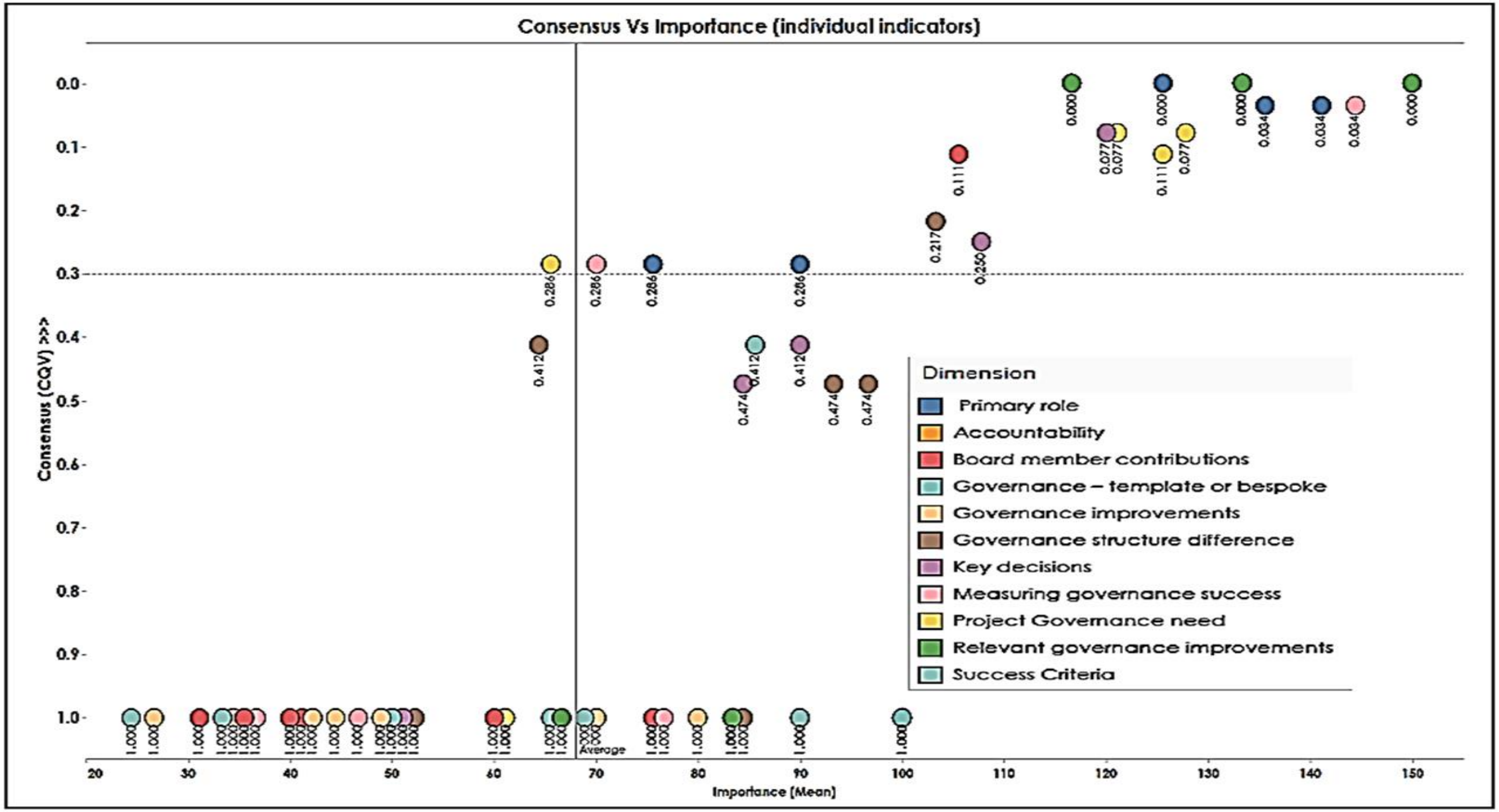


Table 6-6 summarises the number of indicators by each quadrant at the indicator level. Of the 100 indicators, a total of 23 indicators are in the high importance-high CQV quadrant; which is quite different to the analysis at the dimension level. As the importance rating used the mean to calculate high-low importance, results were split evenly between high and low; however, when considered by consensus, only 24% of the indicators show a high level of importance. The top quartile is slightly lower with a combined result of 23% of the Indicators.

Table 6-6: % distribution of quadrant Indicators by Consensus and Importance

		Importance			
		low	**high**		
Consensus	**high**	1%	23%	**24%**	**total**
	low	48%	28%	**76%**	
		49%	**51%**		
		total			

A total of 23% of the indicators are placed in the high consensus-high importance quadrant, and the number of dimensions also saw a high representation, with 7 of the 12 dimensions in the high consensus-high importance quadrant (Table 6-7). This demonstrates that the Delphi was able to show that, within each of the dimensions, there are far more Indicators confirmed by the board members as being more significant. This also provides a reason for why, when a project is evaluated for success or failure, it depends on the perspective taken, as results from one set of analyses can be presented very differently depending on the level of analysis being undertaken and technique used.

Due to the CQV and Importance now being compared over a range of 100 input indicators, the CQV calculations are quite different, as shown in Table 6-8. While there was only a small variation for importance (mean), the level of overall consensus for the 100 indicators is far higher than at the 12-dimension level. Importance for the 100 indicators is also marginally higher, with an increase of 1.97%.

A full breakdown of the results for the CQV ranking of Indicators by Dimensions can be found in Appendix O (ranking of each dimension by indicator) and Appendix P (CQV and importance by quartile).

Table 6-7: Indicators Above Mean by Dimension

Dimension	Indicator
3. Board member contributions	8. Leadership
	6. Believed in the project
5. Governance – template or bespoke	1. Template
6. Governance improvements	1. Introduced AO board earlier
	9. Been closer to rail operators and end clients
	4. End user/ customer impact
7. Governance structure difference	7. Sense of identity
	3. External board members
	5. Good team
	8. Single Purpose
8. Key Decisions	6. Safety
	5. Risk management
11. Relevant governance improvements	3. Project delivery / structure
	5. Independent
	12. Construction vs operations
	16. Business case
	17. Risk transfer
	7. Skills review (of board)
	10. Long term planning
	11. Collaborative outcome
	14. Reporting
	18. KPIs
	19. Community expectations
	20. Board structure
12. Success criteria	1. Planning
	2. Control of time, cost and quality
	7. Good team
	3. Scope management

Table 6-8: Comparison of CQV and Importance

Level of Analysis	CQV	Importance
12 Dimensions	0.8	68.0%
100 Indicators	0.3	69.97%

6.4.1 Using Low Consensus to Validate Key Findings

With 19 of the 100 indictors receiving no ranking in the Delhi, those indictors fell into quadrant 3 (low CQV - low importance quartile), and a listing of each is presented in Table 6-9. While at first, this list indicates low consensus for indicators, the result can actually be used to confirm the importance of other indicators and reinforce observations and findings from Chapter 5.

Table 6-9: Indicators by dimension with 'NIL' ranking

Dimension	Indicator	CQV	Importance
2. Accountability	1. With the board	nil	16.67
	2. With the project	nil	0.00
3. Board member contributions	9. Additional scope items	nil	13.33
	7. Ensured board functioned	nil	5.56
4. Governance effectiveness	2. No	nil	0.00
5. Governance improvements	7. Accepted more risk	nil	26.67
	8. Better cost outcomes	nil	21.11
	6. More discipline (to make sure delivered)	nil	13.33
	11. Insurance cover (non-government participants)	nil	5.56
6. Governance structure difference	1. Advisory only	nil	5.56
8. Measuring governance success	10. 360-degree evaluation	nil	22.22
	6. How well the client team did	nil	13.33
	9. Easier to define if unsuccessful	nil	13.33
11. Relevant governance improvements	13. As built drawings	nil	16.67
12. Success criteria	5. Engagement (of the rail operators)	nil	23.33
	4. Concept of Operation / Business Case	nil	16.67
	6. Good board	nil	15.56
	9. Interfaces	nil	11.11
	12. Influence	nil	0.00

Each of the '*nil'* response dimension indicators will be discussed to demonstrate how each supports other arguments on the positive governance impacts on a megaproject:

- '*Dimension 2 – accountability'* - candidates were asked to select one of the three available indicators. There was a very strong consensus that accountability for the governance of the project was '*with both the project and the board*'; and as a result, the low consensus reinforces the view that governance is a joint responsibility between the board and the delivery agents of the project (collectively, 'the project').

- '*Dimension 3 – board member contributions'* – two of the 10 Indictors received no ranking (# 7 and 9). This dimension also had the 2nd lowest overall Consensus and Importance ratings, with only one dimension (# 3 – safety) identified as Important. The overall low ranking reflects the diverse views of each board member. The board had complementary skills and differing competencies and held differing views on what contributions they made to the project. Therefore, low consensus for this dimension may be quite necessary. Through earlier findings, the board needed to consider what was in scope and how deviations would be identified; however, the board's priority was on delivering the scope of the project. While board members initially rated 'additional scope' as an important variable, its role was to consider scope, but was not a core function to increase project scope (and risk potential cost or time impacts). Tight management of scope through focussing on the overall Project Outcomes (Dimension 1) and having a Single Purpose (see Dimension 9) were far more important. Indicator #9 (ensuring the board functioned) was in general important for the board members, but that responsibility was more so for the Chair, to ensure the board did indeed work effectively. Because the project was successful, this dimension may have been taken for granted by the board and therefore not highlighted specifically in their interpretation of their contribution. For a failed project, this dimension would likely solicit very different responses.
- *'Dimension 4 – governance effectiveness'.* There was 100% consensus that the project governance was effective. Therefore, the indictor 'no' was 0. The low consensus supports the alternative response.
- *'Dimension 5 – governance improvements'.* There were 13 indictors and 4 received no ranking, and there were no indicators with a high consensus. Because the project was successful, the improvements were viewed only as improvement recommendations, as the board member would argue that, because the project was a success, the improvements were not necessary to mitigate a deficiency or risk. Little insight can be gained from reviewing the improvements other than to identify that each is a relevant indicator to consider early in a project's life.
- *'Dimension 6 – governance structure difference'.* There were 8 indicators, and 1 received no rankings. While the governance structure was technically only advisory, interviews confirmed that the board undertook their duties as though they were a fully responsible board. Because of this mind-set, the fact that the board was advisory was not a key consideration for the individual board members. For a corporate governance perspective, in designing a new board structure, the novel nature of the arrangement's structure would have been very important, and require careful management and implementation.
- '*Dimension 8 – measuring governance success'*. Project success measurement identified the focus on three indicators: time, cost, quality; benefits realisation; and having a good team. The items that did not receive ranking are relevant considerations. The Delphi demonstrates that the low consensus items were additional evaluation related. Interestingly, the literature supports a view that, with megaprojects, it is far easier to define project failure, due to the multitude of stakeholders involved with the megaproject and their different perspectives.

- *'Dimension 11- relevant governance improvements'.* 'As-built drawings' was identified as a key risk in the latter part of the project. This risk was successfully managed; and because this risk did not eventuate, the board considered this indicator as a risk item not as an improvement for the overall governance of the project. This reinforces the importance of ongoing and active risk management by the board across the lifecycle.
- *'Dimension 12- success criteria'.* There were 4 indicators that received low consensus. This dimension only had one important success criteria (*#2. Control of time, cost and quality*); however, one of the indicators (12. Influence) received no high priority rankings at all. As has been shown, the board was effective, and this included having high levels of competency and capabilities. Influence is traditionally a key management skill required of a leader; however, implied influence was not considered a priority of the board. This view is surprising considering that influence is generally a desirable skill for a board. This trait, of a successful board not considering influence as an important indicator, could be worthy of further investigation.

6.5 IMPLICATIONS AND CONFIRMATION

The Delphi validation confirms that the findings in Chapter 5 are validated at the 12 Dimension level, with an overall Consensus Value (CQV) of 0.8. Only three of the Dimensions rated above the average level of Consensus. For those three dimensions, there was strong consensus regarding:

- the board's primary role;
- agreement that the governance of the project was effective;
- confirming the need for project governance on a megaproject.

In this case, the project board was an independent, advisory board with a single accountable officer responsible for the delivery of the project. When analysing the 100 indicators within the 12 dimensions, there was a strong level of validation of both the dimensions and individual Indicators, which is far more insightful and provides a far richer picture to validate the Chapter 5 findings. A discussion of each dimension is provided in Table 6-10 relating to what each Dimension confirmed and the impact of the dimension on the project's success.

Table 6-10: Summary of each Dimension

Dimension	Descriptive summary
1. Primary role	The primary role of the project board was to ensure that the project performance was deliver to the expected outcomes. This was achieved by the board members' previous experience brought to the project, with a focus on driving a positive project culture and safety. The board focussed on governance of the project.
2. Accountability	The accountability for the successfully delivery of the project was considered to be the responsibility both of the board and 'the project'. This differs from conventional corporate governance literature that performance of the organisation sits only with the board.

Dimension	Descriptive summary
3. Board member contributions (high CQV, high importance)	The most important contributions the board made to the project was to ensure that safety was a high priority. This is not unusual, as safety performance is a legal reporting obligation. Other important contributions were to provide leadership of the project, and stakeholder management. An underpinning contribution was the board members overall commitment to the project. The least important contribution was identified as ‘ensuring that the board functioned correctly’. It is presumed that this function would be primarily the concern of the Chair and/or CEO.
4. Governance type (high CQV, high importance)	The board members were asked whether the governance type was a template or bespoke creation. Twice as many believed it was a template. This suggests that the governance can be replicated and use a standard approach as opposed to each project needing to design its own structure. Noting, however, that the governance structure for this project was considered novel (see Chapter 3), it appears suitable for future project governance structures. Also see discussion on Dimension 7.
5. Governance effectiveness (high CQV, high importance)	There was a 100% agreement that the governance of the project was effective. This correlates strongly with the performance of the project, which delivered within its budget and timeframe.
6. Governance improvements (high CQV, high importance).	There were 13 areas that the board identified as improvements. Three considered that the most important were: 1) introducing the authorised office earlier (project delivery structure); 2) working closer with the end client (operators) to ensure effective hand over to the operations; and 3) better understanding the end user and customer impacts in the construction stage, and how the project output would be used. All 13 improvements were considered to be important to at least one participant.
7. Governance structure differences (high CQV, high importance)	The participants identified the governance structure used for this project had a number of differences. In particular, the use of external board members, as well as the board adopting the value of being inclusive; which suggest that the board worked effectively together. One surprising indicator was the importance of having a ‘good team’ that delivered the project. This was reinforced by a number of comments made during Phase 3 interviews, where the board members identified having a ‘good’ project team as core to the effective delivery of the megaproject. Hilb identifies that effectiveness can be strongly influenced by the chair, and this dimension would be an ideal area for further research on characteristics of a project team. Also, see Dimension 12.
8. Key decisions	The candidates identified that, out of the 7 key decision areas, the sequence in which the procurement was packaged and integrated was the most important decision the board made. A more traditional project management approach may have seen one prime contractor deliver the whole project; but because of the risk of a prime contractor not being able to deliver (due to the risk profile), the project bore the integration risk and awarded separate packages of work. The other important indicators were most likely a result of the project retaining risk, which focussed on being outcomes-focused, prioritising safety and risk management.
9. Measuring governance success	Governance success was strongly focused on the project delivering within the time, cost and quality constraints of project management success criteria. The candidates also ranked benefits realisation and stakeholder feedback as important considerations. A focus on whole-of-life outcomes was the fourth priority, and this indicates that the board was also focussing on delivering a project that was sustainable over its entire life and not just during the construction phase. This consideration was equally significant, noting that the project delivered under its original forecast, and handed back budget to the government.

Dimension	Descriptive summary
10. Project governance need	The candidates identified that project governance is required when there is a high degree of risk. This confirms that project boards can be considered as a risk mitigation for a megaproject. The candidates also confirmed that project governance was important for large and megaprojects, and that the project governance board introduced more accountability and disciple to the project.
11. Relevant governance improvements (high CQV, high importance)	The candidates considered 20 governance improvement areas and confirmed all as important. This indicates that, although the project governance was effective and the project a success, there is always opportunity for continual improvement. While all the indicators were important, the results show that front-end planning, selecting the board, understanding the risk vs cost profile and the CEO-Chair relationship, were the most important improvements. The last does not suggest there were issues between the CEO-Chair, but places an importance on ensuring that there is was an effective relationship.
12. Success criteria (high CQV, high importance)	There were a number of important indicators for success of the project across the lifecycle. The first was the effective planning undertaken. The board's focus on and control of the schedule, costs and quality during the delivery was critical, as was the ability to effectively manage the scope of the project. While there were a number of proposals to increase or make changes to the project scope, the board considered these against the overall scope, and effectively managed this process. Once again, candidates identified that having a good team was a key success criterion.

At the Indicator level, the consensus of responses was strong at 0.3, with 81% of the indicators being rated as Important. Comparing these to the mean, the relative importance of each indicator is balanced across the high and low mean scales; however, 7 of the 12 dimensions had Indicators in the High CQV-High Importance quadrant. This reflects the original Chapter 5 findings, with the board agreeing that the following dimensions were important and had a high level of Consensus:

3. Board member contributions;
4. Governance – template or bespoke;
5. Governance improvements;
6. Governance structure difference;
7. Key Decisions;
11. Relevant governance improvements;
12. Success criteria.

6.6 CONCLUSIONS AND NEXT STEPS

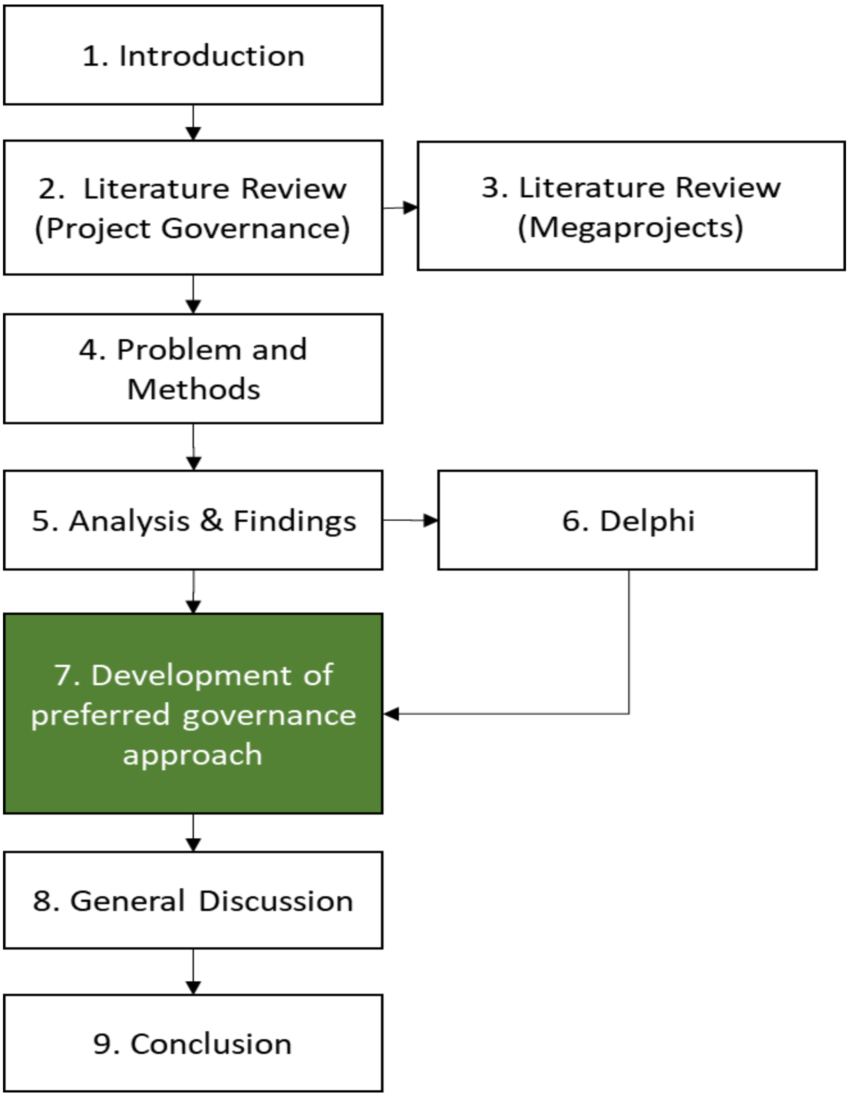
The Delphi was an important validation step in being able validate the results identified in Chapter 5, and provide confidence in the robustness of the analysis by using the project board members as subject matter experts to validate research findings based on a constructionist theoretical perspective. To gain a detailed understanding of the project governance impact a logic was required. Most megaprojects result in being either labelled challenged or a failed project. One of the key areas, that repeatedly identified is diagnosed as being the cause is poor governance. Therefore, the first conjecture is that by having 'good' (or even 'adequate') governance controls in place should result in megaprojects being successful. The literature and performance shows that megaprojects continue to fail, and it is naïve to assert that a project board would set out for such failure to occur. Therefore, a second conjecture is that a successful megaproject, that had 'good' governance, did something different or unique to a normal megaproject governance arrangement. The question is therefore 'what was the *something different?'*.

Performance of projects and the governance arrangements for megaprojects can be inferred or benchmarked, but the actual impact of project governance cannot be changed only be reviewing variables. In order to understand the impact of the project governance, the case focussed on a successfully delivered megaproject. On one level, it is not possible to compare it to another similar project, as all projects by definition are bound by a timeframe, budget and a unique set of deliverables. These unique variables, however, can be considered collectively, by focussing on a number of issues that were contemplated.

In order to understand the impact of governance on a successful megaproject, a case was studied in detail. To research the governance impact was a challenging task: where to start, questioning whether the governance was indeed the core issue that resulted in the project's success, and how could the results be disproved or challenged, were all issues that required careful consideration even before commencing the analysis. The 12 dimensions and 100 indicators were used as the basis for engaging with subject matter experts to confirm the Chapter 5 findings. This process was free from any external bias or influence, and the board members were able to refine or consider earlier responses when presented with new information. This resulted in all 12 dimensions being validated as relevant, and 81% of the indictors identified as important. The remaining 19% of indicators were identified as not important, but were used to reinforce other findings. By using the CQV, further refinement of the most important dimensions and indictors were identified. Using a quadrant indicator distribution, it was identified that 23% of the indicators showed high importance and high consensus.

The Delphi validation contributes towards understanding the case. As the research moves forward in answering the Research Questions, the Delphi did not explicitly identify whether there is a direct relationship between the project governance and project successful: this issue is still not completely answered. However, through the validation of the 12 dimensions and 100 indicators, it allows for the next chapter to move from the data analysis and findings to a focus on the development of new processes, and to answer the research questions. This involves iterating between theory and data, and completing the final steps in the Eisenhardt (1989) 8-step process to reach closure.

Chapter 7 Development of a Preferred Governance Arrangement

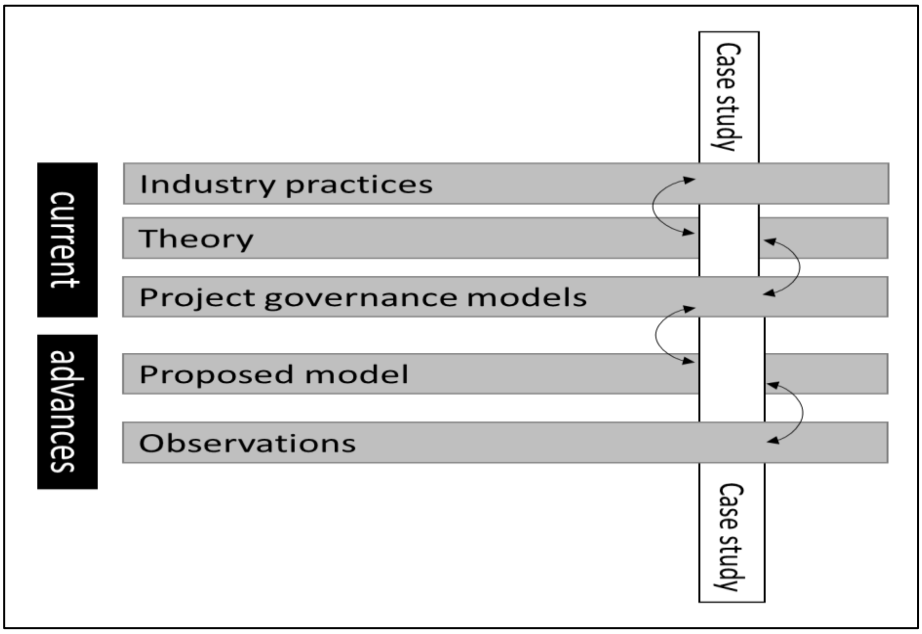


7.1 INTRODUCTION

Chapter 5 analysed the project governance of a specific case from a number of perspectives to understand project board decision making over the life of the megaproject. This approach allowed for a detailed insight into the project board's decision making, and isolated the key decision making that occurred over the lifecycle. Implied in the results of Chapter 5 is a realisation that the project governance requirements for a megaproject are quite different to those of traditional (non-mega) projects. This is especially true in relation to the shortfalls within the current body of knowledge, guidance and theory on megaproject governance. Chapter 3 provided a detailed focus on understanding the concepts associated with a megaproject, with governance considerations used by megaprojects identified; and it addressed some of the major challenges and successes of megaprojects. The analysis in Chapter 5 explored the concept of project board performance and the importance of dynamic institutional arrangements of governance in managing a project over its lifecycle. Through the use of a Delphi, in Chapter 6, the initial findings were validated by the project board members, in responding to a questionnaire, and all 12 dimensions identified in Chapter 5 were validated, and 81 of the 100 indicators were validated as important.

The overall development of the new models and the approach in this chapter is represented in Figure 7-1 and is discussed below, and in detail at 7.2.4.

Figure 7-1: Approach to developing new governance arrangements



The structure considers both current approaches identified in practice, in the literature reviews through theory and in application with project governance models. Consideration was given to understanding in detail proposed models identified in the literature review and from observations made from the case. An iterative process was used to consider the case against the current approaches and advances that are being proposed, and methods used to frame the case study The subsequent method design allowed for the triangulation of data from the case and used for comparison to tested and proven corporate governance models.

As noted in Chapter 6, while this chapter will propose new megaproject governance arrangements, the Delphi validated the construct of the case study findings and was key to developing the preferred governance arrangements. As the Chapter 5 findings required an interpretation of the board minutes in the analysis, it was recognised that this would introduce bias based on personal prejudices, implicit values and/or preconceived ideas (Crossley, 2003). In the context of the case study, the Delphi validation was used to trace a hypothetical causal mechanism within the context of the historical case (Bennett & Elman, 2006, p. 459).A criticism of using a case is that individual words may be the same but have different meaning. By using the board members as the participants in the Delphi validation, individuals were able to confirm the relative importance of the actions and decisions made on the megaproject board.

By using the data from the previous two chapters, this chapter iterates between current practices and advances to close out the research, building upon the findings from the case to develop a preferred governance model for megaprojects. This chapter uses the inductive approach described by Eisenhardt (1989)[42], whereby the research reaches closure as the saturation and marginal improvement occurs. What has become clearer, though, is that the board participants used a number of corporate governance principles to effectively govern the megaproject.

While the findings indicate that it is inconclusive whether project governance was the primary reason for the project's success or not, iteration between the data and the theory has been used to consider three different models and apply them to the case.

This chapter results in the creation of a new model, known as the VIBRA model, outlined in Section, the successful application of an Effectiveness Model in Section 7.3, and in Section 7.4 an attempt to compare the Viable System Model (VSM) to the megaproject governance structure used in the case. The new VIBRA model is a linear 7-box process model which considers external and internal factors to shape the megaproject governance success.

7.2 DEVELOPMENT OF A PREFERRED MEGAPROJECT GOVERNANCE ARRANGEMENT

As described previously, the RRLA's sole purpose was to deliver the megaproject; and due to this specific focus, the project governance arrangements could adequately be referred to as the 'Project Board' as defined in project management literature. A series of linear logic steps were required to develop and test models for application against the case. The starting proposition was that, without good governance being sufficiently implemented from the outset, this would result in a core failing of a megaproject. For the case studied, the analysis in the previous chapters was inconclusive in attempting to demonstrate that good governance alone was the core, or only, characteristic that lead to the overall project success. This result is also reflected in much of the standing literature on corporate governance, as studies on the relationship between the board and its performance of large listed companies also provide inconclusive results.

While many corporate governance studies support the view that the board has an impact on company performance (see Sections 2.3.2, 2.3.3, 2.3.4), others reject that position, and the results are observed both over the short and long-term (Landier et al., 2013). Similar results are especially varied when analysing

[42] See Chapter 4.

ongoing business sustainability and long-term company performance. Another way of considering the impact is that, without good governance, project failure will occur. But with good governance in place, the overall governance solution forms a necessary part for the project to be successful, though it is not sufficient by itself. Structurally, recognising project governance alone is not an adequate control to ensure project success: even with an adequate project governance solution, project governance application must be effective and active throughout the project lifecycle. One must, therefore, consider whether, from a success perspective, megaproject governance is *the* essential enabler for project success, or just *one of the* essential elements.

While the answer is unclear, the focus of this chapter will turn to the development of preferred megaproject governance arrangements that contribute to the overall success.

7.2.1 Project Governance as a Corporate Risk Mitigation

The key consideration is whether project governance is the *essential enabler* for project success. The hypothesis of this thesis considers that there is a positive relationship, and that project governance is primarily corporate governance risk mitigation. The corporate risk that requires mitigation is Poor Megaproject Governance (PMG). The concept of Good Project Governance (GPG) is framed as the alternative – and without GPG, the theoretical position is that this is a core failing of megaproject governance. For the case, analysis was inconclusive in demonstrating that GPG itself was the only enabler that leads to the overall project success. The risk remains, however, that without a suitable governance arrangement, a megaproject will likely be unsuccessful.

In terms of failure, the success criteria of time, cost and quality were the primary success indicator measures, which were identified in Chapter 5 and confirmed in Chapter 6. This result is similar to that in Corporate Governance studies on listed companies, with arguments both supporting and rejecting the position that a board has an impact on company performance.

This is also true over both the short and long term. Another way of considering the project governance impact is that, without GPG, the project failure can be isolated and easily identified as a core reason for project failure; but with GPG in place, the risk of failure does not occur or is easily identified. Having GPG alone will not be an adequate control to guarantee a project's success: the expectation is that, even with this in place, the megaproject governance must continue to be both effective and dynamic throughout the lifecycle to continue to manage the risks presented.

The use of project management techniques outside of megaprojects has been based on the theory that a project can be broken down into components or stages, and that through these stages, risks can be allocated to the party best able to manage the risk. For example, during the procurement stage, a tendering process is typically used to determine who will deliver the bulk of the project works, along with the use of professional services, consultants and sub-contractors.

In the case, the megaproject was unable to transfer risk to one party: there were multiple work packages and interface risks, and only the RRLA Board, as the project governance arrangement, was best placed to ensure that the overall project risks were managed. With traditional projects, most risk is contractually managed through allocation to a party best able to manage the risk. While this differentiation is subtle, there was recognition that the megaproject governance arrangement was best placed to maintain and manage overall delivery and coordination risk; which is a key differentiation between megaproject governance and traditional project governance arrangements.

7.2.2 Specific Application of Risk through the Case

The RRL project commenced with the strategy and development phase, managed within a government departmental planning process arrangement, with a Senior Project Steering Committee governing the strategy and development. In 2010, the need (*'risk'*) of the project shifted, which resulted in the creation of a standalone Administrative Office for the Procurement and Delivery phases (Stage 2 project governance) of the project. When the project was at completion, the project governance was handed over to another body, to the operator, for ongoing management. As outlined in Chapter 5, the project board members identified that one of the major improvements they would have made was to introduce the Stage 2 board earlier in the lifecycle, rather than for only the Stage 2 project governance.

In non-complex and smaller projects ('lower risk' projects), the position is taken that project governance arrangements can be administered using traditional and conventional project governance techniques, including procurement and scope management to transfer risk to parties most capable of managing the risk. It appears that megaprojects do not operate under the same delegation of risk and associated governance: regardless of the transfer of risk, the interfaces between parties are complex; and without ongoing governance oversight, namely, megaproject governing arrangements, the risk of project failure remains.

The case studied was an example where the project governance arrangement did not transfer all risk to individual work packages. There was an acknowledgement that individual parties would struggle to resolve mitigating overall coordination and interface risk without the cooperation of a number of separate parties, compared to using contractual arrangements for the risk mitigation.

7.2.3 Logic for Developing Improved Project Governance Arrangements

After completing the three phases of analysis and validation via the Delphi, new processes and knowledge relating to megaproject governance were identified. To guide the development of new arrangements, a 12-step process was used which is outlined in Figure 7-2 . The first two steps were completed in the literature review, which identified that failures of past projects and proposed that a core reason for the failure was Poor Project Governance (PPG). The methodology proposed that, when undertaking a case study, a well-defined research question, and a priori specification, are required to ground construct measures.

Guidance from Eisenhardt (1989, p. 536) recommended that the research should try, as closely as possible, to begin with the construct that no theory is under consideration; therefore, the research should identify variables from the literature in order to avoid bias and ensure that findings aren't limited The third step in the framework is to shape the hypothesis by using iterative tabulation for each construct and searching for evidence for the 'why' behind the relationships. At this point, a hypothesis was developed indicating that, by implementing mitigation to PPG, future projects would be successful. The logic then progresses to step 5, for application and monitoring of this change in future projects.

In this scenario, there is underpinning knowledge that PPG is an important governance consideration. If that knowledge was adopted and applied on a future project, and the project was evaluated as a success, comparative analysis could be undertaken to determine why the project was a success and whether the project governance arrangement was indeed the reason. If the project failed, a feedback loop to step 2 is constructed. For the case, the project was confirmed as a success (Step 6a) and thus progressed on to step 7, where three alternatives pathways of discovery were available, concerning whether project governance was the reason for the success. If the answer is 'yes', the logic then requires adequate evidence to support the hypothesis.

If the answer is 'no' or 'maybe', a number of sub-questions are asked, which also results in the need for evidence (step 9) to test and disprove the hypothesis. Steps 10 and 11 are the culmination of the development of new arrangements. Evidence from Chapters 2 through to 6 were used to inform this chapter, and allow for the completion of the steps.

The next section will use this process (i.e. the one just outlined to propose preferred arrangements for megaproject governance. In developing the approach, the methodology focusses on paying attention to the audience, the purpose, the research cycle, and the approach (Neuman, 2006, p. 33). An inductive approach is employed whereby empirical data is used to formulate concepts in order to develop abstract theory. The process is developed by refining and testing the research questions that were identified in the introduction.

7.2.4 Identification of Models from Corporate Governance for Application to Megaprojects

While the concept of implementing good corporate governance solutions is strong, there are few examples in the literature that outline potential solutions for project boards to implement; and the literature has struggled to provide project owners, sponsors and project governance practitioners with sufficient guidance. The literature review identified the strong links to corporate governance, and as the literature on corporate governance models is mature, models in this domain were primarily considered. The literature identified that variables influencing company performance as a key issue, as was the concept of the importance of recognising the organisational lifecycle. As also introduced in Chapter 3, viability of organisational systems, with an inner core and outer periphery supply: and these three considerations were used to identify potential models to test.

Special attention was given to the use of content analysis as the methodology, and to the importance of focussing on objectivity, systematisation sampling methods and reliability, which are described as key by Kolbe and Burnett (1991). By using these approaches, the expected outcome was that a new process and/or conceptual framework for megaproject governance would be developed; and this required identifying relevant associated governance models that could be applied to project governance.

A process model was developed to link project board arrangements and project (success) outcomes. This was achieved by adopting and modifying a corporate governance model by Zahra and Pearce (1989) which considered the attributes and the role of a board in relation to the performance of the organisation, and the variables that influenced that performance. The corporate governance model, as outlined in Figure 7-3, had a number of attributes and contingencies that lead to role definition; and from that definition, strategic outcomes and performance could then be achieved. Four prominent research perspectives were considered in developing the corporate governance model, which reflect the different orientation of studies undertaken in corporate governance[43].

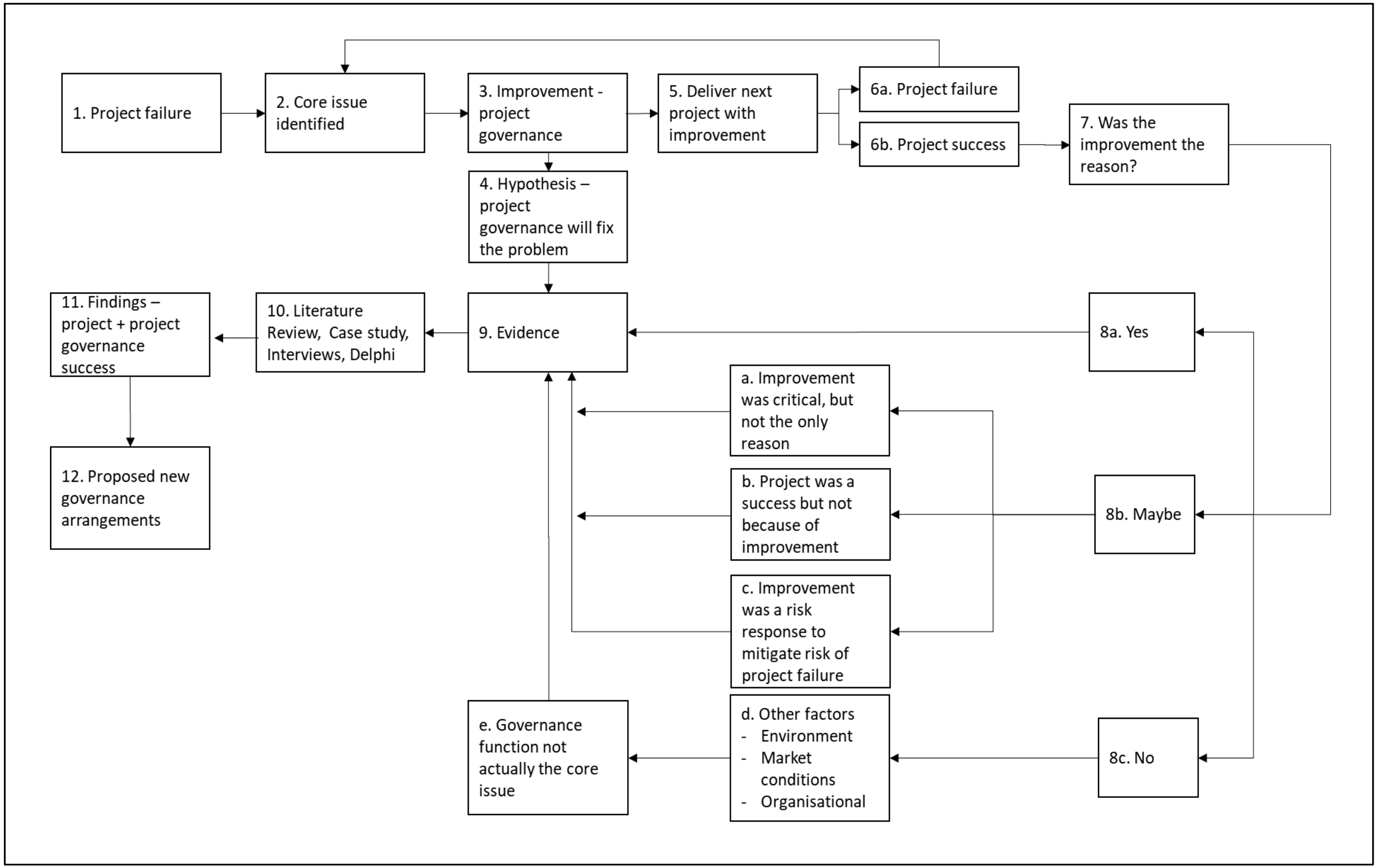
Each of the models was used to understand elements of a preferred project governance arrangement:

1. The first model considered variables that influence the creation of the megaproject's board, which was adapted from a corporate governance model by Zahra and Pearce II (1989)
2. The second model was an organisational effectiveness lifecycle model that tested megaproject governance arrangements based on a Competing Values Approach, by Quinn and Rohrbaugh (1983)
3. The third compared the Viable System Model (VSM) against the case to explain project success using viability of a governance system. The VSM is a tool used in cybernetics to describe the viability of any given system, developed by Beer (1972).

Each of the three models were identified and tested in the present research and will be separately discussed.

[43] The four perspectives address legalistic, resource dependency, class hegemony and agency theory perspectives.

Figure 7-2: Process logic for development and testing of new arrangements

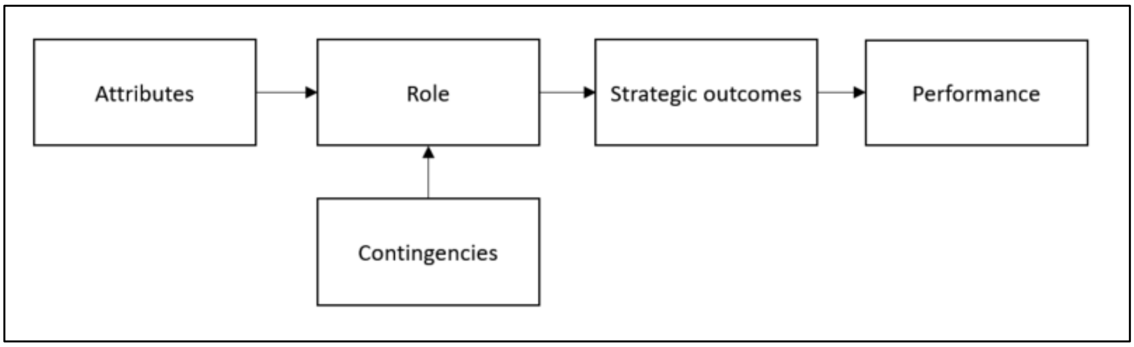


7.3 APPLICATION OF MODEL #1 - VARIABLES INFLUENCING MEGAPROJECT GOVERNANCE

7.3.1 Megaproject Governance and Performance

A process model was developed to link project board arrangements and project (success) outcomes. This was achieved by adopting and modifying a corporate governance model by Zahra and Pearce (1989) which considered the attributes and the role of a board in relation to the performance of the organisation, and the variables that influenced that performance. The corporate governance model, as outlined in Figure 7-3, had a number of attributes and contingencies that lead to role definition; and from that definition, strategic outcomes and performance could then be achieved. Four prominent research perspectives were considered in developing the corporate governance model, which reflect the different orientation of studies undertaken in corporate governance[44].

Figure 7-3: The five Dimensions of Board Variables and Company Performance by Zahra and Pearce II (1989)



Each of the model's five dimensions has a series of associated variables that consider what boards should do to improve the effectiveness of corporate governance performance; which variables are dependent on the perspective that performance was considered from. The first perspective, oriented towards boards carrying out their legal responsibilities, is supported by legislation, guidance and practices. From this perspective, the board is primarily responsible for corporate leadership; allowing the CEO and senior leadership team to deal with the company operations. The second perspective, resource dependency, is grounded in sociology and organisation theory, which considers boards as boundary spanners that make timely information available to executives. Board members are able to extract resources from their extensive networks to ensure successful operations of the company. The third, class hegemony, orients towards a board where 'only the most influential, prestigious individuals are invited to serve on boards' (Zahra & Pearce II, 1989, p. 300). This provided a focus on selective recruitment of directors, a

[44] The four perspectives address legalistic, resource dependency, class hegemony and agency theory perspectives.

concentration of ownership and the CEO as the ultimate power broker in the firm. The fourth, agency theory orientation, considered the role of the board to monitor the actions of executives to ensure efficiency and to protect the owner's interests. The focus for this orientation is on maximising shareholder wealth, reducing costs, incentivising the CEO, company performance, and strategic decision making.

Each of the 4 perspectives is applied to each of the 5 dimensions within the model above (Figure 7-3), with these the perspectives providing guidance on what the directors should do, and on which criteria should be used to assess company performance and the contribution made by the board under each perspective. As a result of the differing relative perspectives, an integrative model was developed and adopted to the perspectives on megaproject governance, considering the differing dimensions, variables and perspectives. A full mapping of the governance dimensions and perspectives is in Appendix Q

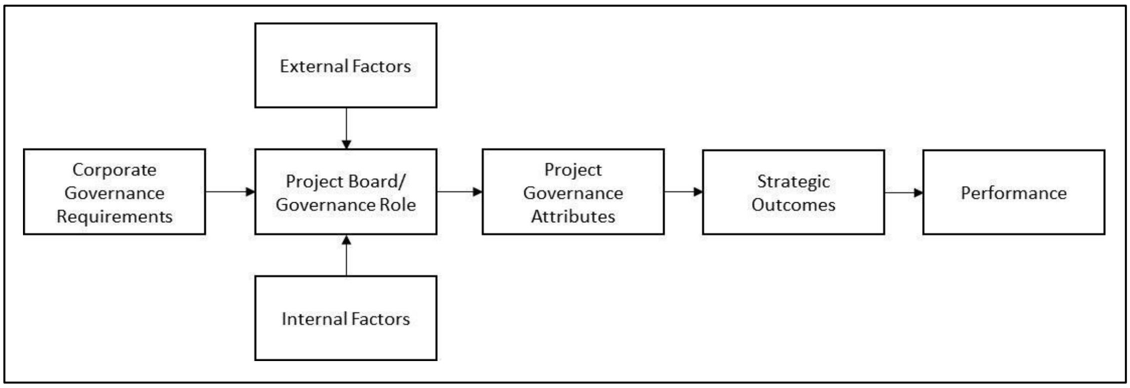
7.3.2 Framing a Preferred Megaproject Governance Arrangement

The Zahra and Pearce II (1989) integrative model identifies the contingent nature of board attribute variables, and matching this with the board role required to achieve corporate governance performance outputs. In particular, there are variable attributes and critical roles that a governance board can employ, all of which require careful consideration. The model provides a demonstration that attributes have a direct impact both on the role of the board and on overall performance. The board attribute-and-role model provided the basis for developing a megaproject governance model, which is introduced as the '*VIBRA Model*' (see Figure 7-4).

The VIBRA model is a linear, 7-box process model which considers external and internal factors that shape the megaproject governance success. The first consideration is those of the corporate governance requirements of the megaproject; and it ends with consideration of the performance criteria that will be used to evaluate the success (*or failure*) of the megaproject. The model builds upon past research which has considered the specific links between role-and-attribute impacts on overall performance. While each element will be described, there are a number of important features that require discussion. Firstly, the relationship between corporate governance and the project governance role is a key input, and differentiates this from the Zahra and Pearce model. Depending on the needs of the sponsoring or financing corporate organisation, the role of project governance is key and dependent on that higher-level need.

Earlier, it was identified that megaproject governance can be considered as a response to managing a risk; and the VIBRA model transforms that response into key megaproject governance attributes. The second feature is the direct linkage from attribute to performance, and the steps in between to convert outcome needs into a performance outcome. The megaproject governance *attributes* and *roles* are the core considerations at the commencement of project governance creation, and can be used to shape the expected performance outcomes. The third and fourth steps recognise that the internal and external environments have a direct impact on project governance variables, and that these environments sensibly change over time, depending on the influences and responses to changes of the environment. A variation on the Zahra and Pearce model is that the attributes are reversed, so that role of the project governance is driven by the attributes required of the corporate governance need. This modification recognises that a corporate governance requirement is introduced as the first step in the model, whereby the corporate governance need defines the role of a megaproject governance arrangement, before determining the attributes.

Figure 7-4: Variables Influencing Board Roles and Attributes (VIBRA) for Megaproject Governance by Pelham-Bomar



When combined into one integrated model, the VIBRA model has a total of 23 variables which the project governance arrangement should consider. While the model adopts a linear process, there is an iterative nature to the model which dynamically responds to the corporate governance need and external/internal factors. As a consequence of this dynamic nature, the ‘project board role’ and ‘project board attributes’ are identified as the critical variables within the model. The detailed model is represented in Figure 7-5.

Each of the 23 variables is described in the next sections.

7.3.2.1 Corporate governance requirement variables

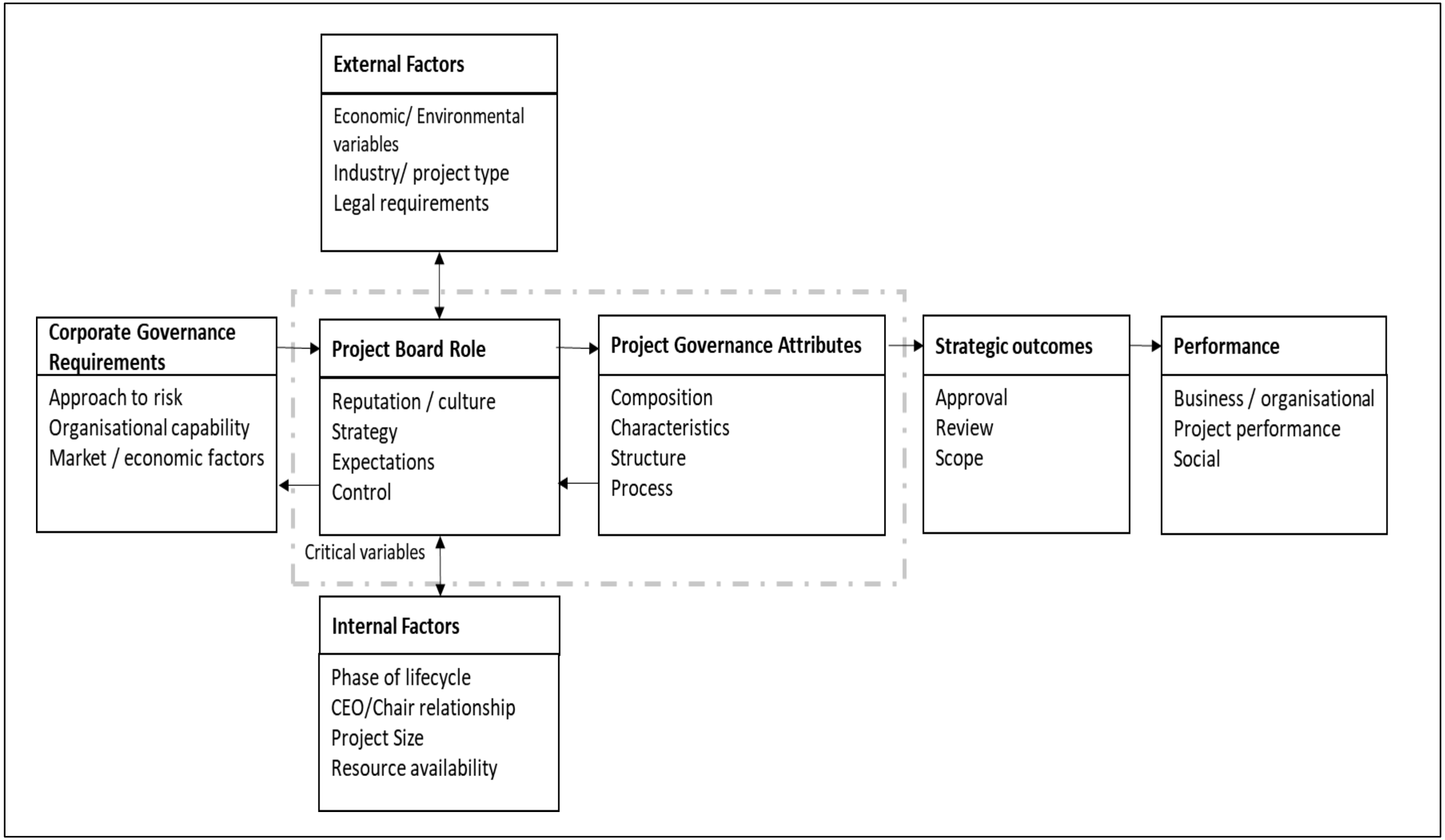
Three variables are considered within the corporate governance requirement. At this point, considering that the use of a megaproject governance arrangement is in the pre-project development stage and is still being created, the variables from the organisation are responding to an emerging risk. In the literature, a number of governance models were reviewed which consider the development of new structural models to improve project governance arrangements. These models have a focus on developing an overall structure of governance that is static, using agency and stakeholder theory as the construct. The review found that current governance models had limitations, in so far as they did not conclusively demonstrate when a certain model should or should not be used. Nor were the models useful for post-project evaluation. There is little detailed research, evidence or investigations on whether or how, by having a focus on project governance, the models either have an impact on or improve the performance of a project.

The corporate governance requirements are inputs into shaping the future project governance; and corporate governance role considers three variables:

1. the approach to risk that the organisation is willing to adopt;

9. the organisational capabilities the organisation has to deliver megaprojects;

Figure 7-5: –VIBRA Model and the 23 variables by Pelham-Bomar



10. corporate factors of the market and the economy in preparing for the megaproject.

Each variable is a consideration that will define what the role of the board will be. Depending on the risk approach, the final performance variables can be quite different. If there is a focus on delivering the megaproject for an economic outcome (i.e. for profit or within a limited budget), the inputs to the project governance will be quite different to, for example, focussing on a transport megaproject’s critical variable of ensuring the alignment of all key stakeholders. The organisational capability variable will shape the board’s role and attributes depending on whether the organisation has the resources, skills and capabilities to deliver the megaproject. The third and interrelated variable considers the market and/or economic conditions that the project is about to enter. Unlike a traditional project, a megaproject holds a very significant value and risk, which is delivered over multiple years and is subject to fluctuating economic and market conditions over its lifecycle. If the megaproject is being undertaken in a period of scarcity, the focus might be quite different for the board compared to a time where there are more positive market conditions. Such factors would include access to resources, capital and specific competencies in the market. For the case studied, the board confirmed through the Delphi study that they considered their primary role as being to drive a positive culture, ensure the success of the project, provide an active governance focus, and contribute to a very strong safety record.

7.3.2.2 Project board role variables

At the core of the model are the four variables of:

1. reputation and culture;
2. strategy;
3. expectations;
4. control.

The first variable relates to the development, creation and sustainment of the megaproject’s reputation and culture. Prior to the commencement of the megaproject, the megaproject does not have an identity. The identity of the megaproject is created and evolves as the scope of the project becomes more widely understood, more resources join the project, and as the project board and stakeholders engage with the megaproject, the literature review identified one of the eleven critical project governance principles as being the importance of fostering a culture of improvement and internal disclosure of project information. Throughout the analysis of the case in Chapter 5 and 6, the importance of project culture was also identified. In the analysis of Phase 2, Observation 10 identified the importance of a culture that valued consistent and open reporting while the Project’s Insight Series specifically called out the culture influencing the way in which decision making was undertaken.

The Delphi validation identified that the Board considered ‘driving a positive culture’ as the most highly ranked Indicator (see Table 6-5) and driving culture was identified as one of the important board member contributions. While reputation is a harder concept for a board to create, using non-executive directors can be one way to ensure strong supervision occur in the boardroom. Strong reputation in a project environment is also closely linked to the perception that stakeholders have about the project. As stakeholder management, in particular stakeholder expectation management, is a key activity to ensure success, the reputation and culture variable is critical to set up a megaproject for success.

The second variable is the role of project governance in terms of influencing strategy. This considers the delivery of scope of the project, from the perspective of giving advice and counsel to the CEO (or Project Director). The importance of a coherent strategy was also identified as one of the most important principles for project governance. Strategy is a key variable as the scope of a megaproject develops over time, as was outlined in Figure 2-8, and is required to ensure alignment with the overall business objective. For the case studied, there were five project board meetings during which the strategic alignment and project shaping occurred. This critical front-end activity ensured the megaproject tracks for success from the outset. A board brings a number of skills, processes, contacts and experiences to the project board; however, the board collectively has to be integrated and set the expectations for how it will function in delivering its obligations. In the VIBRA model, this is considered through delivery of a well-defined strategy in the early phase of the megaproject's lifecycle.

The third variable is expectations. For the case, there was an expectation that the disparate work packages were integrated and providing a safe workplace, and the subsequent safety record was paramount in importance. The board was solely responsible for setting the standards expected within the project to deliver the performance outcomes. The fourth variable is control. The role of exercising governance control is different from a project owner's perspective and also from a project financier perspective. Each of the ownership perspectives need to be considered; in particular, the incentives used for the board members. The size of the project or corporate organisation will also have considerations unique to the project. Another consideration of this variable is the CEO's or Project Director's influence on power, and their style. As the most senior powerbroker on the project, this role shapes the values that the organisation will deliver. The controlling variable was also considered by all of the four corporate governance perspectives as a core consideration. The role of exercising governance control is different from a project owner's perspective compared to a project financier's perspective. Understanding how these expectations will drive how a project governance structure will be created and implemented is therefore a critical variable. As was seen in the case, the Authorised Office was created with the sole purpose of delivering the project. New legislation and reporting structures were created to ensure control was sufficiently in place. Each ownership perspective needs to be considered, which would consider the overall megaproject structure, the use of non-executive directors, external chairs, and incentives for board members.

The size of the project or corporate organisation will also have considerations unique to each project. Another consideration of this variable is the CEO (or Project Director) influence on power, and their style. As the most senior powerbrokers on a megaproject, this role is critical in shaping the values that the megaproject organisation will deliver.

7.3.2.3 Internal and external factors variables

The model considers both the internal and external factors that impact on the project board's role. From the external perspective, there are three variables:

1. Economic / environmental;
2. Industry / project type-specific;
3. Legislative requirements that can be imposed on megaprojects.

The first addresses the corporate governance requirement factors (market / economic factors), but is considered through the context of a constraint that must be recognised by the project board; whereas the corporate governance need is considered as a response to a risk, and therefore the need results in controls being in place. Just like with a corporate governance must consider the context in which it is operating, a megaproject must also have a very strong understanding of its environment. For example, an economic cycle that is over-inflated may have a significant impact on the cost to deliver the megaproject, or ability to attract resources to deliver the project. Conversely, the project board will require a strong understanding of the environment in which the megaproject will be delivered. As an example. The case saw the creation of an Administrative Office (AO) to deliver the megaproject. At the time, the use of an AO had not been used as a mechanism to deliver a megaproject, however the economic conditions and construction environment at the time warranted use of the AO.

The type of project or industry within which the megaproject is being delivered is also a variable. Different skills influence the role of the board: a technology-driven defence megaproject board would have a far different role compared to that of a large real estate development megaproject. Consideration needs to be given to the type of megaproject will be delivered, and therefore the external impacts that the type of project will have in that setting. The third external factor is the consideration of legal (or legislative) constraints within which the megaproject operates. This factor influences the role of the board to deliver on the performance outcomes, which may include constraints on what the megaproject is allowed to do, having to be compliant to certain approvals (i.e. environmental approvals, planning applications and permits). If the legislative environment is not well understood, major delays or risks will materialise, which will inevitably result in time delays to the megaproject. Combined, these three variables make up the external factors variables.

From an internal variables' perspective, the factors that influence the project board role focus on four variables, of:

1. the phase of the lifecycle;
2. the relationship between the chair and the CEO;
3. the project size;
4. resource availability.

The third and fourth factors are generally specific to a certain time in the project's life, and would not normally have a major impact on the project, if the factor changed significantly. Changes concerning resource availability would most likely occur from an external variable, and this considers individual resources rather that macro factors. The first two factors change throughout the project. Surprisingly, as was identified in the literature, the first two factors have received little attention, and the literature has steered away from considering the lifecycle stage and relationships as variables. This was also validated in the phase 3 results, where the project board members identified the importance of the CEO-Chair relationship. Merrow (2011) also positively researched the relationship between project director turnover and project success; however, there is very little in the literature on the relationship between the chair of the board and the CEO delivering megaprojects. In corporate governance principles, the separation of role between the CEO and the Chair is recommended as a best practice. For a megaproject, as the stakeholder management task is so varied, the CEO-Chair relationship therefore has to be very strong, but it is also expected that both roles will have different knowledge, skills and experience to complement each other.

7.3.2.4 Project governance attribute variables

There are four attributes that make up the variables involved in the board being able to undertake its role. The theoretical perspectives by Zahra and Pearce identify that the four, highly interrelated variables have several elements that contribute to company performance. These four variables are:

1. composition;
2. characteristics;
3. structure;
4. process.

The project governance *composition* refers to the size of the board and the skill sets of the directors. In the case studied, the number of members on the project governance board varied at different times throughout the project. This was reflective of the differing skill sets required by the megaproject, and the need for different members on the board. The skill sets of the members were outlined in detail in Chapter 5. These variables are complementary to those in the work by Brookes and Locatelli (2015, p. 12), who researched Special Purpose Entities (SPEs) as megaproject delivery mechanisms. They identify governance as a key taxonomy specific to SPEs, with specific focus on accountability, authority, alignment, disclosure, flexibility and decision-making efficiency. Board size and membership have been shown to have strong influence on performance outcomes. This may require the induction of external parties (non-executive board members) with outside skill sets to provide service to the board and to supplement board skills. The case study reflected the use of an independent project board with all members external to the project except for the Chair. It is noted, however, that the direct relationship between board size and performance remains largely inconclusive.

The *characteristics* variable has two components. The first is the directors' backgrounds. This addresses those attributes such as knowledge, skill, age, experience and values. Such considerations are important in ensuring that the right mix of skills is considered in the project governance design. The second component is the 'personality' of the board. This could be referred to as the culture of the governance and is the result of the individual and collective characteristics of the individuals. Within the context of a megaproject, the temporal nature is a unique dynamic in that the characteristics do not pre-exist; thus, the project governance requires an entrepreneurial approach to create the culture while the megaproject and the organisation are developing and focusing on delivery. This variable is considered essential for the effective performance of the project board, as each component requires distinct skills and ability. Within the mega transport project in the case study, project governance identified that technical engineering skills were critical, as well as complex financial skills and risk management.

The project board *structure* refers to the organisation and dimensions of the organisation. This includes use of sub-committees, recognising the potential changing structures of the project board over the different stages of governance, and leadership. This variable is also a major factor ensuring that the megaproject governance role can be efficiently delivered. Use of sub-committees can be an effective mechanism to ensure that the detailed work of the project board can be delegated to a specific group, ensuring that the project board is able to focus on the Strategic Outcomes and Performance variables they are responsible for. For a megaproject, the changing nature of the board is an important factor, as it is the timing of the board's change. One of the improvements identified by the project board members in the Delphi, was that the Stage 2 board could have been created earlier. The flow of information between the project and the board is necessary; and as was seen in the case, consistent and regular formal reporting occurred throughout the lifecycle. Because the reporting categories did not change over the 4-year period, this was an indicator that correct information and reporting structures is one of the reasons why the project was successful.

The *process* variable refers to the approach the board takes in relation to decisions. Zahra and Pearce identify that past research had shown that board processes embody five elements: frequency of meetings; length of meetings; CEO-Board interface; level of consensus amongst directors; and board evaluation (Zahra & Pearce II, 1989, p. 307). Effective meetings are critical, with appropriate agendas to ensure the adequate coverage of relevant issues. The board meetings need to allow for questions to be asked and alternative views expressed. The provision of information is normally through the CEO (or Project Director or equivalent) for a megaproject, and the interface between the project board and organisation is a key consideration. To complete the process, the minutes and support documentation created should reflect the decisions of the board. As evidenced from the case studied, the creation and use of effective minutes was a key tool in capturing actions and decisions from the board, as was demonstrated through the Phases 1 and 2 of analysis. The process variable has a major impact on the ability of the board in being able to deliver on its performance expectations.

7.3.2.5 Strategic outcomes variables

Depending on the selection of the critical variables, the role of the board in the strategic domain may take a number of avenues. When a project board undertaken their roles effectively, they shape managerial choices and actions. For a board to deliver on the project performance expectations, it can choose to focus on one or a number of variables to achieve this. The strategic outcomes are considered through the three variables of:

1. approvals;
2. review;
3. scope.

While each of the three variables can be used in combination, the strategic outcome is a useful medium in order to provide clarity around how project board performance will be delivered and shapes the approach that will be taken. The first variable considers the role of approvals, whereby project success is achieved through the project board being limited to being responsible for approving decisions. The project board does not initiate any new ideas, strategies or scope, and in this way, can effectively govern through oversight and control. The second considers that the board is responsible for the review of strategic decisions or scope. From an agent theory perspective there is no consideration of the strategic outcomes delivering the performance outcomes, as it relies on external relationships and concentration of ownership in order to deliver the financial and systemic performance outcomes. Relating this to a megaproject, a focus would be placed on using financial incentives, and reinforcing the role of the CEO (or project director), in driving performance outcomes.

There is a wealth of research on the issue of incentives and tools in the corporate governance domain, however, much of the project management practitioner literature is silent on this topic. The third variable to consider is that of managing megaproject scope. A traditional project has clearly defined boundaries of scope; however, for a megaproject, the precise clarity is not always there due to the complex interfaces, actors involved and changing environment.

A project board can decide to undertake either a major or minor role in determining what is in, or out of scope under this variable. For the case, there were a number of additional business cases that were provided to the project board for consideration of additional scope. The Delphi study confirmed that the project board placed a high importance on carefully reviewing what was ‘not in scope’, and that this was a core decision that the project board undertook during the life of the project.

By having a project board determine the focus and level of involvement in the strategic objective variables, clarity is provided on the role that project governance will adopt to deliver the performance outcomes.

7.3.2.6 Performance variables

The *performance* variables are the result of the model inputs to deliver the outputs. There are three variables for performance:

1. business / organisational;
2. project performance;
3. social.

The first two variables reflect the Success Criteria Framework (SCF) from the earlier section, which considers the business and organisational goals being achieved, as well as considering the project management variables of functionality, budget and schedule. For a successful megaproject, the argument is that the definitions of successful performance are dependent on meeting certain criteria that align to the delivery of the corporate governance requirements. The Phase 3 interviews identified that the project board members considered the success of the project to lay between both the project board and the team, which could be measured using the traditional project management metrics.

The social variable considers success based on a stakeholder's perspective and that the relationship a stakeholder has with the project would shape the view of success.

7.3.3 The VIBRA Model Assessment

The 23 variables within the 7-box process model combined provide for a new megaproejct governance model that will improve the ability of a megaproject board to be set up for success. The model considers the three major inputs from the external and internal environment, and the corporate governance expecations in order to give consideration to the 8 critical variables contained within the project board role and proejct governance attributes.

The model was effectively adapted from the corporate governance literature to the megaproject governance environment. The next model will move from considering the variables and attributes of a successful megaproject to considering organisational effectiveness.

7.4 APPLICATION OF MODEL #2 - AN EFFECTIVENESS MODEL FOR A MEGAPROJECT

In order to test theory, the second model tests megaproject governance arrangements against an Organisational Effectiveness Model (OEM) by Quinn and Rohrbaugh (1983). Many lifecycle researchers suggest that different management arrangements are created because of the inability of the existing systems to cope with the complexity faced by the growth and development of the organisation being studied (Lynall et al., 2003, p. 421). This perspective is also confirmed through the Viable System (introduced in Chapter

3), which at its core holds the concept of a system that requires regulation through the use of attenuators and amplifiers (Beer, 1979, p. 96).

The analysis in this thesis draws parallels between organisational lifecycles and a megaproject's dynamic lifecycle, in order to develop a model to analyse megaprojects. Previous wisdom for project governance arrangements considered a project board as a one-off static activity that was simple, standardised and easily represented; which was demonstrated to be untrue for the case studied.

7.4.1 Organisational Lifecycles and Organisational Effectiveness Models

In the study of 27 electrical manufacturing organisations, K. Smith et al. (1985, p. 815) demonstrated that organisational priorities change, as the organisation progressed through different stages of their lifecycles The study identified three distinct stages: inception, high growth and maturity. The study also identified the importance of organisational co-ordination, which gains its greatest significance in the middle lifcycle stage. In the same decade, other organisational lifecycle theorists, Smith and Miner (1983), were beginning to research the transition of organisations from *entreprenuerial* to *hierachical* systems.

Much of the previous organisational research had focussed on the inception (of an organistaion) only, and then identified the changes involving functional versus divisionalised structures. Their work built upon other, parallel works which considered early stages of transition from *entrepreunerial* to *bureacucratic* form. In particular, there was a focus on two types of entreprenuer – 'the craftsman' and 'opportunitist entrepreneur' – and the ability of each to move to the next stage of a lifecycle. The first type (the craftsman) was characterised by limited education and training, low social awareness, and a limited time orientation. The second type (opportunitst enterpreneur) showed opposing characteristics, with a high degreee of education, awareness and a longer-term time orientation.

The study found that the opportunitistic-oriented entreprenuer moved through the initial phases of the lifecycle to aggrandisement, primarily because this type of entrepreneur was attuned to the need for bureaucratic management systems, which was identified as a key requirement of success in the next stage. The study focussed on those organisations that started as a small entreprenuerial business and then later transitioned to a larger business with its bureaucratic consequences (Smith & Miner, 1983, p. 326).

These early studies drew parallels to the field of project management, especially considering emerging organisational size, context and approaches. In drawing such parallels, the need for differentiating traditional projects and complex management arrangements for megaprojects, the need for more sophisticated mangement of risk, and complex organisational design within a megaproject, were highlighted.

7.4.2 An Organisational Effectiveness Model

Further exploration of organisational lifecycles and effectiveness was undetaken by Quinn and Cameron, who suggested that organisations follow predicatable paths when viewed using developmental stages

(Quinn & Cameron, 1983, p. 33). To create this view, nine different lifecycle theories and associated models were assessed by Quinn and Cameron; and they organised each of the major factors and characteristics under a *summary model*. The summary model contained four lifecycle stages, which supported the view of K. Smith et al. (1985), where such priorities were contingent on the lifecycle stage of the organisation under study. Quinn and Rohrbaugh (1983) discovered that there were three underlying value dimensions of organisational effectiveness. The value dimensions compete with each other, which are recognised as organisational dilemmas in the literature. Quinn and Rohrbaugh called these the three sets of Competing Value Dimensions (CVDs), which make up the Effectiveness Model. The three value sets are:

1. Organisational focus. This was either externally or internally oriented.
2. Organisational preference for structure. The emphasis was on providing flexibility or stability through control.
3. Organisational closeness to organisational outcomes. The emphasis was on a preference for the nearer and larger through process (the means) against the farther and smaller away through outcomes (the ends).

Since the initial introduction in 1983, the Effectiveness Model has been refined and simplified, with the value sets combined into a four-quadrant model. The x-axis provides the value dimension for the *organisational focus;* the y-axis represents the organisational structure; with the third value dimension (the depth or distality-axis) being the *organisational means-ends,* which considers processes and outcomes. This is presented in the three competing dimensions was represented as a four-quadrant spatial model that considers all dimensions concurrently.

The x-axis (dimension 1) considers the organisation from an internal and external perspective on wellbeing and development (of both individuals through to the development of the organisation itself). The y-axis (dimension 2) represents the organisational structure with the emphasis on either flexibility or control; while the third axis (dimension 3) considers the means-ends dimension. This considers a focus on either internal processes (the means) only or the final outcome (the ends).

The Effectiveness Model identifies contradictory and competing values that are simultaneous and complementary opposites (Quinn & Rohrbaugh, 1983, p. 375). The model is referred to as a Competing Values Model (CVM), and when viewed over a lifecycle it becomes apparent that an organisation has different focus based upon the priorities it faces in each lifecycle stage.

The model is further represented in a form, as seen in Figure 7-7, which categorises each of the four quadrants as an individual organisational effectiveness model:

1. the Human Relations Model. This model places emphasis on flexibility and an internal focus, with the means-ends of cohesion-morale and human resource development (top left of Figure 7-7);

2. the Open System Model. Places emphasis on flexibility with an external focus, and emphasis on the means-ends of flexibility-readiness, and growth-resource acquisition (top right of Figure 7-7);
3. the Internal Process Model. Places emphasis on control with an internal focus, and emphasis on the means-ends of information management-communication and stability-control (bottom left of Figure 7-7);
4. the Rational Goal Model. Places emphasis on control with an external focus, and emphasis on the means-ends of planning-goal setting and productivity-efficiency (bottom right of Figure 7-7) (Quinn and Rohrbaugh (1983)).

Figure 7-6: The three dimensions of the Competing Values Model (CVM)

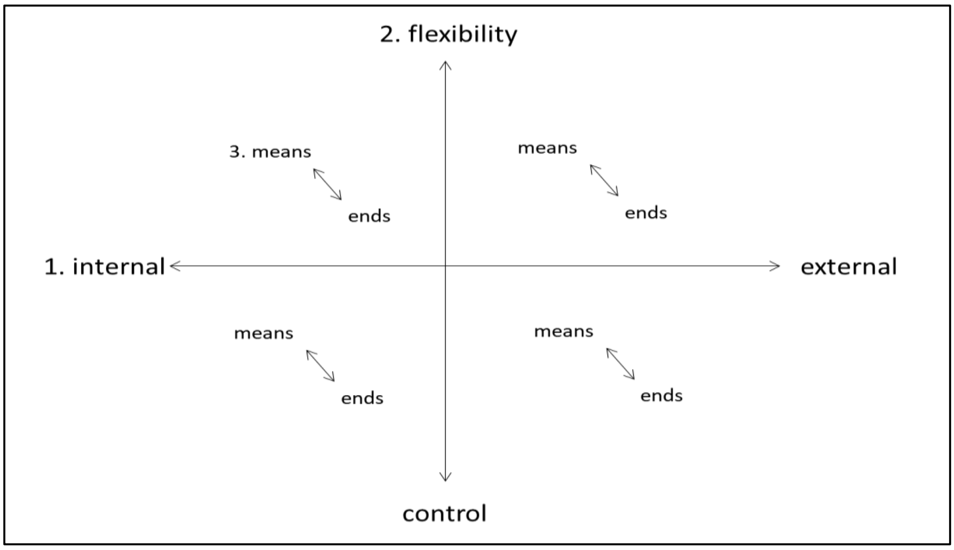
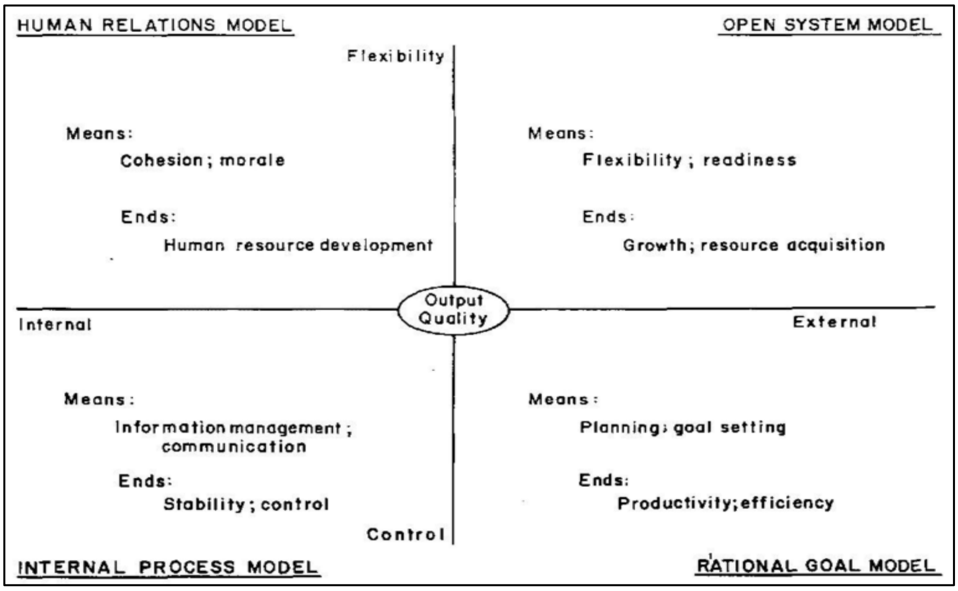


Figure 7-7: Competing Values Model (CVM) (Quinn & Rohrbaugh, 1983, p. 369)



The Organisational Effectiveness Model (OEM) was used by Quinn and Cameron to identify different stages that organisations progress. The model was applied to a case (of an organisation needing to transition from the open system model to the internal process model) and the transition identified that a change of organisational structure, and of the activities of the organisation occurred (Quinn & Cameron, 1983, p. 49). According to Quinn et al. (1991) the flexible values of the Human Relations (model 1) demonstrated certain traits such as cohesion and moral, while the Open System (model 2) included descriptors addressing adaptability and flexibility.

The OEM has strong applicability to a megaproject lifcycle. In the early definition stages of the megaproject lifecycle, a megaproject has little scope or understanding of how the outputs and performance will be achieved. Due to limited levels of control and certainly, a megaproejct displays a flexible organisational structre and is oriented towards an external organisational focus, as the megaproject is respondng to a corporatre need, or problem. As the megaproject scope develops, the orientation changes. The concept of a project lifecycle is well understood, which has different stages and priorities during each stage. Applying an organisational effectiveness assessment model to the megaproject environment was identified as an avenue to differentiate megaprojects from those of traditional projects.

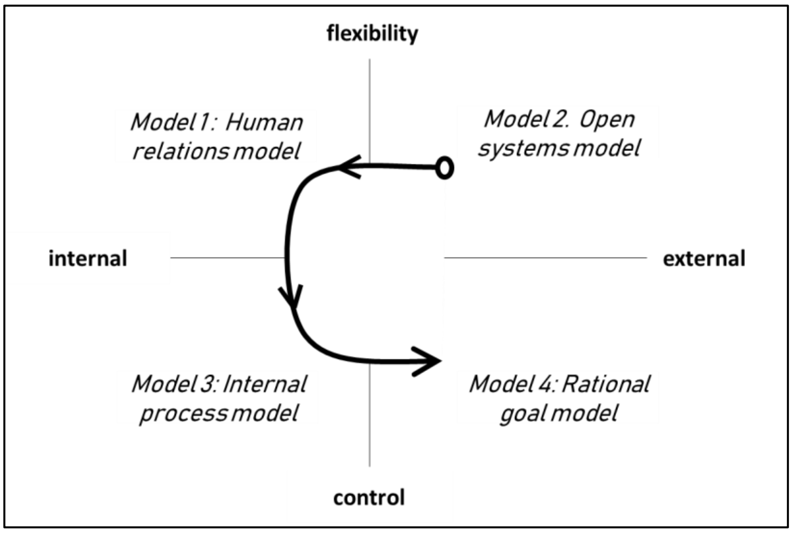
7.4.3 A Megaproject Effectiveness Model (MEMo) assessment

Using the OEM describe a project, in general, a traditional project displays a focus of a formalised structure with a clear scope and defintion, and therefore, in the OEM, this would equate to being a Human Relations orientation. As the lifecycle priorities of the RRL project changed over time, the lifecycle stages arrangements were mapped to the OEM. The RRL project commenced its lifecycle in Model # 2 (open system model), then progressed to the Model 1 (Human Relations Model) through to Model 3, and completed its lifecycle in the Model 4, as represented in Figure 7-8.

Quinn and Cameron (1983) hypothesised that, as an organisation progresses through its lifecycle, different effectiveness criteria are emphasised. In Stage 1 of the RRL Project (the strategy and planning stage; see Chapter 4), the project was being defined and the scope was not well understood. The case study started as an open-system with a focus on exploiting flexibility of solutions and an external orientation to consider stakeholder impacts. During that stage, the *survival threshold* (the likelihood of the project proceeding) was low, and required an entrepreneurial-type approach to the governance where possibilities and options were considered, ruled out and others pursued. It was also during this stage that the scope, and subsequent business case, were developed, which were guided by the higher-level strategic plan,[45] which considered overall transport needs and multiple project alignments for transport in Melbourne, Australia.

[45] The East West Link Needs Assessment, 2008. See Section 1.4

Figure 7-8: Progression of the RRL Project through its lifecycle



As organisations progress through their lifecycle, priorities changes, as happened in the megaproject case. The approval of the business case marked a shift to a new lifecycle stage, as the project was then approved for implementation and required a new governance arrangement (Stage 2). Once the approval of the project becomes formalised, the focus transitions to being internally focussed, with the project and the supporting organisation being formed. The flexibility orientation quite necessarily transitioned to a project organisation, where more control and internal structure were required. It was during this transition that the project governance arrangement was introduced (Stage 2). The final stage (Stage 3) saw the completion of the transition, as the project neared completion and started delivering the benefits initially specified. Orientation continued to require control over flexibility, but a shift occurred from being internally focused to an external orientation, as the project became more visible to end users and services commenced with the new transport system.

The literature review addressed organisational effectiveness within a projects domain from shareholder-stakeholder orientation and behavioural-outcomes paradigm perspectives. The relationship between the corporate governance, a project, and project governance, was represented as a 2-part Venn diagram, and using that representation, project governance was considered as a subset of the organisational corporate governance and defined as being for a temporary organisation with three levels of governance (of the project, projects within programs and portfolios, and the board). The Venn diagram presumes a static relationship between the two governance structures of the corporate and project governance; but the analysis of the case in Chapter 5 revealed that the project governance function evolved over time, with two distinct phases before the governance arrangement was terminated at the completion of the project. The effectiveness model was successful in showing that the case transitioned through all four stages of effectiveness. This successful mapping of transitions also supports the hypothesis that megaproject governance is dynamic and responds to the environmental needs over the lifecycle, and not static as previously thought in the literature.

7.4.4 Lifecycle stages of effectiveness

1. The effectiveness model developed by Quinn and Rohrbaugh was further enhanced by Quinn and Cameron (1983). The latter model identified major factors upon which the 9 models are based and organised, and developed a summary model consisting of four major stages of lifecycle development. These four models reflect the different effectiveness criteria emphasised as organisations progress through the life cycle stages of the organisational effectiveness model. The four models address the following:
2. Entrepreneurial model. Typified by innovation, creativity and marshalling of resources. Organisation tends to associate with flexibility, growth, resource acquisition and development of external support. During this stage a stabilisation of resources is a pre-requisite for success.
3. Collectivity model. Typified by informal communications and structure, a sense of family and cooperativeness, high commitment and personalised leadership. Emphasis on development, morale, cohesion and human need satisfaction. Group unity and psychological contracts are typical in this stage.
4. Formalisation and control model. Typified by organisational stability, efficiency of production, rules and procedures and conservative trends. Emphasis on goal setting and attainment, productivity, efficiency and stability control.
5. Elaboration of structure model. Typified by the organisation monitoring the external environment in order to renew or expand itself. Decentralisation of structure and a balance between differentiation and integration occurs during this stage (Quinn & Cameron, 1983, p. 43).

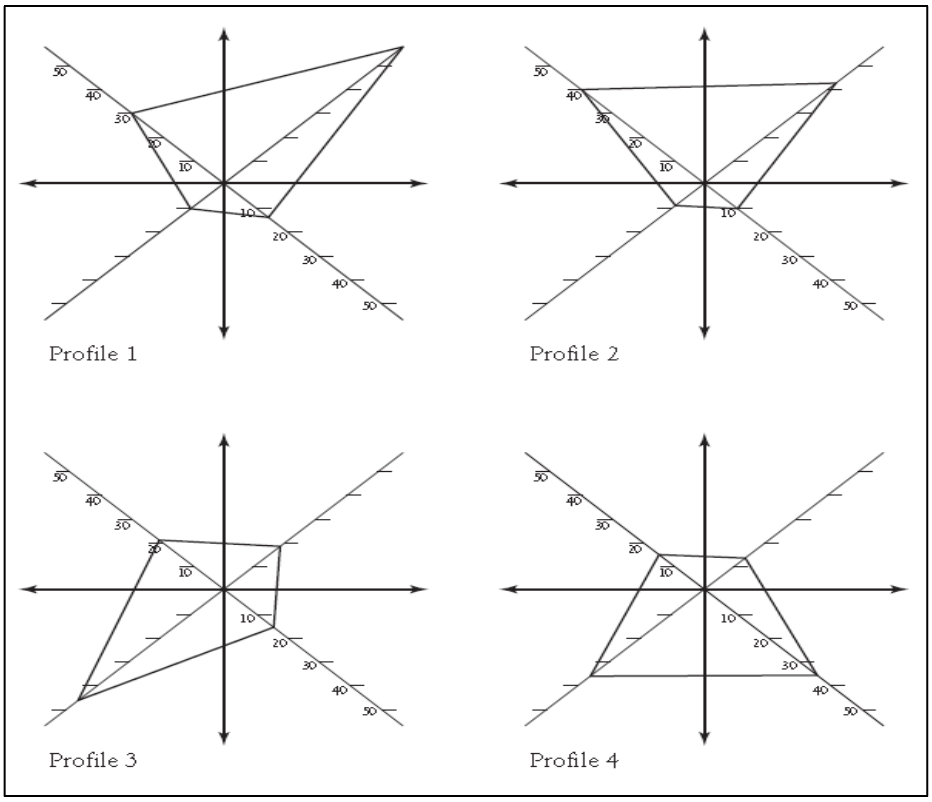
At the time, the differing effectiveness values were presented as a hypothetical model; but by 1991, Quinn et al. (1991) had refined the model as a Competing Values Model (CVM), which illustrated the conflicts of organisational lifecycles. The CVM was used to profile the mean scores against each of the models of effectiveness. A *standard profile* for an organisation was created and was able to be evaluated over time (see, for example Figure 7-9), where the priorities of the organisation changed over time; as, and is reflected in figure from profile 1 through to profile 4. While the detail of the assessment will not be discussed here, a full assessment is addressed by Cameron (2011). Each assessment has 4 alternatives, and 100 points must be divided amongst the four alternatives, with the higher the number of points representing the criteria most representative of the organisation.

While the Effectiveness Model (EM) considers the competing values, different levels of analysis are required when considered in terms of value creation. The original EM was refined by Cameron et al. (2006) to introduce a secondary overlay level of analysis which focussed on three levels of outcome:

1. external,
2. internal organisational level;
3. individual level (2006, p. 14).

The overlay to the original model illustrates the different levels of value by organisational perspective, in terms of the effects beyond the organisation itself. This assists in clarifying that, in order to achieve long-term organisational value, multi-level outcomes should be considered over the lifecycle. This suggests that alignment across each of the quadrants in the model leads to effective performance, and thus each of the four quadrants can be pursued at each level of analysis (Cameron et al., 2006, p. 159).

Figure 7-9: Organisational lifecycle assessment (Cameron, 2011, p. 55)



The 'individual level' refers to the attributes of individuals in the organisation as opposed to the organisation's attributes. The 'internal organisation level' considers elements within the organisation that facilitate value creation, which includes issues such as design, culture, and approach. The 'external outcomes' level identifies factors that relate to valued external outcomes such as shareholder return, shareholder return and brand identity. The model allows for the alignment of different levels of analysis by balancing external internal and the individual attributes, making the alignment simpler to comprehend and less ambiguous. As each quadrant maps a degree of value, a pathway map can be created to map the percentage of resources dedicated to functional activities for a megaproject, and also for a traditional project.

The first stage, entrepreneurial, profiles a result that had a major focus on the flexibility-external focus, with strategic forming as the dominant theory. As the project progressed to the collectivity stage during the business case development, the focus shifted from an external focus to an internal focus, whereby the project started to consider the competing values of internal stakeholders, but also maintaining flexibility in the governance design, as the project was still in the pre-approval stage of development and the final options had not been fully considered. The third stage, the formalisation and control stage, was assessed as shifting priority from the x-axis position of flexibility to a focus on control, as the project governance arrangements sought to limit change to the project as it progressed through the tendering and project delivery phase, and to introduce formal processes (such as the use of procurement processes and contractual arrangements). The last transition, to the elaboration of structure, occurred when the project governance arrangement was completed, and the project was handed over into operations. From a project perspective, there was again a shift in focus on the external environment, but also towards the strategic forming quadrant, as the project started to deliver train services, and new strategies began to emerge.

The assessments are provided in Figure 7-10 in the form of a Megaproject Effectiveness Model (MEMo). The Effective Model shows that there is strong alignment with the case's lifecycle, and this is was mapped to the different governance stages (stages 1-3). The applicability of the four models of effectiveness show that for the case, in the different governance stages there were differing priorities across the lifecycle, and that the megaproject governance arrangement adapted to each change. This model could further identify the differences between traditional projects and megaprojects, in that a megaproject governance arrangement shifts its priority from external to internal, while a traditional project starts with an internal focus, and only has an external focus once the project is delivered. A theoretical assessment comparing the overall profile of a traditional project and megaproject is outlined at Figure 7-11.

In the assessment, the focus of a traditional project model has a focus on the 'internal process' quadrant, with an internal preference over external orientation; a preference of control over stability, which is consistent with project management theory of control and certainty, and a mean-ends orientation to information management and stability. The megaproject profile demonstrates an overall flexible orientation over control with priority towards an open system model, and orientation towards the external environment and stakeholders over the internal.

Given the size, impact and profile of megaprojects, the assessment must manage a multitude of external stakeholders; and has a means-ends orientation towards readiness and resource acquisition. Further research on comparing different megaproject effectiveness profiles provides an opportunity to further test the robustness of the model.

Figure 7-10: Megaproject Effectiveness Model (MEMo) evaluation during the 3 governance stages by Pelham-Bomar

7.5 APPLICATION OF MODEL #3 - VIABLE SYSTEM MODEL (VSM)

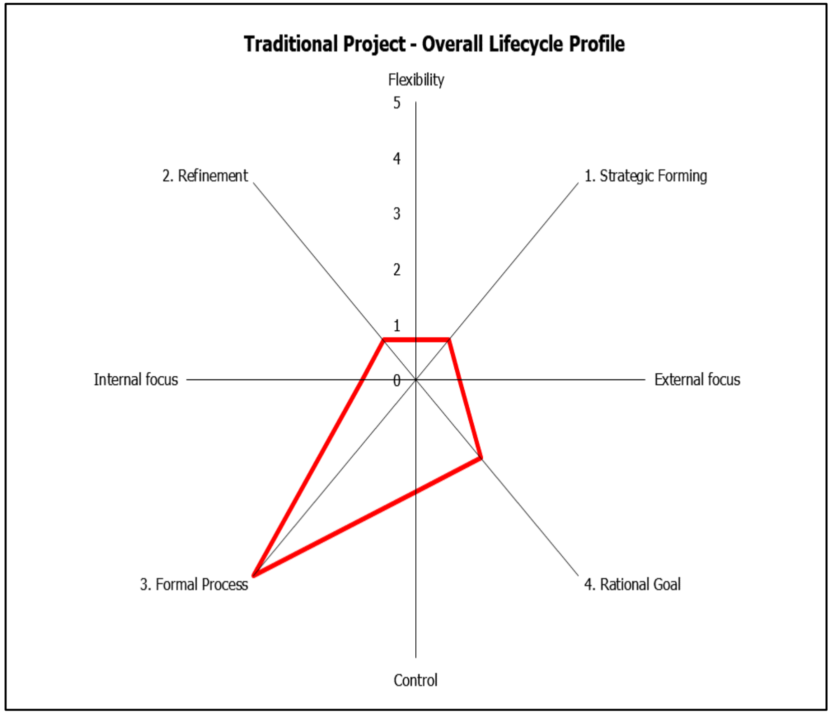
The VSM was introduced in Chapter 3, and the concept of a mapping a megaproject as a viable system was introduced. In this scenario, a megaproject has two constituent parts: the inner core and a periphery supply-chain. The number of actors in the core grows during the early stages of development, as more stakeholders become aware of (and involved in) a megaproject's development and delivery. As a megaproject progresses through its lifecycle, Gil and Lundrigan (2012) discovered that megaprojects can be compared to a relay race, whereby control of the megaproject passes "like a baton between leadership teams" (2012, p. 5) through the lifecycle stages. The four stages of the relay race were the common lifecycle stages of project management: the inception, gestation, delivery and operations; with each having a unique function and priority, but each being similar to the effectiveness models considered in the previous section. The concept of passing a baton highlights an element of project governance arrangements that has not received much attention: hand-over / hand-off (Ho/Ho) points and longitudinal project governance control points.

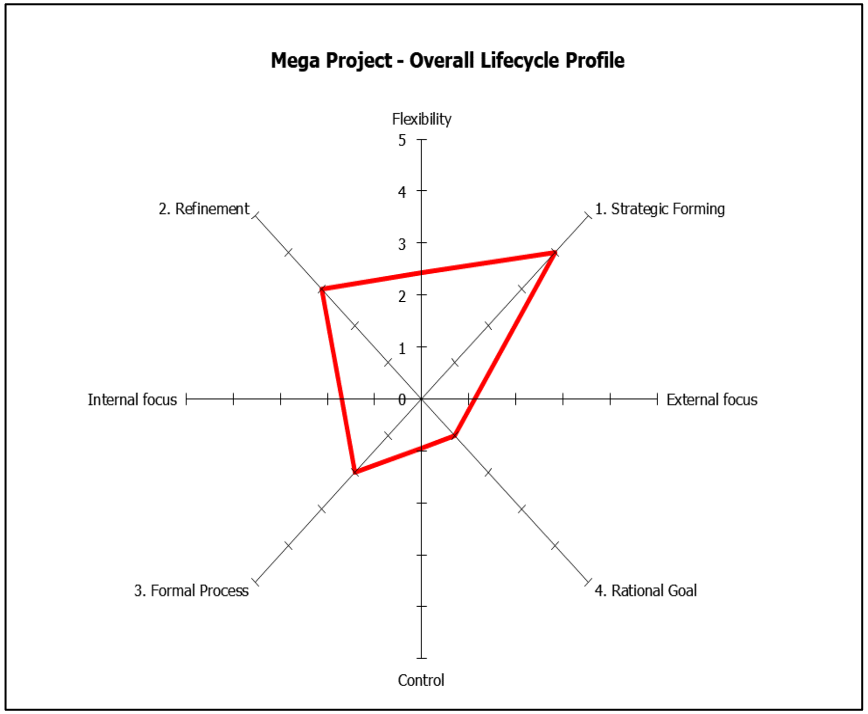
In Chapter 4, it was also identified that during the delivery phase of a megaproject was the stage at which the project governance arrangement was at its most complex. While the demarcation of Ho/Ho points was useful to understand the changes in megaproject governance, these points also represent a time at which strategic change is at its most resistant.

The earlier considerations of VSM proposed that, by using the layout and definitions of the VSM, the organisational model could be directly compared to the temporary organisational structure that is a megaproject; and therefore, that it is possible to compare a *project version* of a VSM to a megaproject governance structure. Such mapping has been undertaken in other industries such as with Dominici and Federica (2013), who compared the VSM to Lean manufacturing, and Beckford (1993) who suggested that the VSM could be used as a black box technique to study the system without interfering with its internal operation. The most well-cited example of using the VSM was in 1970, with the Chilean President, Salvador Allende, inviting Stafford Beer to assist in organising the social economy of the country. The project lasted less than 2 years as the President was overthrown. The VSM was described as a success, but there are no other examples of government using this innovating approach since (Leonard, 2009, pp. 231-232).

The hypothesis was that a Megaproject Viable System (MVS) model could be identified by using the VSM, and a system diagnosis could occur. The Chilean example had 12 levels of recursion; and by identifying an MVS system and applying a diagnosis, the method was expected to identify potential flaws or strengths in the megaproject governance arrangement, which could either threaten or enhance its viability. It was also expected that the diagnosis would identify any holes in any of the levels, which "either does not exist or, if it exists, is insufficiently embodied" (Pérez Ríos, 2012).

Figure 7-11: Effectiveness Model assessment of a traditional project and a megaproject, by Pelham-Bomar (2019)





Using this method, a description of each system was needed. System five is the policy function which is considered as the overall organisation responsible for the strategic direction of the megaproject. This function was responsible for identifying new projects, and was the overall recipient for the benefits of the project.

System 4 would represent the project board or chair of the project, which works with the external environment (suppliers, contractors, service providers, designers and the like) and is responsible for the delivery. System 4 may also have a number of sub-committees that are used to delegate specific issues to ensure the board's time is managed efficiently.

System 3 would equate to the role of the Project Director. The term project director is used here to nominate the most senior person responsible for the delivery of the project. In many cases, where a special purpose vehicle is created for delivery of the project, this role may be called the Chief Executive Officer, or an equivalent term.

System 2 function is the reporting function where multiple work packages, issues and status reports are collated together to provide management (the board) with information on the progress of the project or work packages.

System 1 represents either the deliverer, or for megaprojects, the delivery groups, who undertake stages, work packages or discipline-related works. The comparison of the VSM to a project governance structure is summarised in Table 7-1.

Table 7-1: VSM hierarchy and mapping to a megaproject governance arrangement

System Level	VSM	Project governance equivalent	Case study specific role
System 5	Policy	Department / Asset Sponsor	Minister / Department
System 4	Planning	Project Board / Chair	RRLA Chair
System 3	Control	Project Director / CEO	CEO RRL Project and Advisory Board
System 2	Coordination	Reporting	Joint Coordination Committee
System 1	Project implementation	Project delivery / Work packages / delivery groups	Work packages A-F (projects)

The VSM can be used as a tool for organisational design for monitoring of the organisation's health and as a diagnostic tool (Beer, 1985). The complexities of diagnosis, language and expertise required in order to undertake the diagnosis proved to be difficult in the evaluation in the present research. While several researchers have used the VSM for diagnosis (see for example, Ja'bari and Kummamuru (2016) and Espejo et al. (1999)), the ability to transfer this approach to a megaproject was difficult to apply in the present study. One of the theoretical challenges with the VSM application to megaprojects is the mechanisms for adaption, of which viability is key (Espejo et al., 1999). For an organisation to remain viable, it must identify new possibilities and adapt.

As was seen in the Effectiveness Model, adaptability is a key feature of project governance. For megaproject governance arrangements, this adaption results in the governance arrangement being disbanded once the project is completed. It is this unique element of *viability*; the inevitable cessation of the project occurs. Although the 'baton' is handed physically handed in to operation, the inevitable cessation of the project occurs, as does the project governance arrangement.

Due to difficulties in being able to apply the VSM to the case, it is not pursued any further in this thesis.

7.6 OBSERVATIONS

This case studied focused on a mega transport project, delivered over a period of seven years. For this megaproject, the governance structures utilised shifted a number of times, reflecting the changing needs of the project. Project governance practitioner and theory consider that implementing a project governance structure is one of the key management activities. The literature currently does not extend past the point at which a project board is in place, or provide insights in what function the board then has or when the project board needs to be put in place.

In non-complex and smaller projects, governance arrangements can be administered using conventional project governance techniques, including procurement and scope management to transfer risk to parties most capable of managing the risk. It appears that megaprojects do not operate in the same manner: regardless of the transfer of risk, the interfaces between parties is complex; and without oversight, namely megaproject governing arrangements, the risk of project failure remains.

The RRL project is an example where the project board did not transfer risks to be managed individually, but there was an acknowledgement that individual parties would struggle to resolve mitigating their risks without the cooperation of a number of parties, compared to using contractual arrangements for the risk mitigation.

The literature had demonstrated that project governance was an intersection of management domains; and one of the future directions of project management research indicated that an exciting new area of research in project management is to consider application of models from other industries. Three corporate and organisational models were used to test megaproject governance arrangements to identify whether models from other domains could be applied to the case. The three models chosen in the present research had quite differing levels of application.

The first, the corporate governance model, considered variables that needed to be considered for performance evaluation. This model was effectively adapted to the megaproject governance environment; and this resulted in a new process model, the VIBRA model, being developed, which identified 23 variables for performance evaluation.

The second model considered a competing values framework to assess megaproject effectiveness, which identified that the megaproject governance transferred through four different stages of the lifecycle. Each stage placed different priorities on its orientation to structure, from allowing flexibility through to control, organisational focus on internal or external orientation, and a focus on organisational outcomes, either focussing on the means or the ends. Without such a framework, megaproject governance may be missing opportunities to ensure value creation and that project success at each stage is focussing on the correct orientation. By applying this model in parallel to the desirable variables in the VIBRA model, this allows for different levels of analysis, from the individual through to the external outcomes, to be considered collectively.

The corporate governance and organisational effectiveness models demonstrated that megaproject governance arrangements change over time and respond to the needs of internal and external factors, and of the lifecycle stage and orientation priorities at the time.

Adaptability is thus a key focus of megaproject governance; and the third model, the VSM, considers ongoing organisational design and viability. Inroads were made with the VSM to apply the model to a megaproject governance arrangement; but due to the complexities of application, and lack of suitable reference examples to guide how the VSM could be adapted to a project environment, this avenue was stopped.

7.7 CONCLUSION

The Research Questions (RQs) allowed for a focus on what the core issues were that the board considered; and the second question was answered in Chapters 3-6 by categorising and identifying those issues that the board focussed on[46]. Four broad conceptual clusters were identified (Board Administration, Project Status, Project Outcomes, and Board Obligations/Governance); and as well as the four clusters, the management of risks across the lifecycle was highlighted as an important consideration requiring consistent attention across the lifecycle.

Through the use of a consistent reporting framework, pro-active risk management, and use of a subcommittee to identify and escalate risk (364 risks in total), the project was delivered effectively within the project management evaluation criteria of time, cost and quality. Coupled with the approach to risk,

[46] What is the impact of project governance on a megaproject?

there was a realisation that the project governance structure was dynamic, and had three distinct changes of structure over its life.

This was an important realisation in a megaproject governance setting: that sensible project governance change may, in itself, be a key for ensuring that the project is successful. The answer to the first research question thus identified that there was a positive relationship between the project board and the project success. A difficulty, however, was identifying and defining exactly what this relationship and its impact were.

To assist with this definition, and to answer the fourth research question[47], this chapter explored the concept of corporate risk management, and identified that megaproject governance arrangements can be viewed as a risk mitigation of project failure, poor project governance (PPG), and integration of multiple parties with conflicting interests.

A process logic map was developed to guide the application of suitable models to identify potential models or processes that could be used to improve megaproject governance. Three models were identified, and two were effectively adapted to evaluated megaproject governance, while the third, the VSM, was abandoned as its application became too complex to pursue.

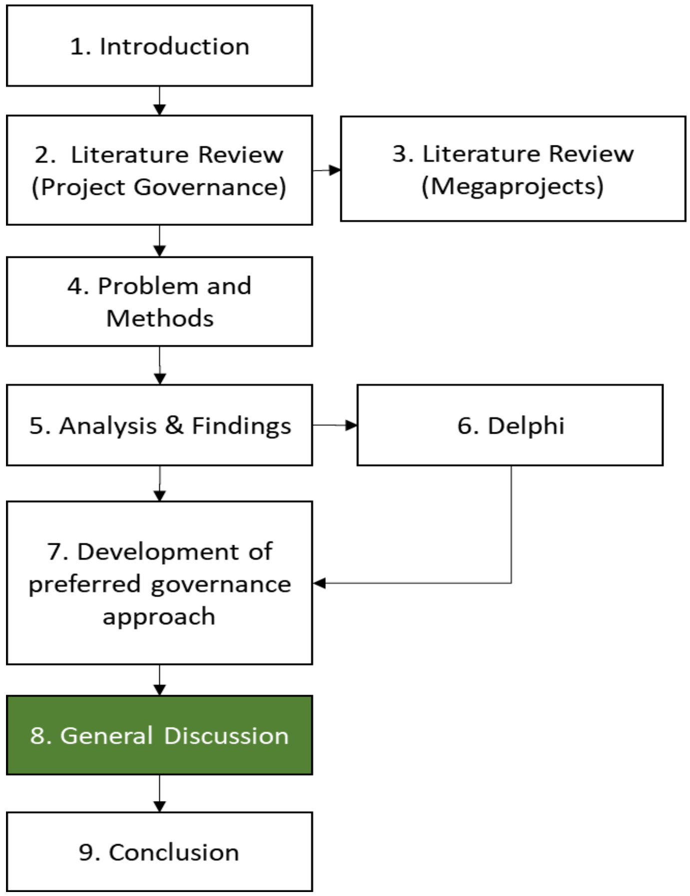
As with case studies, there remains a question of whether the learning from this case is representative of a wider spectrum of projects, or whether this case was unique. The study did not consider the influence, tone, priorities, personalities or expectations that the individual board members experienced. Such elements would provide a richer picture as to the issues the project board faced, as would interviewing the board members to get an insight into their observations on why the project was a success, and their opinions on using novel governance structures on megaprojects.

The relationships between the roles and attributes in the VIBRA model could be further explored in future research; as could the detailed application of the effectiveness model to other MTPs and different megaprojects, and considerations of whether the model could be used on traditional projects to shape improved project effectiveness.

The next chapter will commence the task of joining up both the research questions with a general discussion, before the thesis concludes.

[47] Are there models and/or processes that can be used to improve the decision-making functions of a megaproject board?

Chapter 8 General Discussion



8.1 INTRODUCTION

This chapter discusses the learnings and gaps identified from the literature, the analysis of the case, the Delphi validation survey, and the three proposed models. It brings each element of the thesis together through triangulation, and discusses the problem of megaproject governance (Chapters 1 and 4) by testing key findings from the literature review (Chapters 2 and 3) against the results of the analysis and findings in Chapters 5 and 6.

The thesis posed four research questions, which are outlined below; and each will be discussed.

- RQ1 – What is megaproject governance?

  - This question was considered in Chapter 2 (Literature Review) and Chapter 3 (Megaprojects Literature Review).

- RQ2 – What is the impact of governance on a megaproject?

  - This was considered in Chapter 5 (Analysis and Findings) and Chapter 6 (Delphi Validation).

- RQ3 – What are the core decisions that are made by a megaproject board?

  - This was considered in Chapters 2 (Literature review), 5 (Analysis and Findings) and 6 (Delphi Validation).

- RQ4 – Are there new models and/or processes that can be used to improve the functions of a megaproject board?

  - This was addressed in Chapter 7 (Development of a Preferred Governance Model).

New approaches to further understand and improve megaproject governance have been investigated. In Chapter 2 it was identified that current research practices was not keeping pace with the practice developments of project governance. There were multi-dimensional factors and change occurring that was not well understood. In particular, the management of risk was a major gap. Er et al. (2013) stated that there was demand for more detailed investigations of what is occurring in the real practices of project management; and that the management of complexity in projects demands more emphasis on detailed investigations in the research. This present research has argued that the megaproject governance arrangement is a key ingredient in ensuring the success of a megaproject.

There are two aspects associated with success. The first is in delivering the project to the iron triangle constraints of time, cost and quality; and the second and more important is in delivering the longer-term business need. A competent megaproject board must initially identify, and then continual to manage risk throughout the entire lifecycle. Over time, however, the megaproject governance arrangement studied was shown to dramatically change. Stakeholder interests and their involvement levels varied, and the precise understanding of what constitutes project success moves on with time. Some suggested it was impossible to have a clearly defined measure of success on a megaproject due to the long timeframes they are delivered over, as over this time expectations change. While a project will always be expected to deliver against a need, defining the specific longer-term outcome, as seen with megaprojects, is a significant megaproject governance challenge.

Chapter 2 recognised that there was a need for the literature to move from investigating project failure, to turn attention to megaproject success. It was recognised that a general theory for project governance was missing, and the case research undertaken in this present research was viewed success from ‘within the megaproject’. It adopted an inside-the-megaproject view of the megaproject governance arrangement. Iteration between the data and theory was able to close the gaps identified in the earlier chapters. This study provided detailed insight into the actuality of a successful megaproject structure and reviewed the internal workings of the governance arrangement. As such, it has provided new guidance on a successful megaproject governance model.

Chapter three identified Mega Transport Projects (MTPs) as a distinct type of megaproject. Dimitriou (2014) suggested that MTPs often redefine their project boundaries and longer-term opportunities, as the original objectives change. Opportunities in MTPs exist to deliver additional value through identification of emergent objectives. The challenge for a megaproject governance function therefore needs to acutely be aware of the changing political, environmental and stakeholder priorities; and thus, MTPs are not static engineering artefacts but dynamic and alter significantly over time.

In the Phase 3 analysis, the project board members were asked about the key decisions made, and the consolidated results showed that second most important decision was to ‘ensure there were no scope changes’ and the third was to ‘consider scope changes’. The conflict shows the complexity that is faced by a megaproject board. Although delivering additional scope can deliver value, this must be carefully balanced with delivering within the time and cost constraints. This reflects one of the many complex and sometimes conflicting perspectives identified in the literature review.

Next, a discussion on each of the research questions is undertaken.

8.2 RQ1 - MEGAPROJECT GOVERNANCE (CHAPTERS 2 AND 3)

In Chapter 2, this thesis showed that popular governance theories are being used to better understand project governance. The theoretical position by Crawford et al. (2008), suggests that good governance improves project performance, and that effective project governance speeds up the decision-making process and does so through an efficient use of resources.

The use of a project is an important construct. It is estimated that more than 20% of the global economic activity takes place ‘as projects’, and this number may be as high as 30% in some economies (Turner et al., 2013). As the actual dollar size of projects also increases, the use of megaprojects has been projected to continue to grow. Due to the importance and scale of a project’s impact, a definition of project and megaproject governance is now critical. In particular, the applied organisational theories of shareholder, stakeholder, agency, stewardship and transactional cost economics were used to theoretically examine project governance. There are dominant themes, however, the theory remains difficult to grasp.

A megaproject sits within the wider domain of project management; but more is written about the dire picture of megaprojects – gross estimation errors, failures to reach specifications, and negative impact on corporate survival, than on how governance can be improved.

This section therefore discusses the definition of megaproject governance.

8.2.1 Definition

Megaprojects are in a league of their own compared to traditional engineering projects. Early definitions of megaprojects considered them as Large Engineering Projects, while others used a dollar figure to categorise a megaproject as distinct from a non-megaproject. The scale, complexity and implied risks of megaprojects have demanded new approaches to reframe them through multiple corporate and project governance theory lenses.

Research Question 1 asked, 'What is megaproject governance'? Megaproject governance was argued as sharing the same definition as project governance, but megaprojects were defined quite differently. While attempts to define megaprojects have eluded a strict definition, the literature in this thesis shows that a broader megaproject definition is a mix of criteria of:

- Displaying certain hallmarks, as defined by Pollack et al. (2017) and Miller et al. (2000);
- A cost definition, being greater than $US1Billion, as identified by Merrow (2011), noting however that this criteria is an entry-point definition for a megaproject;
- Characteristics, using the 6C's of Frick (2008) of colossal, captivating, costly, controversial, complex and (laden with) control issues;
- Categorisation, with most megaprojects found in Major Transport Projects, Large Engineering Projects, ICT System Projects, and Complex Real Estate Projects as identified by Priemus et al. (2008);
- Risk and stakeholders, as either manageable or unmanageable, as identified by de Bruijn and Leijten (2008) and .Lundrigan et al. (2015).

Merrow's (2011) use of a qualitative '$US1billion criterion' for defining a megaproject, is recognised as being completely arbitrary; but the criterion is less arbitrary than it seems - it is at this price point that project performance deteriorates sharply. Along with a definition, research into the causes of both project success and failure were predominantly based on using case studies of failed projects. That body of work resulted in a large number of recommendations for project and megaproject governance improvements, but they are largely untested, lack context of when to be applied, and do not have strong linkages to theory or definition. The real hallmark, however, of a megaproject is in "organisational complexity, ambiguity, ambition, politicality and risks that are entailed" (Pollack et al., 2017, p. 2). This hallmark sits well in the definition of project governance that was defined in Chapter 2 by Müller (2009).

The accepted Müller definition considered a number of specific elements to achieve organisational objectives, which are in the best interests of all the stakeholders and the sponsoring corporation:

- The value system;
- Responsibilities;
- Processes;
- Polices.

Definitions have been either too narrow or are too open to contextual interpretation. Ansell (2016) suggests that definitions of governance are in popular but often very slippery terms. There is one view that complex [mega] projects are being used for strategic transformations; yet they exist in the context of uncertainty which makes governing them difficult to deliver detailed objectives. In such circumstances, there is a requirement for possessing skills in technical matters and in having the ability to function in turbulent operating environments (Pitsis et al., 2014). This suggests that for megaprojects the outcomes required could actually be more important than concentrating on the input of the project governance structure required to deliver the megaproject.

In the case studied, to ensure the success of the megaproject, the composition of the project board was selected based on identification of specific skillsets, to address this risk. Miller and Hobbs (2005) argue that there has been little in the project governance literature that addresses the dynamic nature of governance structures of megaprojects. Even though the research was some time ago now, their position is that the literature has suggested that governance is primarily an oversight function; with that oversight function being quite stable despite changing activities and priorities within a project.

From a project management methodology point of view, many of the traditional project management methodologies (such as in PRINCE2) consider a project board as being static. Miller and Hobbs (2005, p. 48) further argue for "governance regimes that are themselves dynamic – that can change themselves to adapt to the emerging context". The need for adaptability is further reinforced by Too and Weaver (2014), who argue that there must be a link between the outputs of a project and the business strategy for projects to be able to deliver value. Wilson et al. (2010) argue that the complexity of a project necessitates a variety of governance structures, ranging from corporate governance and reporting obligations to internal governance accountability.

Within each perspective, corporate and project governance is conceptualised as generally an oversight function; however, there is now recognition that complex projects require governance structures that adapt to the context [of the project].

With all the recent use of theory to describe specific elements of megaproject governance, a core agreement on megaproject governance had been eluded to, but not agreed. To close out the definition of megaproject governance, three concepts will be argued:

1. The importance of implementing good governance
2. Recognition of a megaproject as a long-term endeavour
3. The multiple paradigms, perspectives and methodologies of project governance and megaproject governance

8.2.2 Good Governance

The concept of implementing Good Project Governance (GPG) was identified as a specific problem area for megaprojects, along with the gap that there are few sources of literature that provide solutions on how to implement GPG. Complimentary to this gap are the new capabilities needed for megaproject boards to ensure that governance does not contribute to another megaproject failure. When faced with the question, ‘what is good megaproject governance?’ the literature struggled to provide sufficient guidance and answers: there is a strong preference toward addressing poor project governance instead. Such a deficiency allowed for this thesis to focus on addressing the gap. This was achieved through addressing the issue with those individuals on a megaproject board, who were faced with delivering a megaproject.

The dominant fields of governance theory relate to that domains of public and corporate governance; and it is at this intersection, similar to the one with project management, that megaproject governance has been identified. For both public (government) organisations and corporations who deliver megaprojects (from financing, sponsoring, delivering, contracting or supporting), the use of megaprojects to deliver project outcomes is becoming increasingly common. Although a number of contributing theories have been outlined, there was recognition that complex project management theory has been increasingly being advocated as a main theory for megaprojects.

The broader Cadbury (2002) definition of governance, which embodies the idea of ‘he that sits quietly at the stern and scarce is seen to stir” (Cadbury, 2002, p. 2), is particular apt for a megaproject. When a megaproject is delivered to time, cost and quality, the definition is relevant; but for many megaprojects, success does not frequently occur and more often than not, the megaproject board does not sit quietly. For this reason, the wider corporate governance response to improving megaproject governance is to consider a megaproject more as a corporation than as a project. Therefore, a definition of megaproject governance now tends more towards corporate governance practices.

As the field of governance advances, governance theory propositions and multiple perspectives on the nature of governance, various disciplines have applied theory to understand it. For megaprojects and this thesis, the Müller (2009) definition identified in Chapter 2 remained relevant.

By studying the case, the use of good megaproject governance practices was observed. Such considerations included the introduction of a novel project governance structure, through enacting public legislation and the creation of an Administrative Office; and the response of corporate governance to the risk of megaproject failure. Of note, all the members of the board were also external to the project organisation, which is just like a corporate board that is made up of non-executive directors, often seen with public listed organisations. These structural changes were key inputs that enabled the megaproject to be successful.

8.2.3 Recognition of a megaproject as a long-term temporary endeavour

In 2017, International Standard ISO21500 was created to define project governance across Projects, Programmes and Portfolios (PPP). The standard reinforced governance is a function that directs a permanent or temporary organisation (ISO, 2017). The inclusion of the term 'temporary' was significant in relation to megaprojects. (2009a, p. 22) argues that, while a project is temporary and resources are assigned to do work in a beneficial way, a project is different from the routine work of an organisation.

Routine work is a business-as-usual function, whereas a project is defined by time, cost and quality to deliver a unique deliverable. Bekker (2015) 'large capital school of thought' also considers that, while projects are temporary in nature, the entities that create projects are generally not; nor are institutional governance arrangements and corporate governance principles used to guide entities.

By extension, the governance of megaprojects, while considered as a temporary endeavour, often have a lifecycle that spans multiple years; and sometimes of these megaproject temporary endeavours outlast the lifecycle of many unsuccessful corporations. Megaproject success is also quantified through the delivery of time, cost and quality, but as was shown with the success evaluation model in Chapter 2 (Table 5-4), both short-term and long-term project metrics need to be met in order for a project to be considered successful.

One difficulty with conceptualising megaproject governance is the conflict between requiring long-term corporate sustainability, and the temporary nature of the megaproject. For now, however, the recognition of a megaproject as temporary has been an important milestone. The megaproject's delivery phase does indeed come to an end, albeit over a significantly long period of time.

8.2.4 Project Governance and Megaproject Governance theory

The arguments provided in this thesis suggest that the increased focus on megaproject governance is a corporate governance risk mitigation response to failure.

It could be suggested that megaproject governance was historically an accident, designed on the project management concept of a leader who coordinated activities to be efficient and uses centralised support to prevent chaos. With megaprojects, the projects just started getting very large. The requirement for project success of a megaproject have, however, been unclear; and both the motivations and incentives of megaproject boards to deliver on-time and on-budget against those longer-term objectives have been in direct conflict with the ever-present risks that a megaproject presents in the short term. As a result, generalised theory and mid-range theory has been absent.

A traditional project management approach considers that risk and uncertainty reduce as a project progressed through its lifecycle; but with megaprojects, each stage can induce new risk and create new issues that had not been considered. Such an approach has led to wave after wave of examples of megaproject failures. While a megaproject must deliver long term business value, when delivered late or over budget, that business value is eroded or delayed. As a result, corporate governance performance is also compromised.

Proposing new theory and approaches to megaprojects, broader analysis of project management literature shows that the field is characterised by multiple paradigms, perspectives and weak theory. Failure has been a useful point to theoretically understand megaprojects; but Sovacool and Cooper (2013) recognise that while each attempt at describing each theory has its own merits, by having a singular approach, each has missed the value of what other theories have to offer.

Megaproject failure is suggested as being a result of "competition of interests and values; a competition that is enhanced by larger and more expansive a project becomes" (Graaf & Sovacool, 2014, p. 26). These competing views provided good foundations for this thesis to undertake the deep investigation of the case to understand the corporate-megaproject governance intersection. These competing views have resulted in confusion about the success or otherwise, as "(mega) projects fail largely because there are no good metrics for measuring how project objectives are being met and no proper mechanisms for rewarding good performance and penalising bad" (Sovacool & Cooper, 2013, p. 221).

Again, and again, this section demonstrates that megaproject governance is still an emerging with theory development. While it emerged from the technical perspectives of project management, it is now intertwined with the more commercial, legislative and regulation driven corporate governance perspectives.

8.3 RQ2 - THE IMPACT OF GOVERNANCE ON A MEGAPROJECT (CHAPTERS 5 AND 6)

In Chapter 3, an analogy of a relay race was used – whereby control of a megaproject is passed like a baton through the lifecycle stages of the megaproject. Hand-over/hand-off points (Ho/Ho) were identified as necessary governance control points. It is with these hand-over points where dynamic organisational change specifically occurs. Gil and Lundrigan (2012) showed that control of a megaproject pass through stages, which are common lifecycle stages in project management, with each stage having a unique function and priority. By having Ho/Ho points, project governance is demarcated with the need for different leadership teams and skillsets being required.

For the case studied there were three significant and discrete Ho/Ho stages of project governance observed:

1. from 2008-2010, where the megaproject was conceived, and a business case developed;
2. from 2010-2014, where the megaproject was procured and delivered;
3. from 2014 onwards, where the physical megaproject was completed, and hand-over to operation occurred.

Over the lifecycle, the megaproject board created the systems, responsibilities, process and policies for the organisation, as well as ensuring the technical aspects of developing and delivering the megaproject occurred. As a megaproject is a temporary endeavour, albeit over a significant period of time, the need for an integrated approach to megaproject governance have been somewhat overlooked.

For the case, the megaproject governance arrangements met for 51 formal meetings over the 7-year period. The Stage 2 governance arrangement (the RRL Authority) constituted the bulk of the project governance arrangement and was set up with the sole purpose being to deliver the RRL Project. In total, 221 different issues and subjects were identified and analysed using the cluster frequency function, to understand the primary functions of the megaproject board. The results from both the Stage 1 and Stage 2 provided an overall view on the impact of the project governance. One of the observations made was the overall need for an ongoing and consistent approach to megaproject governance.

The RRL Authority had a Chair who was the single point of accountability for the project's success. The RRL project board was engaged as an advisory board only. The research it was able to specifically identify whether it was the organisational design or the actions of the megaproject board that were responsible for the success of the project. This observation required more probing, by using a broader perspective, and through the Delphi validation study, it was confirmed by the board members that the effectiveness of the governance arrangement supported the overall success of the megaproject.

The Chapter 5 analysis was able to show that the board participants consciously set out to utilise a number of corporate governance principles to effectively govern the megaproject. The design of the RRLA, as a single purpose Authorised Office, also contributed structurally ensuring that appropriate governance was in place. This structure ensured that from a design perspective, sufficient control of the megaproject was set in place, and that sufficient time was allocated for most senior resources within the megaproject. Previous practices of project governance do allocate resources to project governance, but traditionally this as an additional work activity, and not as a specific activity for the project board members. As the study considered only one case, the generalisability of having a sole purpose and dedicated megaproject governance resources is unknown; however, the practice is common for corporate governance.

The RRL project board had its singular purpose to *'deliver the project'*, and through the use of a board and sub-committee, the purpose was achieved. Attached to the notion of singular purpose, is the concept of incentives that used to motivate the governance members to deliver on outcomes. The topic of incentives was not addressed in this research, but this aspect is identified as a critical element of future research, one which is also already well addressed in corporate governance literature.

The impact of governance on the megaproject case was observed from multiple perspectives; and the analyses in Chapters 5 and 6 were key in determining those specific areas in which the impacts occurred. As already identified, the singular focus of the RRLA board was key, with no other 'business as usual' activities, to ensure that the megaproject received sufficient senior management attention. The structure of the project board was key. The board consisted of members external to the organisation, who had the necessary skillsets and experience to address all the major risks that were identified Expectations concerning clear lines of accountability and responsibility were provided through the appointment of the chair, the individual board members and through legislation. The identification of the higher level institutional and corporate risk, of poor project governance, was identified as a core priority that could have the biggest impact on the overall success of the project. The mitigation of this risk this was ultimately project success.

A second significant impact was the novel structure of the board, especially the advisory-capacity structure in Stage 2. In Stage 1, it was identified that use of a traditional project governance structure would not be adequate to manage the risk of failure for the megaproject. Therefore, the use of an Advisory Board, along with the creation of the special entity, an Administrative Office, occurred. For context, at the time the project was the largest transport project being undertaken in Australia. This approach in itself was also a risk: implementation required new legislation to be created and the project governance structure adopted had not previously been used.

Although the Caravel Group (2013) identified that nearly 70% of organisations did not understand the differences and/or the linkage between corporate and project governance, in the present case studied, the board clearly understood the use of both project and corporate governance techniques to ensure that the megaproject was successfully delivered. For many failed megaprojects of the past, it could be presumed that the megaproject governance had not adequately supported the effective execution of the project. This was also recognised by Pits is et al. (2012), who identify that poor governance of projects results in organisations not delivering their anticipated organisational objectives, and reduced the level of corporate governance effectiveness.

To further explore the impact, the three different perspectives undertaken during the detailed analysis are briefly explored further. Each of the three phases identified elements that contributed to the overall success.

8.3.1 Phase 1 (Stage 1 and 2, Board Minutes) Impacts on Governance

Phase 1 findings identified 221 different subject and issue categories that were considered by the project board over the life of the project. The high volume itself starts to demonstrate the complexity dealt with by the board. Using a conceptual theme cluster to analyse the data, the board's decisions were clustered into 4 key themes, with 79.4% of the board's collective effort spend on 'managing the project's status' and 'dealing with project board administrative issues'.

During Stage 1, the project governance arrangement also developed an understanding to ensure that the expected project cash flow (funding) was accurate. This ensured down-stream success for the Stage 2 governance arrangement, who were provided with a well-planned, adequately funded, and well-considered megaproject. While the volume of issues and subjects significantly increased during Stage 2, the overall number of people resources that delivered the work packages also occurred. The activity during Stage 1 of identifying 'risk' and 'procurement' as the key subjects to be managed, was a critical decision that ensured that the megaproject tracked for success.

During Stage 2, the project board focussed on the 'project status reporting', with a specific focus on safety; while the board also ensured that the minutes consistently and accurately documented attendance, detailed action and tracked business items. From the documented board minutes perspective, the Stage 1 and 2 analyses provided an overall view on the project governance priorities, over the life of the project governance, and this led to nine critical observations were made.

Collectively, the 9 observations summarise the impact the board had on the project. The governance focus changed over the megaproject's lifecycle, as it responded to different risks and priorities. These changes appeared to be planned, rather than being a reaction to the environment; but while these changes occurred, there was a stability of what the project board focused on (the 4 clusters of Project Status, Administration, Project Outcomes and Board Member Obligation), which continued to be the consistent themes throughout.

Consistency of board members was also observed with 84% attendance (of board members) at board meetings over the project's life. Merrow (2011) stresses the importance of maintaining continuity of senior project members on megaprojects, and highlights that the most damaging time a senior member of a project can leave a project is between scope development and project completion. In his research, over 50% of megaprojects experienced turnover of the leader, and a great majority of these departures were unplanned (Merrow, 2011, p. 179).

Not surprisingly then, low turn-over was correlated with megaproject success. Consistency is, therefore, a core trait of megaproject success; and it is one that only the megaproject board and senior management can influence themselves.

Phase 1 identified that there was a large volume and breadth of governance activities that the project board considered. What is not obvious, however, is the administrative support required to produce such a large volume of reports. Without sufficient resources to support governance and management reporting, it is asserted that many issues would materialise as risks that would have cost or time impacts (or both). Regular project reporting was key, and was identified as a specific risk, which would have otherwise eroded the megaproject's likelihood of success.

Thus, the phase 1 analysis shows the impact of governance a megaproject was its ability to manage megaproject risk. This is achieved through active risk management, engagement of the multiple levels of stakeholders, ensuring that the reporting requirements are being addressed, and developing the overall organisational culture, the latter of which can only be set by the board.

8.3.2 Phase 2 (Sub-committee reporting) Impacts on Governance

Phase 2 analysed the sub-committee's role in managing risk on behalf of the project board. Risk was monitored across 25 reporting categories, with an average of 12 risks per month requiring escalation to the board for action.

In total, 27.2% of the 364 risks requiring active management were escalated. While risk was shown to be ever-present throughout the project lifecycle, analysis showed that several new risks, identified later in the lifecycle, continued to require significant ongoing board attention. The use of sub-committees in corporate governance practices is well embedded, with best practice guidelines such as the ASX Corporate Governance Principles (ASX, 2014) recommending the establishment of at least three committees (audit, remuneration and nomination committees). The use of sub-committees in project governance literature is immature; however, practices in action do show the use of advisory groups, steering committees and reference groups starting to appear on many megaproject organisational charts.

In Phase 2, five observations were made. In particular, creating a culture to promote the early reporting of risk was identified in the procurement and contract development stage, and this resulted in specific clauses being included in the contracts with contractors, to reinforce and make clear the culture wanted by the project board.

Risk management was identified as a core governance function that required consistent and ongoing attention; and by having two categories of risk ('of concern' and 'requiring attention' risk categories), the reporting provided clear demarcation between the sub-committee and board responsibilities and escalation pathways.

Interestingly, Observation 13[48] demonstrated the value of early risk identification; as those risks not identified early continued to be reported as issues later in the project's lifecycle.

8.3.3 Phase 3 (Board member perspectives) and Delphi Validation Impacts

Based on Phases 1 and 2, the twelve dimensions were considered, and a further five observations were made. As part of phase 3, board members were asked to describe the biggest impact they made to the project. This insight provided a very specific detail of the impact that governance had on project success. Collectively, board members identified that their oversight of managing 'forecast-to-complete' and 'budget' were the two biggest contributors.

As important though, the board set the culture and tone for the megaproject. By focussing on the two biggest contributors, they made clear the priority. A number of key decisions and contributions were also identified, which the board credited the success of the project, as:

- (having undertaken) adequate planning prior to the procurement and delivery stage;
- managing the megaproject against the traditional project management outcomes of time / cost / quality;
- having delivered a sound business case with an adequate budget and risk provision;
- ensuring there was strong engagement with stakeholders and end users.

As identified in Chapter 5, findings were highly aligned with corporate governance practices and theories, especially relating to the use of independent board members and the use of strict reporting and disclosure requirements. These practices are common for large, publicly listed companies. The monthly board meeting agenda showed that the board had a focus on board administration; which is not surprising as a board's role is to promote and facilitate critical conversations to achieve good governance outcomes. For megaproject governance, however, this concept is not a mainstream issue in practice, and is scantly referred to in the project governance and project management literature.

Structurally, the case study's project governance was novel on four issues, and these had a significant contribution to the success:

1. the Head of the RRL Authority (the Chair) had single accountability for the delivery of the project.
2. the board was appointed to act as an advisory board to the Chair. Traditionally, a project board would have overall accountable for the project outcome, but in this instance the board was advisory only.

[48] "risks identified later in the delivery stage tended not to be resolved in a timely manner, and continued to require ongoing board attention"

3. the sub-committee structure, the JCC, was granted delegation to resolve project integration risk before being escalated to the board for resolution.
4. the use of multiple and different procurement contracts, which were integrated to deliver an overall rail infrastructure megaproject.

Using qualitative analysis approaches, a number of characteristics were identified which provide a depth of opportunity for further research to extend these findings to other megaprojects. In particular, the project board provided the project with an efficient means of reporting. This enabled the critical path timelines of the project to be closely monitored and facilitated clear identification of where the megaproject had critical dependencies, risks and interface issues that required board involvement.

The JCC structure, used for 31 meetings during the construction phase, raised 364 issues that could have otherwise led to risks materialising and project failure, but the overall governance arrangements encouraged risk management by the sub-committee. The project board spend 62% of its time (effort) being briefed on, discussing and guiding the project on *'project status'*.

One critical area to consider is that of traits displayed of the megaproject board. Within the field of management and leadership, trait theory is backed by over a century of research; and given the longevity of the approach, the importance of various traits is strong in the leadership literature (Germain, 2008, p. 33). The critical role of traits in leadership include:

- differentiating leaders from non-leaders;
- drive, desire to lead, honesty and integrity, self-confidence, cognitive ability;
- business knowledge.

Trait theory is concerned with what traits are exhibited, not what skills are need or what should be done in certain circumstances. In understanding the phenomenon of governance of a network, traits can include trust, the number of participants, goal consensus and competencies. While the present research did not consider traits explicitly, it is implied that positive leadership traits were observed in this megaproject.

Finally, the Delphi validation provided a greater understanding of the results from the case. The Delphi validated all 12 dimensions as relevant, and 81 out of the 100 indicators as important. Completing the Delphi validation allowed for closure of the data analysis, and for a focus on developing new processes and to answer the remaining research questions.

The difficulty in asserting a positive relationship between the governance arrangement and project success can be the lack of an alternative. There is no alternative scenario that can be tested, and much of the evidence is context specific. The case studied was identified as a unique megaproject – one that was successful, and the research undertaken confirmed that a positive relationship existed. The three phases of analysis and the validation provided a strong baseline in which to identify suitable models in Chapter 7. By iterating between the three phases of data in Chapters 5 and 6, and the models of Chapter 7, the VIBRA, MEMo and MVS models were developed.

8.4 RQ3 - CORE DECISIONS MADE BY A MEGAPROJECT BOARD (CH 5 AND 6)

The third RQ was developed to understand whether the decision-making function of the megaproject board had an impact on success. The literature showed the importance of structure in both project and corporate governance, however, decision making by a megaproject board was identified a gap.

Through the use of the Phase 3 survey, the 12 semi-structured questions were asked to the individual board members, generating 149 unique responses. During this Phase, 6 observations were made, and the 5 most important decisions made by the board were ascertained. This analysis identified the biggest contributions the board members made (see Table 5-19), while the Delphi validated the Phase 3 findings; with the board members identifying the most important of the dimensions and indicators.

The Delphi validated that the governance arrangement for the case was effective, and also that megaproject governance needed to have overall accountability; and megaproject governance structures should be used when there is a high degree of project delivery risk. The governance design (Dimension 7, see Table 5-14), specifically identified why the governance arrangement was effective. The top 4 reasons identified for the success were:

1. the board was inclusive;
2. the board (and the project) had a strong sense of identity;
3. the board and the project had a ‘good team’, which implies that the necessary skills, competencies and teamwork mechanisms were in place; and
4. the use of external board members ensured that the board had a representation of skills relevant to the risks of the project.

The six observations from Phase 3 (Observations 14-19) further reinforced the overlap between corporate and project governance principles used on the project. The use of a megaproject governance structure was appropriate to ensure the project board focused on the areas of:

- ensuring the board had the right abilities;
- providing advice to the chair;
- ensuring that their accountabilities were well understood;
- focusing on the overall output of the project being delivered;

- being active in discharging their duties.

The board members identified that the sequence in which the procurement was packaged, as the most important decision the board made. A traditional project management approach sees one prime contractor delivering a project; but the potential critical risk of a prime contractor not being able to deliver (due to the risk profile) for this project meant that the project sponsor bore the integration risk and awarded separate packages of work to effectively manage individual work package risks. The other decisions were a result of the project retaining risk, which focussed on being outcomes-focused, prioritising safety and actively managing risk.

The key decisions that were identified reinforce the importance of the megaproject governance function understanding 'what needs to be delivered' and 'how to go about the delivery'. The use of external board members introduced a diverse skill set to the board that is not normally available within one organisation. The board was selected using a skills matrix to firstly identify needed skill sets, and then to ensure that there was an adequate spread of skills. In particular, specific skills such as experience in construction, government relations, finance and cost, legal and compliance and stakeholder relations were amongst the key skills identified. In line with the practice of corporate board members being independent of managers, board members bring skills, acumen and knowledge to decision making, and can better pursue shareholder needs (Baker & Anderson, 2010, p. 5).

For the megaproject governance context, the shareholder needs were those of the Government and the requirement to deliver the megaproject as outlined in the business case. A governance agency perspective on board effectiveness, whereby a board is the governance and control mechanism for protecting shareholder interests from managers, also supports the practice of bringing different skills sets to the board table (Sur, 2014, p. 164). With the introduction of the external board members, the megaproject benefitted from a stronger awareness of corporate governance principles to drive success.

Chapter 5 identified five key dominant words from the Phase 3 board member interviews, which were mapped against leading corporate governance principles. There was strong alignment of these keywords against the corporate governance principles; once again, reinforcing the strong links between corporate and project governance. This allowed to demonstrate that the pedigree of megaprojects now being more driven by corporate governance influences that project management.

By mapping of key governance words, an additional fourteen dominant keywords were identified in each of the five sets of governance principles (see Table 8-2). The last two sets of principles, by the Association of Project Management (APM) and the international standard on project governance, ISO21505, were the project governance-related principles; and interestingly, each of these sets identified 9 out of 14, and 7 out of 14, respectively against the 14 other keywords. This alignment was equivalent to, or greater than all three corporate governance principle alignment.

With such high level of correlation in the project management principles further demonstrates the close links between project governance and the principles of corporations.

Table 8-1: Other dominant key works against leading governance principles

	Key governance principle / rules				
	Corporate Governance Principles			**Project Management Principles**	
	OECD (1999, 2005)	**ASX (2003, 2014)**	**SOX (2002)**	**APM (2004, 2011)**	**ISO21505 (2017a)**
Corporate Governance keywords					
1. Oversight	YES	YES	YES		YES
2. Auditor independence			YES		
3. Corporate responsibilities	YES	YES	YES	YES	YES
4. Disclosure / reporting	YES	YES	YES	YES	
5. Conflict of interest			YES		
6. Fraud accountability					
7. Shareholder/ stakeholder	YES		YES	YES	YES
8. Structure (to add value)		YES		YES	
9. Risk	YES	YES	YES	YES	YES
10. Project-based activity				YES	
11. Strategy alignment / plan				YES	YES
12. Approval				YES	YES
13. Project closure				YES	
14. Sustainability					YES
Count	**5/14**	**5/14**	**7/14**	**9/14**	**7/14**

Megaproject governance had previously been considered as a one-size-fits-all and one-dimensional activity, but the literature demonstrated that the project governance activity may be far more variable and dynamic. For this case study, the decision making used in corporate governance were effectively applied in a megaproject context.

This knowledge allowed for the development of the twenty-three variables in the VIBRA model, that are needed to consider megaproject performance evaluation.

8.5 RQ4 - NEW MODELS AND PRACTICES TO IMPROVE THE FUNCTIONS OF A MEGAPROJECT BOARD (CHAPTER 7)

8.5.1 Alternative Megaproject Governance Models

In Chapter 3, Merrow (2011) presented three alternative megaproject governance model types as being:

- Traditional
- Hub and Satellite
- Organic

The models indicated that the previously accepted one-size-fits-all megaproject governance arrangement was flawed, and each model depended on the type of megaproject, and how it would be designed. Recognition of the opportunity to further identify alternative megaproject governance models led to the identification of the three corporate/ management models (see Identification of Models from Corporate Governance for Application to Megaprojects 7.2.4). Each had successfully been applied in other fields; and they provided an opportunity to consider megaproject governance from new perspectives. This approach complimented the method of intersecting corporate governance and project governance. The models were tested and used to iterate between theory and data, to understand the applicability of the proven corporate governance models against the case.

The successful application of two of the models demonstrated that there are new models and processes that can be used to improve the decision-making functions of a megaproject board. The models are summarised in Table 8-2.

The first new model, the VIBRA model, was tailored for the specific application of megaprojects, and through the creation of a 7-step process evaluation, identified 23 variables that need to be considered by the megaproject governance for success. This process model considered the dynamic nature of megaproject governance, and the variables of 'project board/governance role' and 'project governance attributes' were classified as critical variables.

The second model, the Effectiveness Model, was successfully applied to the case, and was used to profile the comparative differences of traditional projects and megaprojects. While both have a lifecycle, the megaproject's orientation was shown to be external, whereas a traditional project is internally oriented.

The Megaproject Effectiveness Model (MEM) demonstrates that the megaproject orientation and requirements change over time, and as a result, that the project governance must recognise this change, and respond accordingly.

Table 8-2: Applicability of model to the megaproject

Corporate Governance Model	Megaproject model developed	Megaproject Governance Applicability?
1. Board Attributes and Roles Model	The VIBRA model	Yes. The model was suitably modified and adapted to the megaproject case. Twenty-three variables were identified to improve project governance.
2. Effectiveness Model	The Megaproject Effectiveness Model (MEMo)	Yes. A Megaproject Effectiveness Model was evaluated. The model was used to analyze different priorities of the megaproject as it passed through the lifecycle stages. A comparison between a tradition project and megaproject profile was undertaken.
3. Viable System Model	Megaproject Viable System (MVS)	Partial. The VSM was mapped to the different functions of the megaproject governance arrangement. A Megaproject Viable System (MVS) was hypothesized, but due to difficulties in applying the VSM to a megaproject, this model was not pursued.

Project governance arrangement needs to understand in quite some details, the interrelated priorities of the organisation in terms of the expectations and outcomes being sought, as observed by Pelham and Duffield (2013). With a far wider remit, current project governance models need to encompass the broad requirements not just of ‘the project’, but also of the related projects, higher level programs and the organisation. Such an approach by Pelham and Duffield identified four governance drivers:

1. Resource availability;
2. Objectives (of the project, program and portfolio);
3. Autonomy and control;
4. Outcomes required and influence.

In turn, the drivers imply that the governance of megaprojects needs to significantly reframe the way in which risk is managed.

8.6 CONCLUSION

Megaproject failure is not a new area of research, but in many ways has not progressed very far past this focus, with a presumption that fixing structural shortfalls would result in a higher likelihood of future project success. It has been argued that those stable project management modes of delivery used in the past (through applying techniques of: project shaping and delivery; expert design; and competitive bidding) have been challenged, as activists assert new rights, regulators promote competition, and the methods of assessing risks in loan decisions for financing large projects are being reassessed.

Through the use of a case, the present study considered four research questions, discussed the problems of megaproject governance, and tested new models. Effective megaproject governance has been positioned as a response to a corporate governance risk. With megaproject governance, the delivery, coordination and integration risks cannot be allocated to another party, and the megaproject board is best positioned to manage the risks. As a result, megaproject boards must actively manage megaproject risk.

As sponsorship and delivery of megaprojects shifts from large public and private firms to alliances (which comprise developers, financiers, engineering firms and entrepreneurs), the gap between the realities of megaprojects and theory for expressing them is widening. Nearly 20 years ago now, Miller (2000) provided an example whereby an engineering consultant who would traditionally meet an equipment supplier in a competitive arrangement, was meeting them as a strategic partner, investor or as a contractor. Megaproject risks are now being managed in new forms; ones in which traditional project management techniques had not considered. Alongside these changes are the composition of megaproject boards. The skills and expertise needed for a megaproject bard no longer generally sits within one organisation. To address this deficiency, the use of external project governance professionals is occurring. In the corporate governance environment, they are known as Non-Executive Directors. In the project and megaproject domain, the theory has been silent.

The selection of the appropriate governance structure for a megaproject requires consideration of the desired project outcomes (time, cost and quality) and organisational requirements (resource constraints, managerial and corporate incentives). Ultimately an evolution is needed to address megaprojects as a hybrid between a large corporation and a complex engineering project. For megaproject governance practitioners, simply applying an additional ‘project governance layer’ to a megaproject will not sufficient to ensure megaproject success. There are many incentives that can also be used to improve the delivery of a megaproject, with a large number of studies undertaken in the corporate governance literature.

While a megaproject board is responsible for setting the culture of the temporary organisation; it must also determine what the megaproject priorities are; direct what information is needed for the project board; must ensure that the project team is providing the board with sufficient information to execute its duties; and each board member must take an active role in executing their individual and collective responsibilities.

The case identified that sound megaproject governance requires significant change over the lifecycle of the governance arrangement. This change responds to the dynamic nature of a megaproject's risk profile and includes a careful balance between meeting all the requirements of the project, the needs of the corporation (or sponsoring body), and actively managing the vast and multiple layers of stakeholders, both internally and externally. The megaproject governance structures deployed on the case was a classic example of where governance was not static, and it changed dramatically. Changes were primarily responses to the recognised size of the risks that would require administering and managing.

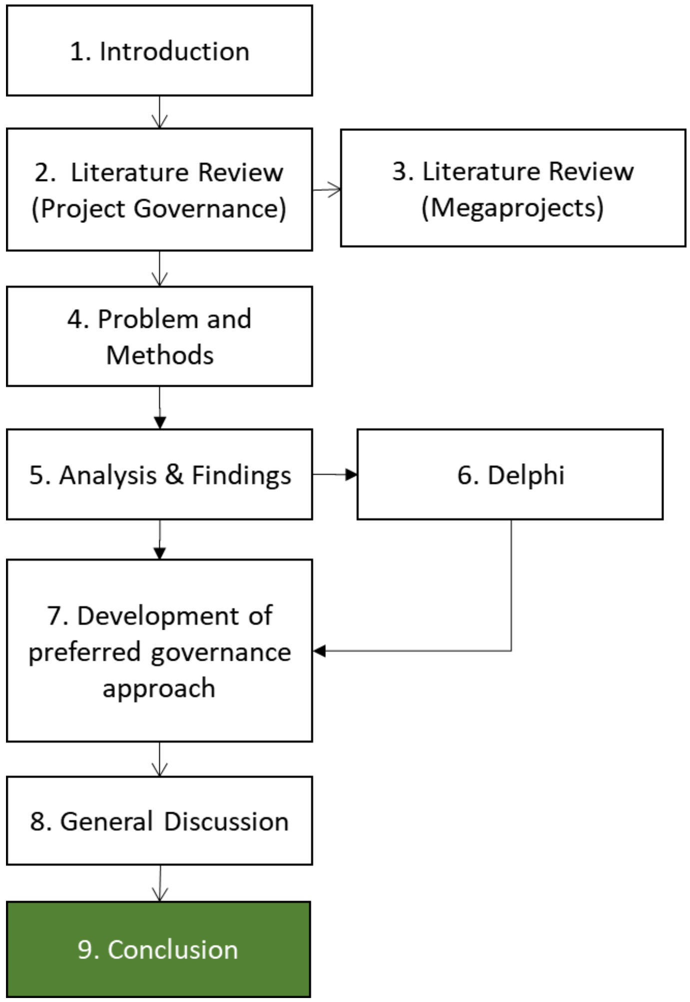
During the early stage of the megaproject's governance, the project board's attention was focussed on understanding the expected risks and suitable procurement approaches. The importance of understanding risk at the embryonic and gestation stages of the megaproject (see Table 3-5) cannot be understated. The first 'handing over of the baton' occurred between the Stage 1 and Stage 2 megaproject governance arrangement. This shift resulted in the megaproject board's orientation towards 'becoming more corporate' both administratively in its output but also operationally focussed to ensure that the megaproject culture was created around the foundations of safety and active reporting.

While this present research was not able to determine the specific relationship between the megaproject board structure and the project's success, the megaproject governance clearly was effective and supported as such by data. The use of the sub-committee to manage risk provided the necessary delegation to that provided a more effective project governance framework; and delegation empowered the sub-committees to be more effective in managing risk. The use of this delegation provides megaproject governance practitioners with new insight into what is required for megaproject governance to be effective.

The most important advice for megaproject board practitioners, however, is to ensure the necessary governance arrangements are in place and are active. The use of the three models presented in Chapter 7 will assist in understanding what considerations should be taken into consideration. Without such adequate project governance arrangements in place, such an omission can now be recognised as a core project governance failure. When adequate project governance is in place, it is difficult to specifically isolate whether that structure was the core reason for the project being successful.

For this reason, without adequate megaproject governance arrangements being in place, it is recognised as a core failing; but with effective megaproject governance in place, it is a necessary but not sufficient condition for megaproject success.

Chapter 9 Conclusion



9.1 INTRODUCTION

"he that sits quietly at the stern and scarce is seen to stir" (Cadbury, 2002, p. 2).

A megaproject delivered over budget, late or not meeting its business objectives is not an acceptable outcome. This thesis is a definitive study that presented a link between the megaproject board and project success. The use pf project management alone will not prevent this ongoing trend stopping, and this research has made it clear that the intersection between corporations and megaprojects need far more attention, during both the planning and delivery of megaprojects, as well as in theory and practice.

The focus of the literature on improving deficiencies in previous governance models provided limited improvement for future project success. The present research has thus responded successfully to calls from project management researchers to develop new approaches to project management research. Theoretical frameworks used to analyse governance were described and dominant project governance theories were introduced.

In providing different definitions, the term megaproject governance has become blurred by the distinctiveness of governance, and has failed to demonstrate what governance adds compared to notions of politics, policy or structure.

While the body of work has seen the introduction of practices to the profession of project management, there is little detailed research on whether these improvements impact or improve the performance of a megaproject. Furthermore, there is a gap in the research demonstrating whether the action taken by a project board assist or detract from the overall performance on a megaproject.

The thesis set out to understand and then improve governance arrangements of megaprojects, and to develop a new process to ensure that more megaprojects are successful. For too long, megaprojects have overwhelmingly been associated with failure; and those sitting at the megaproject boardroom tables haven't sat quietly at the stern, as suggested by governance expert, Cadbury. Instead they have had to deal with the repercussions of megaproject failure.

To achieve the research aims, the thesis considered the relationship between a megaproject board and the success of a megaproject. The research discovered that by using alternative project governance models, and by designing a megaproject board that is singular in its focus, is independent, and that has clear responsibilities, a megaproject's success is more likely. As megaprojects become larger and larger, the risk of continuing to allow cost blow-outs on megaprojects is unaffordable; and by having a stronger appreciation of megaproject risk and using dedicated non-executive project board members to manage those risks, megaprojects will be far more successful.

Three models were tested and further developed. This resulted in one new model, the VIBRA Model, being created, and the second saw the successful application of an effectiveness model to create the Megaproject Effectiveness Model (MEMo). The VIBRA Model is robust, logical and provides megaproject governance arrangements with a model that 'sets up a megaproject for success' and clearly provides a practical and theoretically sound process to understand the critical variables that impact on megaproject success. The second model, MEMo, provides a tool to articulate and recognise that a megaproject passes through different hand-over/ hand-off points, each one requiring a change in the governance structure to manage the emerging and new risks of the megaproject. Combined, these models will greatly improve the governance of megaprojects.

There is no one single optimal megaproject governance arrangement, but it is dependent on context. The thesis shows that megaproject governance is complex and quite different from traditional project governance arrangements. The project board members in the case studied managed the megaproject more like a company than a project, using techniques and methods traditionally found in large, publicly listed companies. While there were many attributes of success, a number stand out:

- the megaproject was managed by awarding multiple delivery contracts that were integrated together to deliver the overall megaproject. The integration risk was managed by the project board's sub-committee, the JCC. Commercial arrangements ensured the JCC was effective.
- the Chair was the single Accountable Officer for the project, and the project board was an independent and advisory board to the Chair.
- megaprojects are so large that they require an exceptional level of management.
- the project board consisted of external non-executive directors who collectively had a range of skills identified as critical for the megaproject.
- the project had a well-developed business case that had considered risk and had an adequate budget.
- the level of monthly project progress reporting was significant, as was the number of risks requiring active management by the project board.

To improve the likelihood of delivering successful mega transport projects, it is necessary for corporate governance sponsors to recognise the differences between megaproject governance and traditional project governance controls. The use of dedicated and single purpose megaproject boards was shown to increase the likelihood that a megaproject is delivered as expected. Use of external, dedicated and competent non-executive board members is critical to ensure the mitigate the management of megaproject failure risk.

The models developed were based on evidence from a successful megaproject, and the case study data was triangulated to confirm initial result, and were then further validated with the board members themselves. The Delphi validation ensure the results and findings were robust, and truly reflective of the megaproject governance arrangement. The research has also made significant contributions to the body of knowledge on megaproject governance by:

- Confirming and consolidating definitions of a megaproject;
- Determining that megaproject governance is a specific type of governance; and
- Identification that there was a strong relationship between megaproject success and the implementation of a suitable megaproject governance arrangement.

9.2 ANSWERING THE RESEARCH QUESTIONS

To understand the relationships between project governance and project success, the thesis posed four Research Questions (RQs). The research questions are addressed as follows.

9.2.1 RQ1 – What is Megaproject Governance?

This was the fundamental starting point for the research, as the literature had demonstrated that project governance was a weakness in failed projects. Failure in megaprojects has had many consequences, primarily due to the quantifiable size of cost overruns, and the associated poor publicity. With both these impacts, sponsoring organisations lose money and need to react, by allocating additional resources into the megaproject, to rectify the shortfalls. Sponsors of failing megaprojects also need to implement additional corporate governance controls, such as seeking access to additional finance (to cover the costs of further rework, completions, commercial renegotiations and extensions to time), and realign their business plans to complete the megaproject, and confirm new completion dates

While megaprojects have eluded strict definition, the 2009 project governance definition by Müller (see Section 2.4.1) was confirmed as an adequate definition for megaproject governance. The definition was further explored in Section 8.2.4, where it was argued that a megaproject is a mix of criteria of:

- displaying certain hallmarks, as defined by Pollack et al. (2017) and Miller et al. (2000);
- a cost definition, being greater than $US1Billion, as identified by Merrow (2011);
- characteristics, using the 6C's of Frick (2008);
- Categorisation, as identified by Priemus et al. (2008);
- Risk and stakeholders, as identified by Lundrigan et al. (2015) and de Bruijn and Leijten (2008).

Megaprojects, however, are in a league of their own compared to traditional, displaying many hallmarks and characteristics that differentiate themselves in terms of cost, risk, impact, profile and stakeholders. Early definitions of megaprojects considered them as Large Engineering Projects, while others used a dollar figure to categorise a megaproject as distinct from a non-megaproject. The scale, complexity and implied risks of megaprojects have demanded new approaches to corporate and project governance. Thus, this research question has now been was sufficiently answered.

9.2.2 RQ2 – What is the impact of governance on a megaproject?

The literature confirmed that while project governance was identified as critically important, project failure and project governance failure continue to be widespread. Failure has been compounded by a lack of literature on the topic of project governance. By using a case of a successful megaproject, a detailed investigation was presented.

The project governance structure of the case underwent a number of evolution changes to respond to the needs of the project. In particular, this was driven by risk. The specific findings on whether the project governance was the reason for case study's success were considered; and the thesis demonstrated that governance was a critical ingredient for success. By having effective megaproject governance, the project was provided with a higher probability of success; whereas with poor project governance, a project is more likely to fail. While project governance is necessary, it is not sufficient in itself to ensure project success.

The first project governance variable to consider is management of risk. The thesis shows that the case's megaproject board took an active role in managing the megaproject. In the Stage 1 and 2 project governance arrangements, 76 different subject categories were discussed by the megaproject board, and 145 different classification of issues were actively managed. The project board's focus and composition changed over the life of the project. The project board minutes and actions, during the procurement and construction phase reflected a project board that did more than being provided with a monthly update on the status of the project. The board reacted to risk, by displaying traits more akin to a corporate governance board, than a traditional project governance board.

The use of a sub-committee to manage risk was a trait that explained how project risk was effectively managed and mitigated. A total of 364 risks required active management, with 27.2% of those risks escalated to the board for action. Other factors found to be essential for ensuring megaproject success include a strong awareness of organisational capability to deliver megaprojects, and an understanding of the market and economic factors in which the megaproject will be delivered. Those three variables are the first inputs for defining the project board's role, as defined in the VIBRA model.

To use an analogy, when thinking about the *'best meal you ever had*': consider what were the exact reasons for its success? Was it the quality of the produce, the skill of the chef, was it a specific taste element, was it the service, the wine that matched the meal, was it the time of the year, was it the people you ate with? Was it all of those elements? Sometimes, when a system is successful, it is because it is what you always expected. Unfortunately, its occurrence is also rare. Conversely, consider a bad meal you have had. You can identify exactly what was wrong: the meat was too dry, the service was poor, the sauce was too thin. This analogy, in particular, in its application to megaproject governance, is relevant.

With good megaproject governance, as in the case, the exact reason for success is hard to pin down, as all parts came together as expected; whereas, with a failed project, it is far simpler to identify the exact reason for the failure. Often, it is poor project governance.

The findings from the qualitative content analysis were enhanced by interviews with the project board, and those findings were then further validated through a Delphi validation study. Board member interviews enabled an opportunity to triangulate findings from the content analysis and provided an insider's view into the decision making of the project board. By considering similarities in responses, this revealed a detailed understanding from *within the project* of why the megaproject was successful. In particular, the key decisions made and the most valuable contributions they made were identified. The Delphi validation confirmed that the board executed its corporate governance responsibilities, while also using project management metrics of time, cost and quality to measure overall performance.

For the case, a specific focus on 'safety' resulted in a low number of safety incidents; and by actively managing project risk, there were no issues that materialised that impacted on the outcomes of the megaproject's success. The categorisation of 12 megaproject dimensions were confirmed as important; and 81% of the 100 indicators of project governance were validated as positive.

Collectively, the findings demonstrated that there is a positive relationship of a board on project success. That success is presented as the megaproject delivering its project management objectives of functionality, budget and schedule, as well as the business organisational goals.

9.2.3 RQ3 – What are the core decisions that are made by a megaproject board?

The Phase 3 analysis provided the initial answer to this question, with a total of 21 core decisions identified. Of the 21 core decisions, the Delphi validation study determined that seven of the 21 key decisions were the most important, those being:

1. Packaging of the works;
2. Outcomes focus;
3. Safety;
4. Risk management;
5. Early procurement decisions;
6. The consideration of scope changes;
7. Closely monitoring of scope management.

On these 7 decisions, the overall consensus (CQV) by the megaproject board members was very high. Whereas with a traditional project board, that would oversee one contract to deliver project works; the megaproject had 6 primary contracts; as the risk of having one contract was perceived to be too unlikely to deliver success, and as a result the megaproject board maintained the overall integration risk. Along with the project board retaining the overall 'project success' risk, the board focussed on being outcomes-focused, placed special attention on prioritising safety, and to actively managed risk.

9.2.4 RQ4 – Are there new models and/or processes that can be used to improve the functions of a megaproject board?

An iterative process of using the case study findings and testing current practices with advances in project governance, identified three models for potential application against the megaproject case. Two were successfully adapted to a megaproject context (the Model of Board Attributes and Role; and the Effectiveness Model), while the third model (the Viable System Model) demonstrated partial applicability. From the two successful adaptations, the VIBRA model and a Megaproject Effectiveness Model (MEMo) were created.

9.3 LIMITATIONS OF THIS RESEARCH

The main limitation of this research is that a single megaproject was analysed over its lifecycle, which was delivered over a certain time (2008-2014), in a distinct environment (it was the largest project of its type being delivered in Australia), and with specific expectations concerning its success (to separate regional and metropolitan trains, and increase capacity to deliver new train services). The case used content analysis to gain an understanding of the decision making, which was supplemented by interviews and a Delphi to validate the findings.

A limitation identified with a single case study is its applicability to a wider set of other projects, and megaprojects in general. The case used was delivered over a number of years, and the research was granted unprecedented access to the project's files and personal interactions with the board members, in order to immerse the research in data. The bigger challenge with the thesis was thus not a limitation of data access, but in having so much data and running the risk of being swamped in detail, resulting in not seeing the 'bigger picture'. The use of more than one coder would have resulted in different perspectives being considered and observations found in the analysis.

In particular, there is an outstanding question of whether the findings can be used to improve the project governance of other megaprojects. To pursue further types of investigation into megaproject governance, it would be necessary to research multiple megaproject governance arrangements, in both similar and different sectors, and by having this comparison, a broader application of theory testing on a larger set of megaprojects could occur.

There remains a question of whether the learnings are representative of a wider spectrum of megaprojects or if this case was unique. The study did not consider the influence, tone, priorities, personalities or expectations that individual board members experienced. Such elements would provide a richer picture as to the issues the project board faced; as would interviewing a wider range of project stakeholders to get an insight into their perspectives on whether the project was a success and to understand their opinions on the use of the novel governance structure used on the megaproject. Regardless, the widely held project management belief of project governance being a static activity, was shown to not be applicable to the case.

During this coding process, only one coder was used. The use of multiple coders could produce different results, along with the production of a different set of master codes. The agent theory of board effectiveness, whereby its governance and control mechanism for protecting shareholder interests from managers, is a perspective that supports the practice of bringing different skills sets to the boardroom table. This is likely to be a major consideration for megaproject governance success, and for future megaproject governance. External and divergent skills on megaproject boards should be explored in great detail to aid future megaproject board selection. Use of CQV, as a tool for understanding similarities and divergence of results, may give rise to future studies to analyse improvements from failed megaprojects, and be used to compare different board member responses.

The Delphi validation study, in combination with the analysis of board meetings and interviews revealed many new insights. However, it still is one case study. The confrontation of results with other cases or a survey with other megaproject boards would not have improved the validity of the specific results of this case. The results would certainly have contributed to the generalisability of the results through external validity, and should be considered as a critical area of future research on megaproject governance.

9.4 FUTURE RESEARCH AGENDA OPPORTUNITIES

This thesis developed a robust methodology and applied three proven corporate governance models to a case. The application of the models identified new knowledge and resulted in new processes developed for application to megaprojects. The was an assumption that the three models were relevant to the other domain and could be practically applied to megaprojects. While the identification of the two successful models (VIBRA and MEMo) was the finishing point for this thesis, a number of future directions are identified and are discussed.

Making a recommendation for improvements on future megaprojects has been argued comprehensively, and the volume of megaproject being undertaken globally continues to grow. Increased applicability of alternative megaproject governance structures, and further detailed application would result in a larger body of data that could be used to test, refine and improve megaproject governance arrangements. In Chapter 3, the agenda for informing future project management research identified three new directions. This thesis addressed direction #3 (theory in practice – the actual use of theory in the midst of action), however, the other two research directions could provide far wider considerations of megaproject governance (Theory about Practice- issues in conceptualising projects, and Theory for Practice - which identify new concepts and approaches).

The intersections between a project, project management, the governance of projects, and project governance, remains at best, unclear and subject to interpretation. Applicability of core project management and corporate governance theory would strengthen argument for a general theory of megaprojects. This thesis has identified a core theory; but complex project manage theory is advocated as the main theory for megaprojects.

When designing structures and executing megaprojects, the corporate governance, institutional governance and project governance must be considered. For the first two arrangements, these are deeply tied to legislation and rules, whereas project governance has been developed from practices. The intersection between different forms of governance and legislation is a rich area for future research.

Finally, this thesis introduced the two new process models and demonstrated that megaproject governance arrangements change over time, depending on the risks being faced at each stage in the megaproject. Further work to understand the corporate governance expectations of a megaproject, including providing enhanced post-megaproject evaluation frameworks, remains a rich source of research opportunity. The relationships between the roles and attributes in the VIBRA and MEMo models require further exploration; as could the application of the two models to other types of megaprojects, to shape improvements in megaproject effectiveness in the broader field of complex project management.

A divergence between theory and practices in project management was identified earlier. The present research adopted the unique perspective that considered project governance and project success from ‘within a megaproject’. The models created in this research will not, alone, prevent megaprojects from continuing to fail, but they have contributed to building a solid knowledge base on which to explore new alternatives for megaproject management practices.

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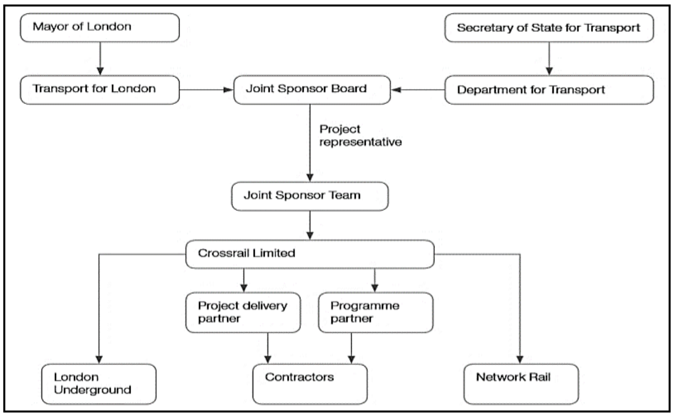
Appendices

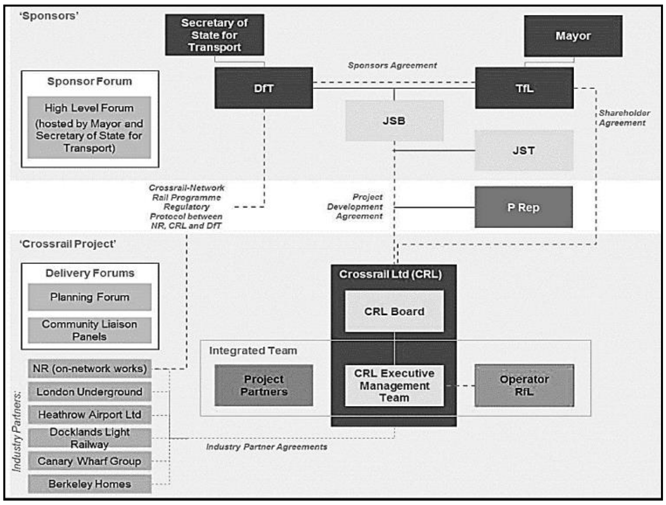
APPENDIX A - COMPARISON BETWEEN PRINCIPLES 2004-2011

Association of Project Management (APM) 2004 – Project governance principles	2011 changes and updates
1 The board has overall responsibility for governance of project management.	No change.
2 The roles, responsibilities and performance criteria for the governance of project management are clearly defined.	Principle clarified and split. The organisation differentiates between projects and non-project-based activities.
	Principle clarified and split. Roles and responsibilities for the governance of project management are defined clearly.
3 Disciplined governance arrangements, supported by appropriate methods and controls, are applied throughout the project life cycle.	Clarified. Disciplined governance arrangements, supported by appropriate methods, resources and controls, are applied throughout the project lifecycle. Every project has a sponsor.
4 A coherent and supportive relationship is demonstrated between the overall business strategy and the project portfolio.	Clarified. There is a demonstrably coherent and supporting relationship between the overall business strategy and the project portfolio.
5 All projects have an approved plan containing authorisation points at which the business case is reviewed and approved. Decisions made at authorisation points are recorded and communicated.	No change.
6 Members of delegated authorisation bodies have sufficient representation, competence, authority and resources to enable them to make appropriate decisions.	No change.
7 The project business case is supported by relevant and realistic information that provides a reliable basis for making authorisation decisions.	No change.
8 The board or its delegated agents decide when independent scrutiny of projects and project management systems is required, and implement such scrutiny accordingly.	No change.
9 There are clearly defined criteria for reporting project status and for the escalation of risks and issues to the levels required by the organisation.	No change.
10 The organisation fosters a culture of improvement and of frank internal disclosure of project information.	No change.
11 Project stakeholders are engaged at a level that is commensurate with their importance to the organisation and in a manner that fosters trust.	No change.
	New principle. Projects are closed when they are no longer justified as part of the organisation's portfolio.

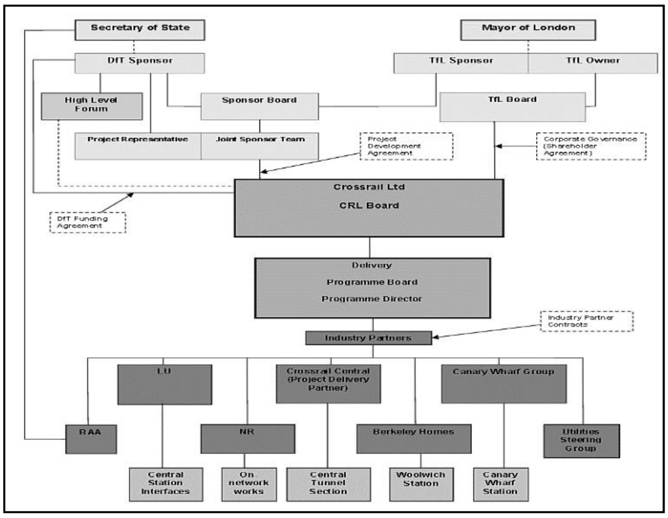
APPENDIX B – REPRESENTATIONS OF CROSS RAIL PROJECT GOVERNANCE ARRANGEMENTS



National Audit Office (2014, p.28)



Crossrail Project (2016)

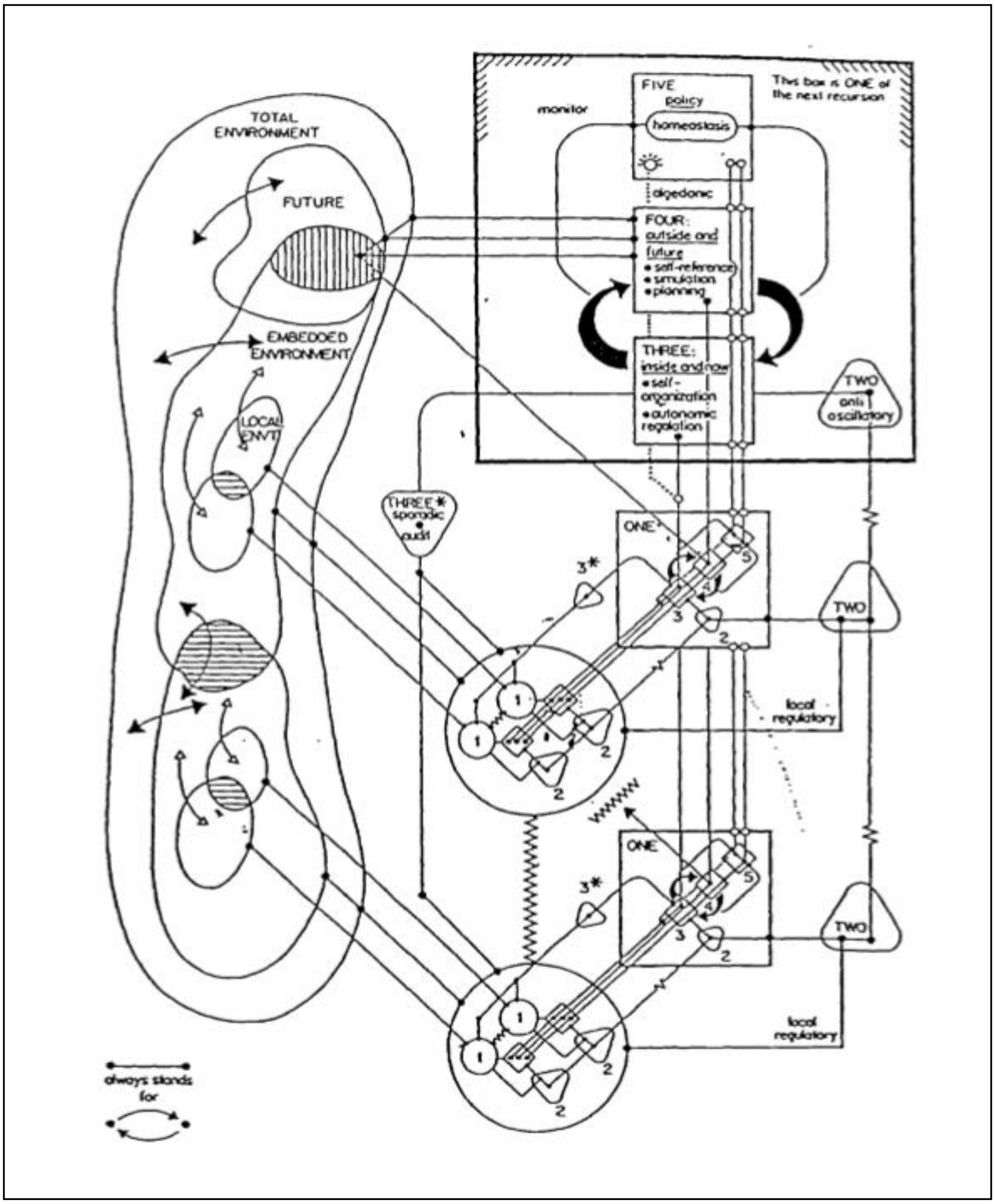


Mayor of London (2018)

APPENDIX C – FAILURES OF LARGE ENGINEERING PROJECTS, ADAPTED FROM MILLER ET AL. (2000, P 4-6)

Year	Source	Sector	Issue	Cause of Failure
1988	Merrow, McDonwell and Arguden	Arms, energy, petrochemical, power, and nuclear electricity	Cost overrun	• Inflation • Poorly defined contract terms • Technical advances • Scope changes • Incentives to underestimate costs
1994	Ingram	World Bank projects	Poor performance	• Incentives facing sponsors and users
1971	Sayles and Chandler	NASA	Complex programs	• Political issues lead to breakdown of rational management techniques • Management science, organisational behaviour and policy must be woven together
1996	Lampel and Miller	Power	Innovation	• Novel projects were sponsored by entrepreneurial developers not large firms
1994	Morris	General	Process	• Procedural approaches cannot deal with externalities, institutions and strategic issues
1970s	Diehl and Sterman (1995), Forrester (1987), Richardson (1992)	General	Project oscillations and controls	• Management levers that could be used to control delays, cost overruns and loss of reputation.
1975	Hirschman	General	Economic planning	• Principle of the hiding hand – projects survive their difficulties as parties face issues that were unforeseen
1973	Pressman and Wildavsky	Planning	Planning versus delivery	• Policy and implementation have to be brought into closer correspondence
1990	Bryson and Bromiley	General	Strategic planning	• The numerical adequacy of planning staff influences project outcome
1985	Stichcombe and Meimer (1985), Stinchcombe (1990)	Oil	Contract management	• Contracts are hierarchical documents through which firms extend their control to suppliers.

APPENDIX D - VIABLE SYSTEM MODEL (BEER, 1995, P. 136)



APPENDIX E - QDA MINER OVERVIEW[49]

QDA Miner is an easy-to-use qualitative data analysis software package for coding textual and graphical data, annotating, retrieving and reviewing coded data, documents and images. The program can manage complex projects involving large numbers of documents combined with numerical and categorical information. QDA Miner also provides a wide range of exploratory tools to identify patterns in coding and relationships between assigned codes and other numerical or categorical properties. Documents are stored in Rich-Text Format and support font and paragraph formatting, graphics and tables. Documents may be edited at any time without affecting the existing coding.

QDA Miner can import and export documents, data and results in numerous document file formats (MS Word, WordPerfect, RTF, HTML, Test files, PDF documents, Ebook and PowerPoint), datafile formats (MS Access, Excel, CSV, TAB, SPSS, Stata, TripleS 1.2, EndNote, MBox, PST and RIS), graphic file formats (BMP, WMF, JPG, JPEG, GIF, PNG), and other qualitative software file formats (QSR N6, NVivo, Atlas.ti, HyperResearch, Ethnograph, Transana, Transcriber and QDA XML). It can retrieve data from online services such as SurveyMonkey, Qualtrics, SurveyGizmo, QuestionPro, Voxco, Mendeley and Zotero, Email services such as Outlook, Hotmail and Gmail as well as social media services like Twitter, Facebook and RSS feeds. It also provides unique integration with advanced quantitative content analysis, text-mining (WordStat) and statistical analysis (Simstat) tools, providing easy combination and integration of qualitative and quantitative methods.

TEXT MANAGEMENT AND QUALITATIVE ANALYSIS FEATURES

QDA Miner provides an easy way to manage documents, and perform common qualitative analysis tasks.

TEXT MANAGEMENT FEATURES:

- Storing and editing of documents in Rich Text format.
- Project files organised by cases, each case can contain up to 2030 variables including multiple documents, numeric, nominal/ordinal, date or Boolean values.
- Importation from various file format such as Excel, Access, Paradox, dBase, SPSS, NVivo, N6, Atlas.ti, Transana, Transcriber, etc.
- Document conversion wizard allows one to easily import documents from various file format and to automatically extract numeric and alphanumeric values.
- Copy, backup and restore existing projects files.
- Easy filtering of cases.

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[49] Extracts taken from https://provalisresearch.com/resources/manuals-2/; https://provalisresearch.com/uploads/QDA-Miner-5-User-Guide-V1.2.pdf; https://provalisresearch.com/downloads/trial-versions/

CODING FEATURES:

- Easy creation and edition of codebooks (hierarchical).
- Intuitive drag and drop assignment of codes to text segments and images.
- Notes can be assigned to projects, codes and coded segments.
- Code merging, splitting, virtual grouping as well as search and replace.
- Ability to import codebooks from other projects.

TEXT RETRIEVAL AND CODING ANALYSIS FEATURES

- The **Text Retrieval** tool searches for specific text patterns in documents. Complex search patterns may be performed using Boolean operators, wildcards and thesaurus searches. Retrieved paragraphs, sentences of text segments may then be coded or saved to disk (as new project, in HTML, Excel, or delimited text files).
- The **Keyword Retrieval** feature can retrieve any document, paragraph, sentence, or coded segment containing a specific WordStat keyword or a combination of keywords.
- The **Coding Frequencies** tool allows one to obtain a list of all codes in the current codebook along with their description and various statistics such as their frequency, the number of cases in which they are found, and the total number of words in the associated text segments. This dialog box also allows one to produce bar charts and pie charts from those statistics.
- The **Coding Retrieval** tool lists all text segments associated with some codes or with specific patterns of codes. Complex search patterns may include criteria such as equality, proximity, overlapping, inclusion, sequential relationships, as well as Boolean operators (AND, OR, NOT).
- The **Codes Co-occurrences** tool uses information about the proximity or the co-occurrence of codes within documents to explore potential relationships among them as well as similarities among cases. This feature gives access to various statistical and graphic tools such as hierarchical cluster analysis, multidimensional scaling, and proximity plots.
- The **Coding Sequences** tool can be used to identify recurring sequences of codes. This feature can produce frequency lists of all sequences involving two selected sets of codes as well as the percentage of times one code follows or is followed by another one.
- The **Coding by Variable** tool is useful for identifying or testing potential code similarities or differences between subgroup of cases (categorical variable) or to assess the relationship between these codes and other numerical variables. Various statistical and graphical tools are used for this purpose such as contingency tables, association statistics, bar charts, line charts, heatmaps, correspondence plot, etc.
- Optional Statistical Analysis module. Simstat is a comprehensive statistical analysis application. Since it uses the same file format as QDA Miner, Simstat can be used to perform statistical analysis on any numerical data stored in a QDA Miner project file. It can also perform numeric and alphanumeric computation, transformation and recoding of variables, as well as advanced file management procedures such as data file merging, file aggregation, etc.

OUTPUT FEATURES

- Saving of tabular outputs to disk in Excel, HTML, XML, plain text, comma or tab separated value or as a Word document.
- Saving of graphics to disk as BMP, WMF, JPG, or PNG files.
- Documents may be exported to disk in plain text, RTF or HTML.
- Whole projects, including tagged documents, may be exported to disk in XML format.

TEAMWORK FEATURES

- The **Security/Multi-Users** feature allows to control users' privileges and restrict access of selected features (prevent modification to documents, variables, or cases, prevent viewing codes assigned by other users, etc.).
- The **Merge Projects** feature allows one to combine two or more project files into a single one, allowing one to synchronise one's own work performed on different computers. As well, both an individual or various team members may work on the same set or different sets of documents and then merge them along with their associated coding into a single master project.

Project Structure

QDA Miner keeps all documents, coding schemes, codes, and notes in a set of files called a "project". QDA Miner projects consist of multiple cases. A case is the basic unit of analysis of a project. It typically represents an individual, an organisation, or a group, it can also be a document or a news story. A case can contain several documents as well as numerous alphanumeric, numeric, categorical, date or Boolean variables. These variables are used to specify the properties associated with a case. Up to 2035 variables can be associated with each case. The number of cases in a single project is limited by disk space up to a maximum of 4 to 8 gigabytes.

For example, if you want to analyze transcripts of in-depth interviews of numerous individuals, you may end up creating a project file where each case contains information associated with a single interviewee. One or more document variables may be created to contain transcripts of those interviews. You may also add other variables to specify socio-demographic information for the interviewee, group membership, as well as the interview date and individual responses to closed-ended questions. One of the unique features of QDA Miner is its ability to explore relationships between any one of the properties and codes manually assigned to documents. For example, you can assess how the content of an interview is related to the interviewee's gender or age, or how it relates to specific answers to a close-ended question.

CODING ANALYSIS FEATURES

QDA Miner provides several tools to assist in the coding task and to perform descriptive, comparative and exploratory analysis of codings. These tools may be used to identify regularities and patterns in coding, uncover hidden relationships between codes and other properties of the cases, etc. The Coding Frequencies tool allows one to obtain a list of all codes in the current codebook along with their description and various statistics such as their frequency, the number of cases in which they are found, and the total number of words in the associated text segments. This dialog box also allows one to produce bar charts and pie charts from those statistics. The Codes Co-occurrences tool uses information about the proximity or the co-occurrence of codes within documents to explore potential relationships among them as well as similarities among cases. This dialog box gives access to various statistical and graphic tools, such as cluster analysis, multidimensional scaling, and proximity plots. The Coding Sequences tool can be used to identify recurring sequences of codes. This feature can produce frequency lists of all sequences involving two selected sets of codes as well as the percentage of time one code follows or is followed by another one. The Coding by Variable tool is useful for identifying or testing potential code similarities or differences between subgroups of cases (categorical variable) or to assess the relationship between these codes and other numerical variables. Various statistical and graphical tools are used for this purpose such as contingency tables, association statistics, bar charts and line charts, heatmaps, correspondence plot, etc. The Inter-Coders Agreement tool is used to compare the consistency of coding between several coders. This tool can be useful to uncover differences in interpretation, clarify equivocal rules, identify ambiguity in the text, and ultimately quantify the final level of agreement obtained by those raters. QDA Miner may also be used in conjunction with the following two quantitative analysis software tools:

WordStat is a powerful quantitative content analysis and text-mining software. When used as an add-on to QDA Miner, it analyzes words and phrases found in specific documents or in selected code segments. WordStat can perform simple descriptive analysis or explore in greater details the relationship between words or categories of words and other numeric or categorical variables. Simstat is a comprehensive statistical analysis application. Since it uses the same file format as QDA Miner, Simstat can be used to perform statistical analysis on any numerical data stored in a QDA Miner project file. It can perform numeric and alphanumeric computation, transformation and recoding of variables, as well as advanced file management procedures, such as data file merging, file aggregation, etc.

For more information see:
https://provalisresearch.com/resources/manuals-2/
https://provalisresearch.com/uploads/QDA-Miner-5-User-Guide-V1.2.pdf
https://provalisresearch.com/downloads/trial-versions/

APPENDIX F – ETHICS APPROVALS

Plain Letter Statement

THE UNIVERSITY OF MELBOURNE

Project Governance of mega projects – a case study on the Regional Rail Link Authority - PhD research (Nick Pelham)

Dear Survey Participants,

You are invited to participate in the above research project, which is being conducted by Mr Nick Pelham, Prof Colin Duffield and Dr David Wilson at the University of Melbourne. This project will form part of Mr Nick Pelham's PhD thesis, and approval to undertake this approved by the University's Human Research Ethics Committee.

This research aims to investigate the impact of project governance on projects. A key outcome of the study will be the identification of new models and processes that can be used to improve the decision making functions of a project board. A key element of this will be to interview board members regarding their insights in to governing successful mega projects.

Should you agree to participate, you will be asked to contribute by participating in an interview which will be scheduled at your convenience, and a questionnaire will be completed. It is estimated that the interview session will take no more than 75 minutes. In order for the researcher to not lose any valuable comments from the interviews the session will be audio recorded.

The time and place of the interview will be conducted at a locations suitable for you.

We will protect your anonymity and the confidentiality of your responses to the fullest possible extent within the limits of the law. Once the thesis that arises from this research has been completed, a brief report of the findings will be sent to you in appreciation of your participation and support. In the thesis (or any other reports that are created), no information which you have provide will be attributed to you personally. We will remove any references to personal information that might allow someone to guess your identity. However, reference to membership of the board of the project reviewed will be quite evident.

The data will be kept securely in the Department of Infrastructure Engineering for five years from the date of publication, before being destroyed. Disposal of hard copy files after five years will be via confidential bin disposal as managed by the University of Melbourne. Computer files will be deleted.

Please be advised that your participation in this study is completely voluntary. Should you wish to withdraw at any stage, or to withdraw any unprocessed data you have supplied, you are free to do so without prejudice. Those participants who might have had any dependent relationship with the researcher are ensured that their involvement in the project will not affect any management or business relationship. The participant can check this with the student's supervisors or the Ethics Committee.

This research project has been approved by the Human Research Ethics Committee of The University of Melbourne. If you have any concerns or complaints about the conduct of this research project, which you do not wish to discuss with the research team, you should contact the Manager, Human Research Ethics, Office for Research Ethics and Integrity, University of Melbourne, VIC 3010. Tel: +61 3 8344 2073 or Fax: +61 3 9347 6739 or Email: HumanEthics-complaints@unimelb.edu.au. All complaints will be treated confidentially. In any correspondence please provide the name of the research team or the name or ethics ID number of the research project"

Yours sincerely,

Mr Nick Pelham	Dr Colin Duffield	Dr David Wilson
PhD research student	Principal Supervisor	Co-Supervisor

Should you have any other general queries you can contact one of the researchers detailed below,

Mr Nick Pelham, PhD Student Department of Infrastructure Engineering The University of Melbourne **T:** 0419 435 525 **E:** pelhamn@student.unimelb.edu.au	**Dr Colin Duffield,** Professor Department of Infrastructure Engineering The University of Melbourne **T:** (03) 8344 6787 **E:** colinfd@unimelb.edu.au	**Dr David Wilson,** Senior Lecturer Department of Infrastructure Engineering The University of Melbourne **T:** 0419 374 776 **E:** wilsondi@unimelb.edu.au

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Human Ethics Application 1647013.1, *2016*

unimelb.edu.au

Consent

THE UNIVERSITY OF MELBOURNE

Consent form for persons participating in a research project

PROJECT TITLE: THE IMPACT OF GOVERNACE ON PROJECTS

Name of participant:

Name of investigator(s):): Nick Pelham, Prof Colin Duffield, Dr David Wilson

1. I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written plain language statement to keep.
2. I understand that after I sign and return this consent form it will be retained by the researcher.
3. I understand that my participation will involve an *interview and observation* and I agree that the researcher may use the results as described in the plain language statement.
4. I acknowledge that:

   (a) the possible effects of participating in the *interview and observation* have been explained to my satisfaction;

   (b) I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;

   (c) the project is for the purpose of research;

   (d) I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements;

   (e) I have been informed that with my consent the *interview will be audio-taped and I understand that audio-tapes* will be stored at University of Melbourne and will be destroyed after five years;

   (f) my name will be referred to by a pseudonym in any publications arising from the research;

   (g) I have been informed that a copy of the research findings will be forwarded to me, should I agree to this.

I consent to this *interview* being audio-taped — ☐ **yes** ☐ **no** (please tick)

I wish to receive a copy of the summary project report on research findings — ☐ **yes** ☐ **no** (please tick)

Participant signature: Date:

Department of Infrastructure Engineering
The University of Melbourne, Victoria 3010 Australia
T: +61 3 8344 9854 F: +61 3 8344 62145
W: http://www.ie.unimelb.edu.au/

Human Ethics Application 1647013.1, 2016

unimelb.edu.au

Survey Questions

Project Governance Survey

THE UNIVERSITY OF MELBOURNE

Summary

We are asking you to participate in a research interview/questionnaire investigating the impact of governance on projects. The first part of the research has been to review the minutes of the Regional Rail Link Authority Board and of the JCC to understand the issues discussed and minuted. The second part of the research involves interviewing each of the board members to gain a reflecting perspective on the functioning of the board. This project has been sponsored by the Department of Infrastructure Engineering. This work will form part of Mr Nick Pelham's PhD thesis, and is supervised by Prof Colin Duffield and Dr David Wilson. This piece of work required approved by the Human Research Ethics Committee of the University of Melbourne, as it involves questionnaires and interviews of adults over 18 years old.

Survey No:

Participant: **A B C D E F G H I J**

Date:

Location:

Time commenced:

Time ended:

Project governance – Board member interview questions

As I am researching the impact of project governance on a project, I am keen for your views and opinions on the following questions about the RRL project you were a Board Member of:

1. What did you consider to be your primary role/s to be on the project board?

2. Can you describe the governance arrangement for this project

3. What made this project a success?

4. What was different about this governance structure

3_Att A_Project governance board questionaire (NP)
Page | 2

5. Was the governance effective on this project?
   a. Y n
   b. What made it successful/not successful?
   c. On reflection, what would you have done differently

6. In your experience is there a link between sound/good governance and project success
   a. What are those key elements

   b. How would you measure 'success' of the project governance on future projects

7. Is the governance 'formula' repeatable
   a. Is it a template?

   b. Is it bespoke?

   c. When is it needed?

3_Att A_Project governance board questionaire (NP)
Page | 3

8. What were the key decisions the board made on the project

9. What were the biggest contributions you believe you made on the project?

10. Without being specific, what was the % of issues:
    a. Noted %
    b. Endorsed / approved %
    c. Escalated to the Minister %
    d. Other %

11. When things go 'off track', where does the responsibility sit

    a. With the Project
    b. With the Board

12. Anything else that is you believe is relevant to improving the governance of projects?

APPENDIX G – CODES BY SUBJECT AND ISSUE

The below list is a complete listing of the codebook used as part of the coding process and subsequent analysis of the Project Board documentation. The following codebook lists are provided:

1. Phase 1 & 2 - Codes and category
2. Phase 3 - codes and category
3. Codes removed

Subject (phase 1 and 2)	**Issue (phase 1 and 2)**
Accredited rail operators	Achievements
Action items	Actions next period
Apologies	Alliance leadership teams
Assurance / audit	Approvals
Attendees / membership	Award
Awards	Benefits
Board member obligations	Bike paths
Board members insurance and indemnity	Board decision making
Board performance	Board duties
Business case	Board indemnity/insurance
Carbon tax	Board papers
Cash flow/ funding	Board purpose
Change management	Board roles and boundaries
Communication and stakeholder relations	Board subcommittee/s
Communications	Branding
Community reference group	Budget - progress
Contingency management strategy	Chair role
Contract signature	Change
Contractor management strategy	Closed actions
Current Status	Commonwealth interface
Delegation of authority	Commonwealth contribution
Endorsement	Communications
Executive update	Communications sub committee
Funding submission	Conflict of interest
Future agenda	Contamination
Governance	Contingency
Governance arrangements	Contract award
Independent review	Contractor safety
Industrial relations	Cost estimate / forecast / cash flow

Subject (phase 1 and 2)	**Issue (phase 1 and 2)**
Industry engagement plan	Council
Introductions	CRG (Community reference group)
Joint coordination committee	Crisis management
KPIs (key performance indicator)	Cultural/heritage
Land acquisition	Deferred
Land planning and environment	Delayed handback
Lessons learnt	Design
Meeting and project documentation	Design/engineering
Membership	Designers
Next meeting / meeting schedule	Discussion
Noise policy	Documentation
Occupations	Due diligence – safety
Operational and Network Outcomes	Endorse
Operational requirements	Engineering safety competencies
Options analysis	Environment
Other business	EOI (expression of interest)
Probity	Evaluation plan
Procurement	Expenditure
Program management plan	External issues
Program management systems and tools	Finance / forecast
Project cost estimate	Finance sub committee
Project interfaces	Gateway review/ review
Project progress/ status	Human resources
Risk and issues	Improvements
Risk management	Industrial relations
RRLA board	Injury
Safety	Innovation
Schedule/ time	Interfaces
Scope	IP (intellectual property)
Stakeholder management	JCC (joint coordination committee)
Subcommittees	Key stakeholders
Succession planning	Land acquisition
Sustainability	Legislation
Terms of reference	Lessons learnt
Transport integration act	Major occupations
Urban design strategy	Media
Work package specific	Meeting frequency
	Membership

Subject (phase 1 and 2)	Issue (phase 1 and 2)
	Monthly status report
	MOU (memorandum of understanding)
	Nil_no discussion/issue
	Noise / noise walls
	Noise walls
	Note
	OHS obligations - directors
	Ohs/safety
	Open actions
	Operations
	Options
	Org structure
	Overview/update
	Permits
	Planning
	PM (project management) tools
	Policy/legislation
	Policy/strategy
	Presentation
	Probity
	Probity / probity auditor
	Procurement - progress
	Procurement model
	Project alliance agreement
	Project completion
	Project highlights (progress)
	Project management plan
	Project objectives / outcomes
	Project report template
	Project scope
	PTV (Public Transport Victoria)
	Reporting
	Requirements
	Resourcing
	Retiring board member
	RFP / RFT (request for proposal/tender)
	Risk /reporting
	Risks

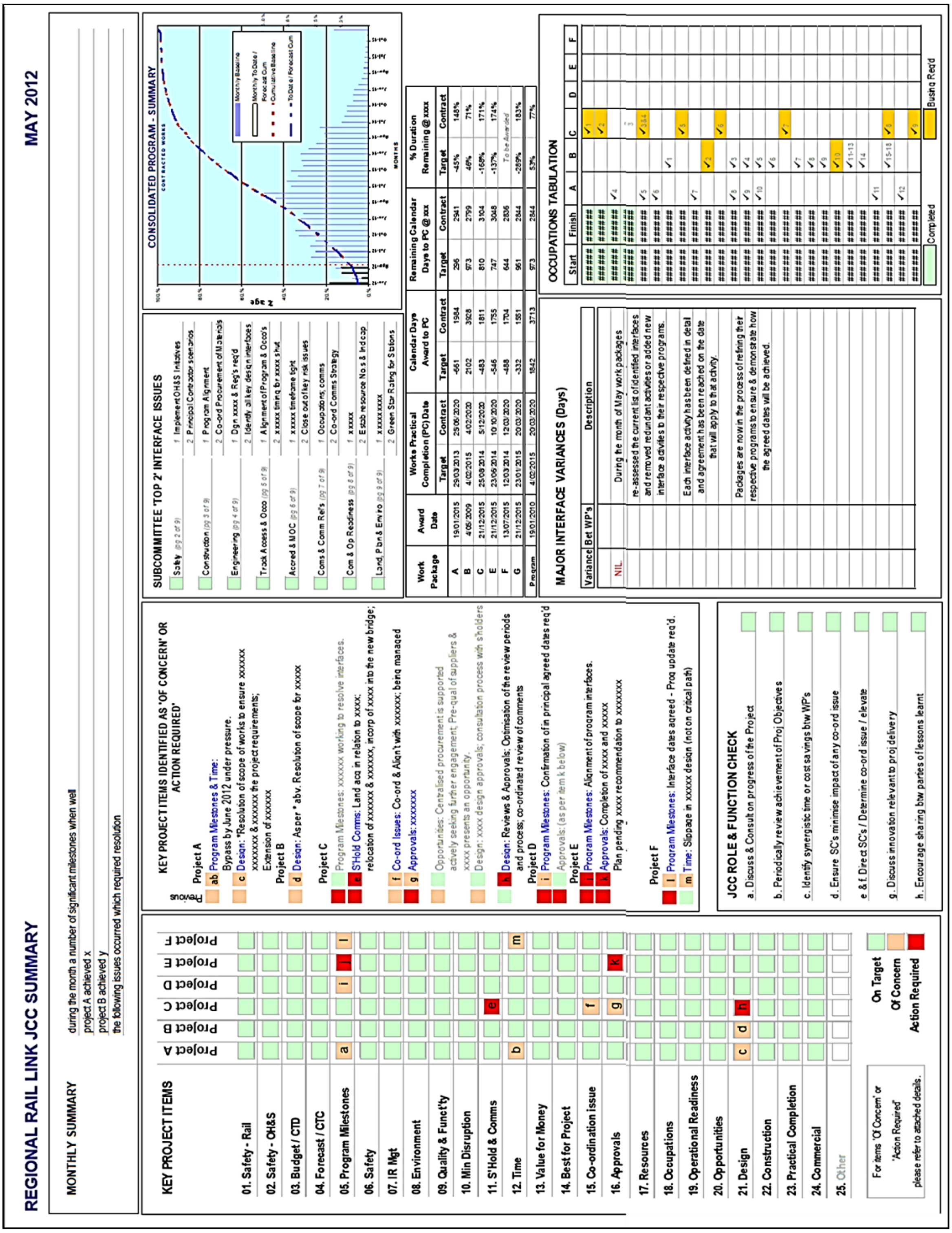
Subject (phase 1 and 2)	Issue (phase 1 and 2)
	Schedule
	Scope
	Scope boundary
	Scope issues
	Scope optimisation
	Shutdown
	Site visit
	Special purpose authority
	Stakeholder management - general
	Stakeholder relations plan
	Strategic plan
	Strategic Procurement plan
	Sub-committee chair
	Succession planning
	Sustainability (construction)
	TCMS (train control management system)
	Terms of Reference
	Terms of Reference (amendments)
	Training
	V/line
	Work package specific issue

Phase 3 Codes	
360-degree evaluation	insurance cover (non-government participants)
a. template	interfaces
accepted more risk	introduce AO (authorised office) board earlier
access to decision makers	IR (industrial relations)
accountability	JCC sub committee
active client	KPIs (key performance indicators)
additional scope items	large projects / megaprojects
adequate budget	legal
administrative office (AO)	legal advice context
advisory only	lessons learnt
as built drawings	long term planning
asked questions	longer occupations

b. bespoke	luck
been closer to Rail Operators and end client	mentor
believed in the project	mentoring
benefits realisation	more challenge (benefits realisation)
best for project approach	more discipline (to make sure delivered)
best interests of project	n/a
better cost outcome	need accountability and discipline
board	no scope change
board structure	odd/novel arrangement
board tenure	on merits basis
both	outcome focus
budget management	outcomes
business case	outcomes focus
c. when needed	packaging work
central agency representation	performance (of the project)
Chair CEO relationship	planning
collaboration	planning framework
collaborative outcome	procurement model
commercial	project
communications	project delivery
community engagement	project experience
community expectations	project ownership
concept of operation_ business case	relationships
consensus driven	relationships (up)
construction	reporting
construction vs operations	reporting / information
contingency management	review contingency level
contract options	right people
contribution	risk management
control of t/c/q (time, cost quality)	risk transfer
creating the right environment	risk vs cost
delivered the project	risk/audit sub committee
disbanded board	safety
discipline (of reporting)	same as a Stat Authority
diverse skills and background	scope changes
documentation	selecting boards
drive positive culture	sense of identity
drove culture	sensible decisions
early procurement decisions	separate authority

early works - risk reduction	shutdowns
easier to define if unsuccessful	single focus
end user/ customer impacts	single purpose
engagement (of rail operators)	skills review (of board)
engineering	stakeholder
ensured board functioned	stakeholder feedback
environment (of tendering)	stakeholder management
external board members	structure
financial	supported project
follow governance criteria	supported the CEO
forecast to completes/ budget	sustainability
front end planning	sustainable outcomes
good board	T/C/Q (time/ cost/ quality)
good team	tendering/ procurement
governance	terms of reference
guidance and advice	the people
how well the client project team did	timely action / decision making
improved reporting (esp. financial)	understanding commercial position
inclusive board	up front governance (to set the standard)
independence	very little
independent	when high degree of risk
independent board	when risk can’t be transferred
independence	when spans election cycles
independent board	whole of life outcomes
industrial relations	worked to Department (not Government)
influence	yes
innovative ideas	

APPENDIX H - JCC SUMMARY PAGE[50]



[50] Template only. Actual data and financial model has been modified due to confidentiality restrictions

APPENDIX I - EXTRACT FROM INSIGHTS SERIES VOLUME 2 (RRLA, 2014)

Section 3.2 Project Board - Key Insights

1. The RRLA Board provided an efficient means of oversight enabling timelines to be met.

2. The RRLA Board ensured clear focus where the project had dependencies on, or interfaces with, other government organisations.

3. There was an unprecedented level of efficiency in terms of government machinations as other government departments were reassured by the fact that the RRLA Board performed a strong oversight function.

4. The operation of the RRLA Board necessitated robust, timely reporting – more rigour than usual department reporting requirements.

5. The RRLA Board provided robust oversight of work package performance.

Section 4.5 RRLA Board

As part of the establishment of RRLA, DOT (Department of Transport), DTF (Department of Treasury & Finance) and DPC (Department of Premier & Cabinet) wanted to ensure the project benefited from the guidance of experienced industry members and consequently sought to establish a governance board to oversee the delivery of the project.

The RRLA Board was established by procuring a small number of senior industry members and two senior public servants. A skills matrix was used to help determine the areas of experience required from the RRLA Board as a whole. The skill areas considered most relevant were:

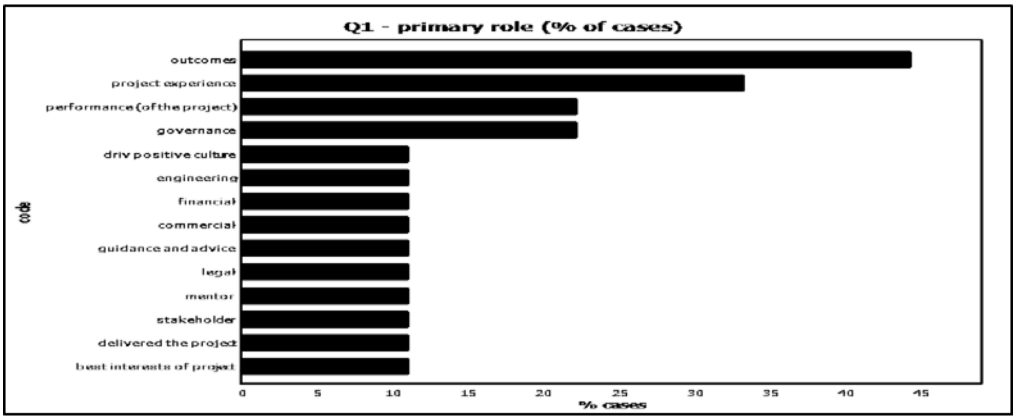
- Construction industry
- Corporate governance
- Government relations
- Finance and cost management
- Legal and compliance
- Major project delivery
- Public transport
- Rail industry
- Risk management
- Stakeholder and community relations.

The RRLA Board established a Terms of Reference to outline its responsibilities and processes. The RRLA Board met monthly, received reports and recommendations from management, and made decisions by consensus. Although technically these were decisions of the Chairman, acting on the advice of Board members, the Terms of Reference made it clear that the members of the Board were intrinsically part of the governance decision making.

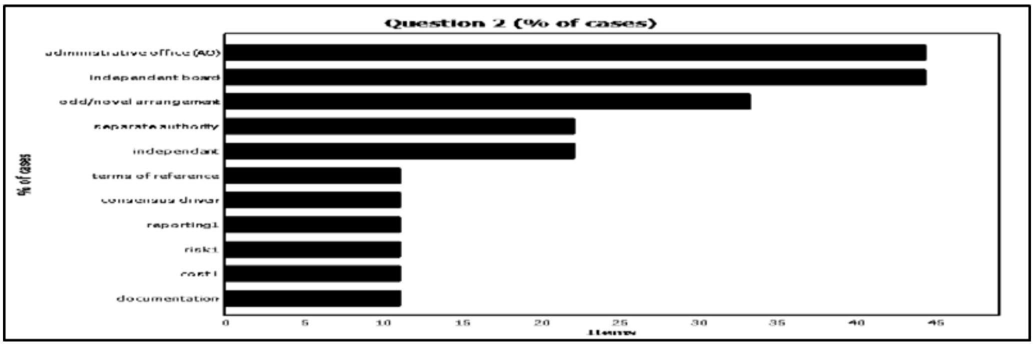
APPENDIX J – RESPONSES TO PHASE 3 QUESTIONNAIRE (N=8 PARTICIPANTS)

The below graphs are a consolidated summary of the Board member collective responses to the questions presented in Stage 3.

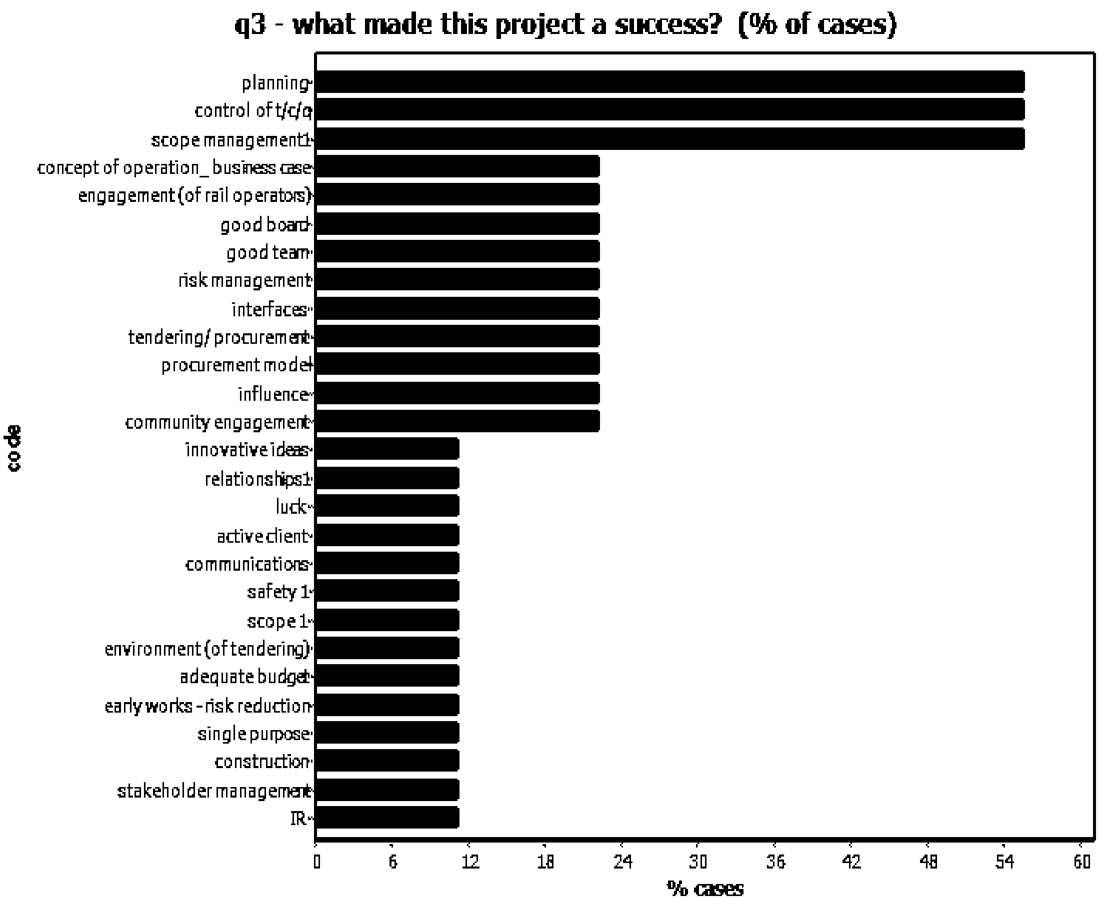
Q1. What did you consider to be your primary role/s to be on the project board?



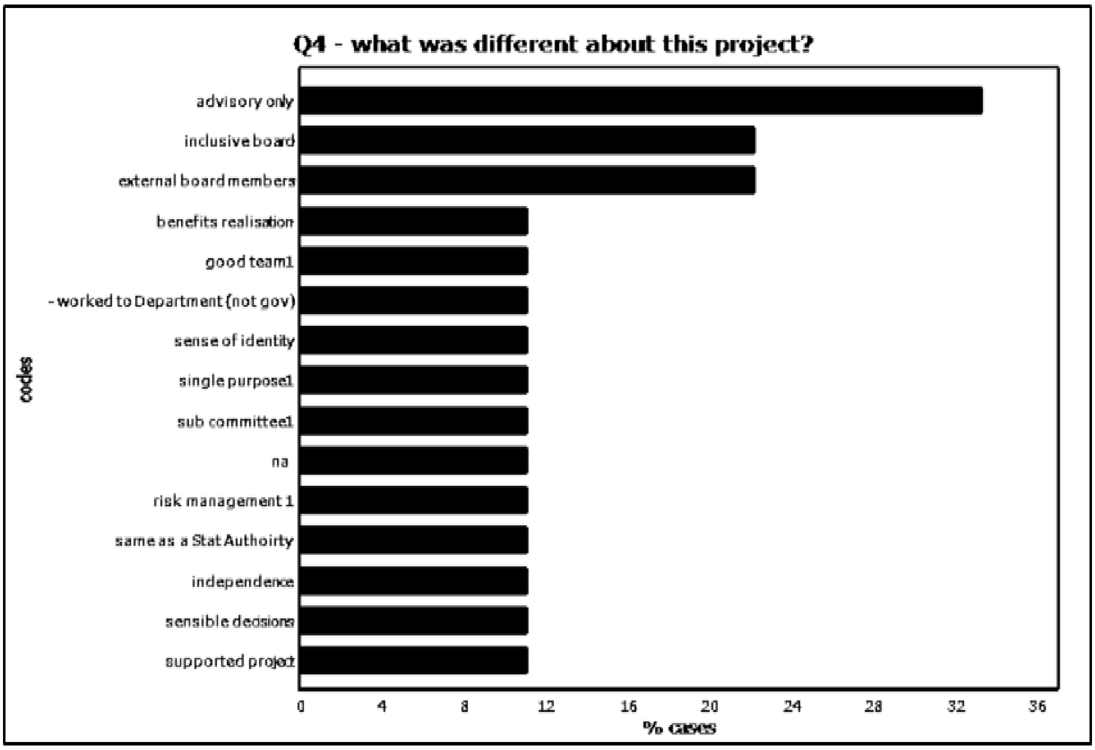
Q2. Can you describe the governance arrangement for this project?



Q3. What made this project a success?

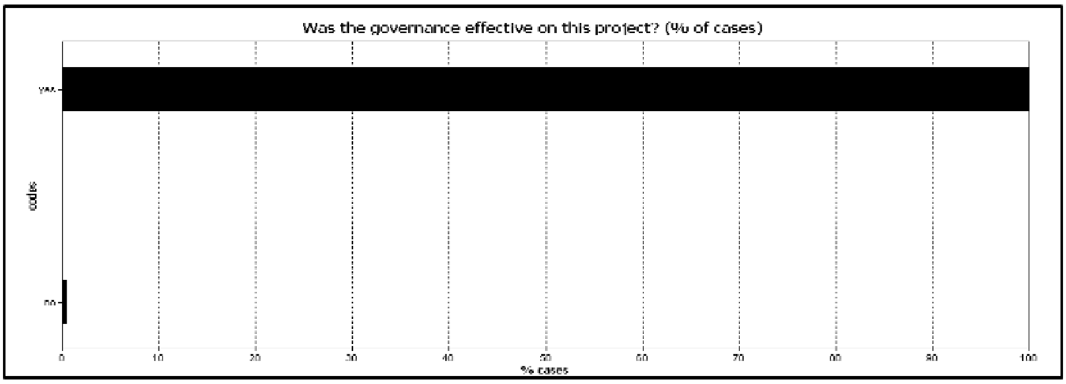


Q4. What was different about this governance structure?

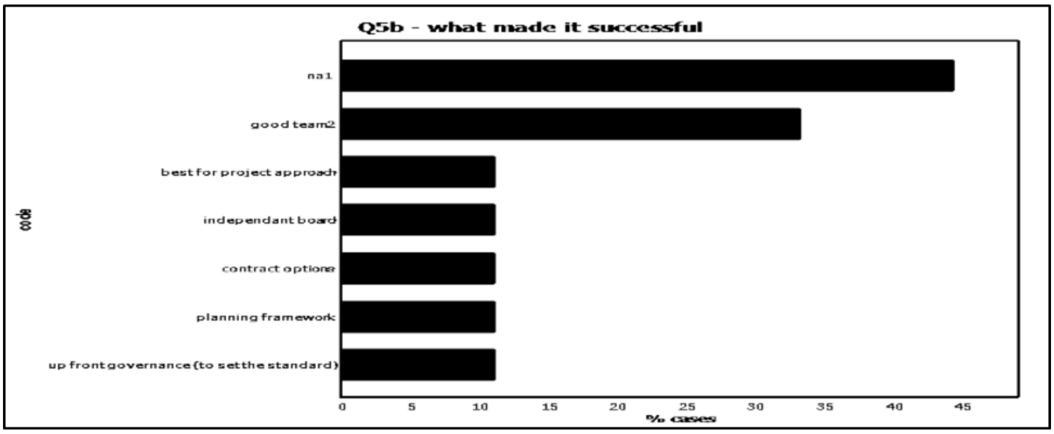


Q5. Was the governance effective on this project?

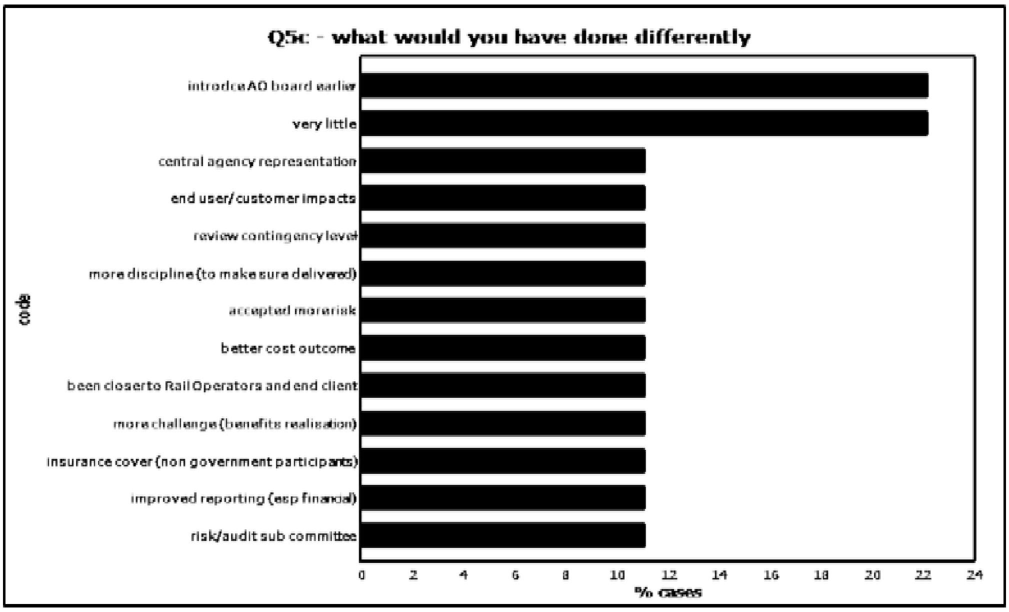
5A. Yes or No



5B. What made it successful/not successful?

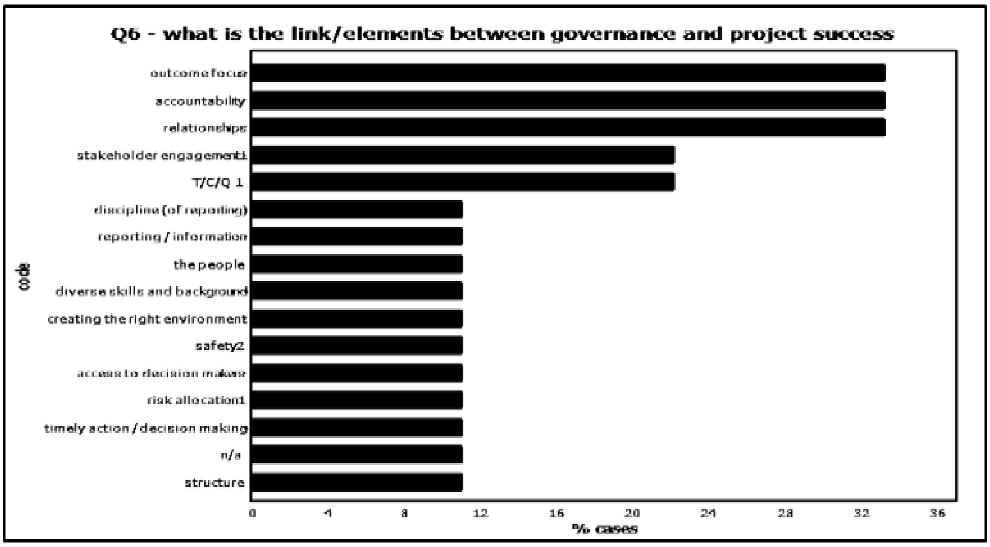


5C. On reflection, what would you have done differently?

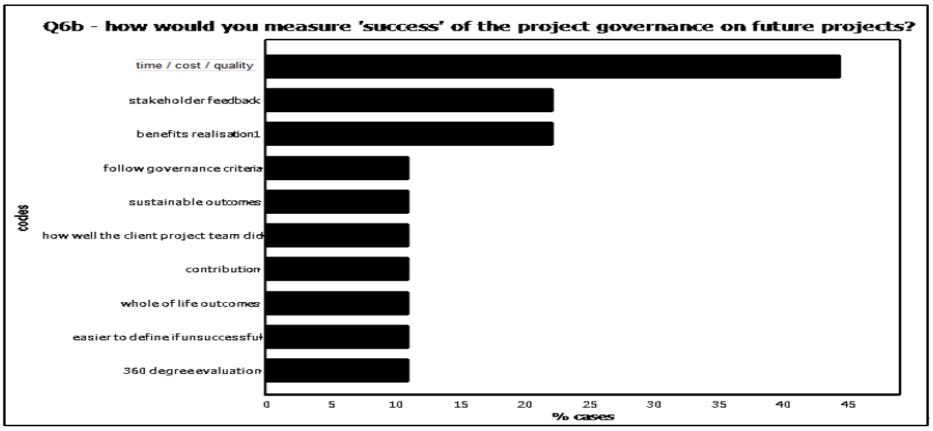


Q6. In your experience is there a link between sound/good governance and project success?

6A. What are those key elements?

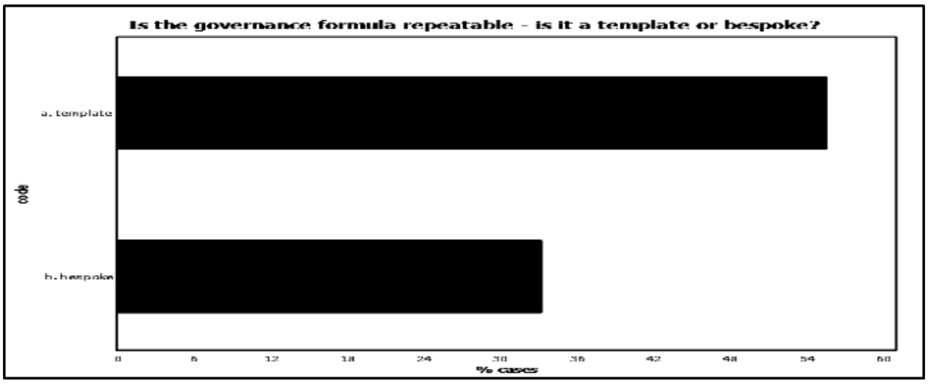


6B. How would you measure ‘success’ of the project governance on future projects?

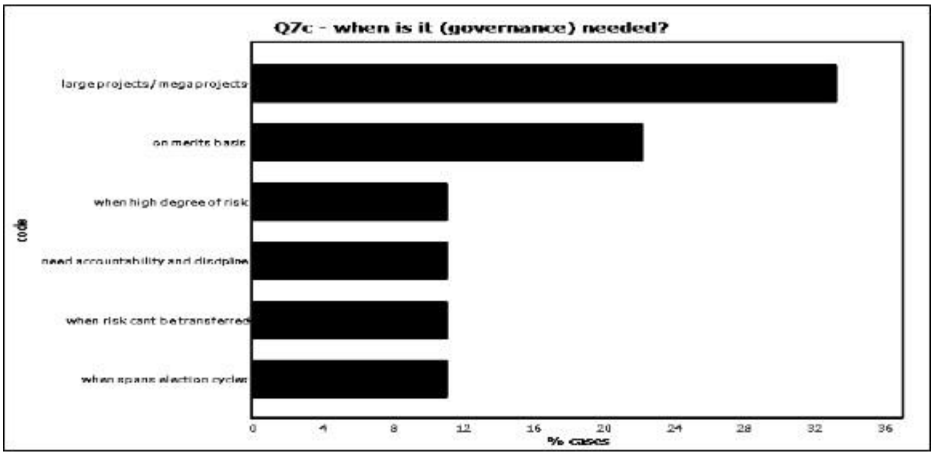


Q7. Is the governance ‘formula’ repeatable?

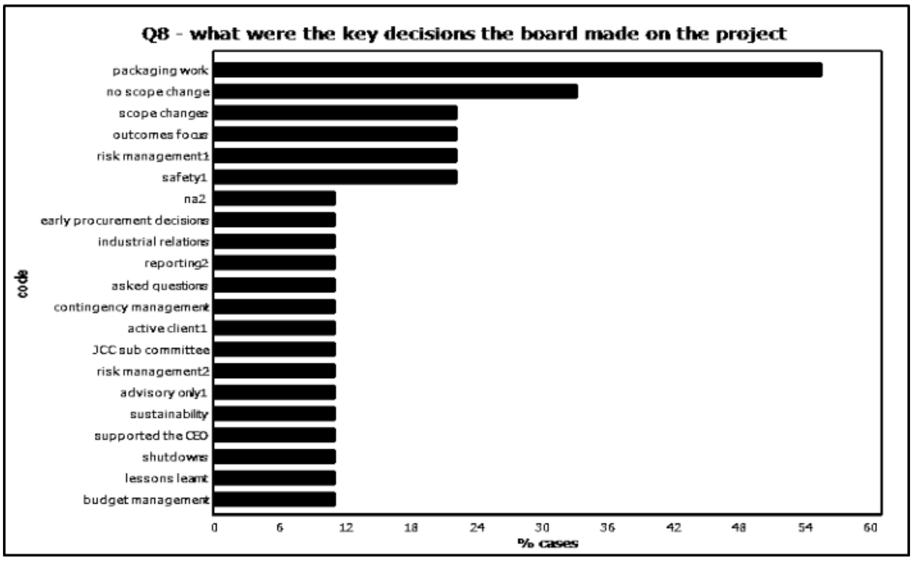
- Is it a template?
- Is it bespoke?



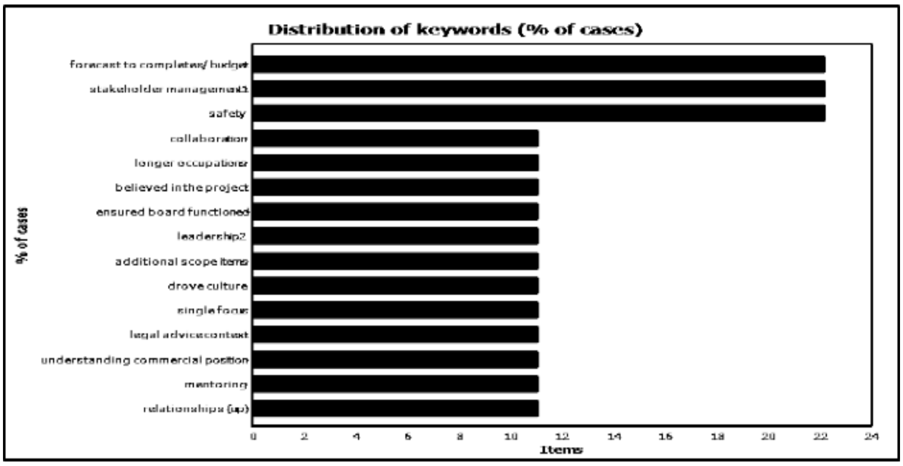
7b. When is it needed?



Q8. What were the key decisions the board made on the project?



Q9. What were the biggest contributions you believe you made on the project?



Q10. Without being specific, what was the % of issues:

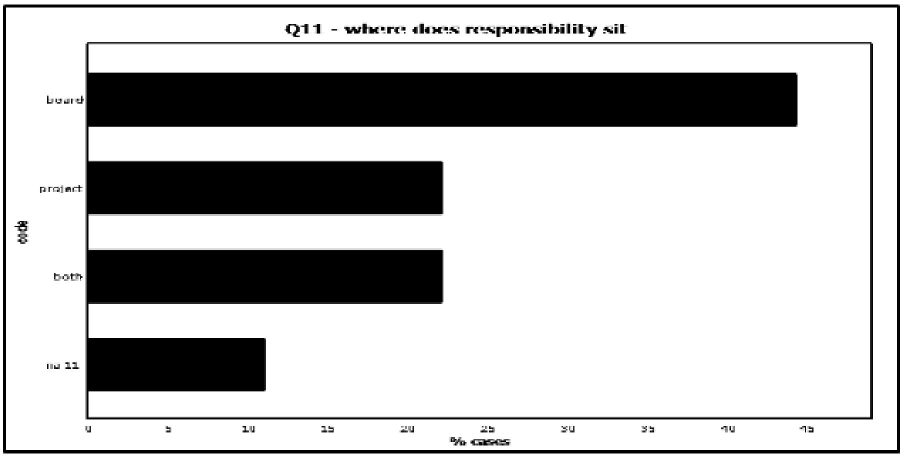
a)	Noted	%
b)	Endorsed / approved	%
c)	Escalated to the Minister	%
d)	Other	%

Results not used due to difficulty with assigning percentage

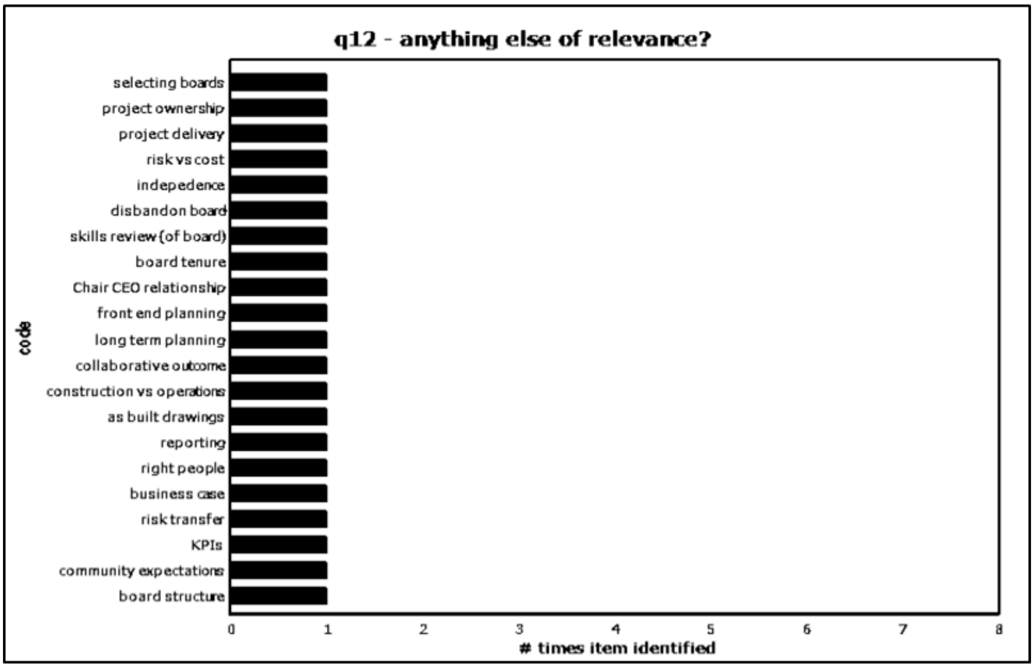
Q11. When things boar 'off track', where does the responsibility sit

a) With the Project

b) With the Board

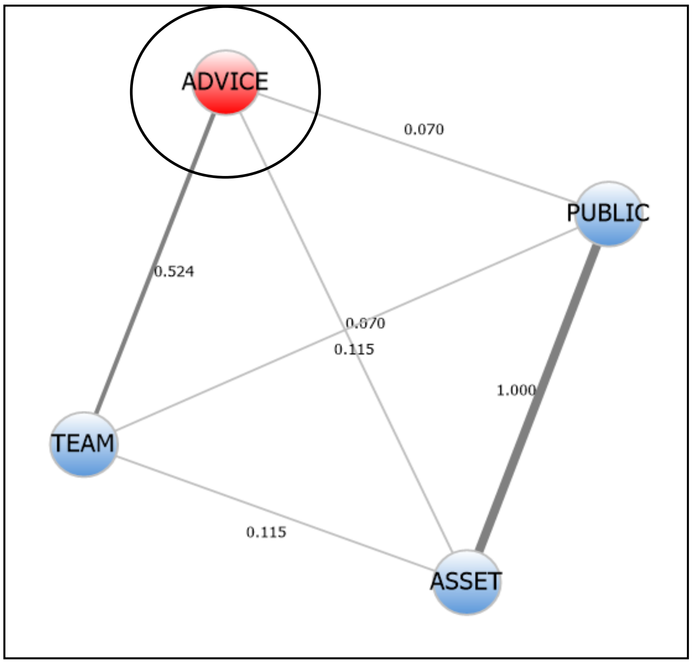


Q12. Anything else that is you believe is relevant to improving the governance of projects?

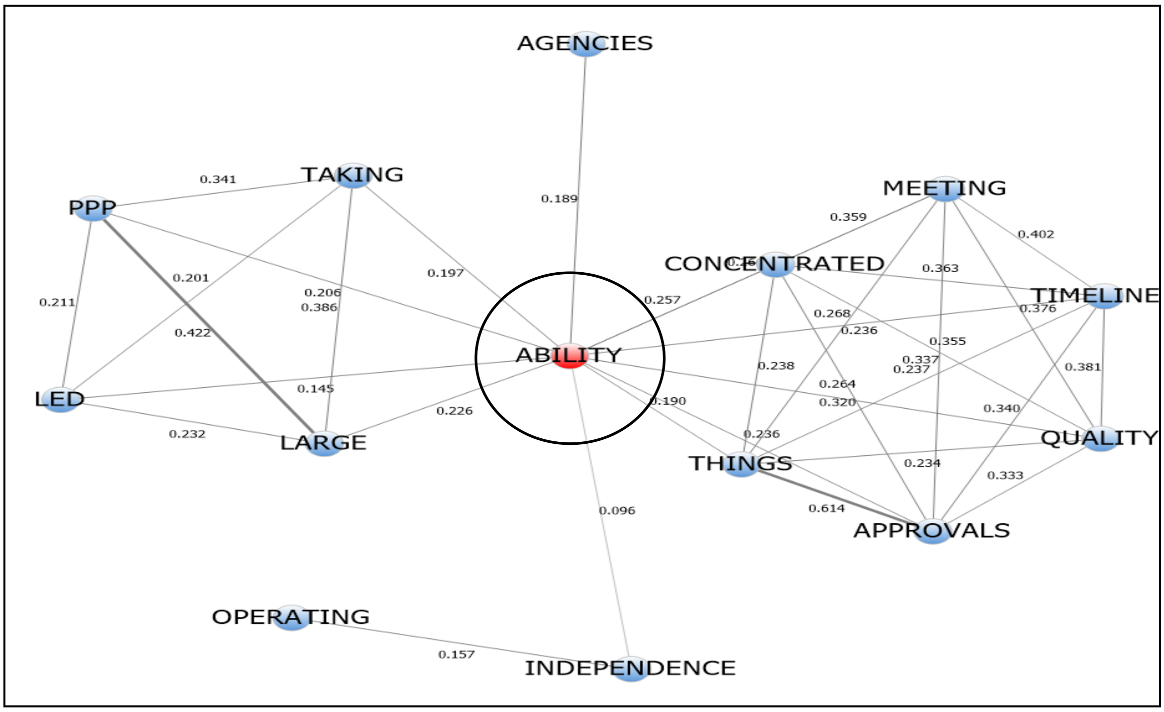


APPENDIX K – COLOUR CLUSTERS (1-6)

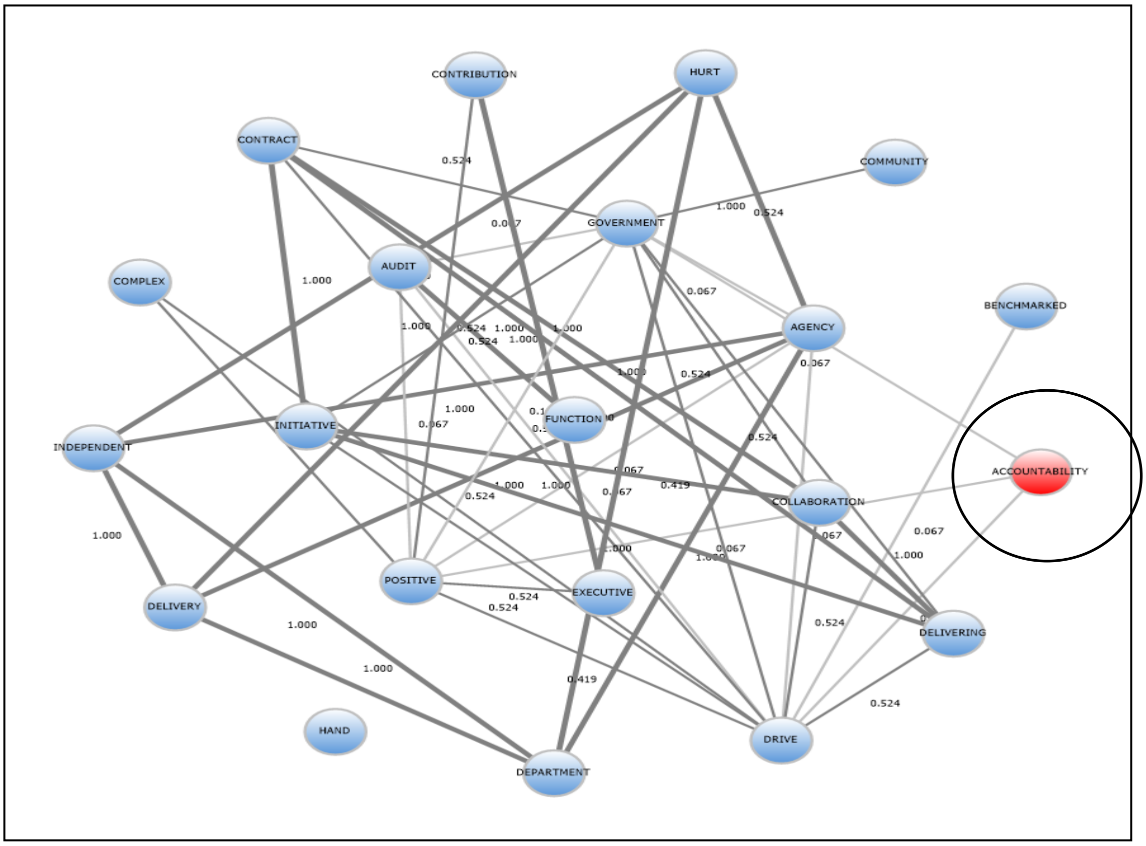
Cluster 1 –Dominant key word - Advice



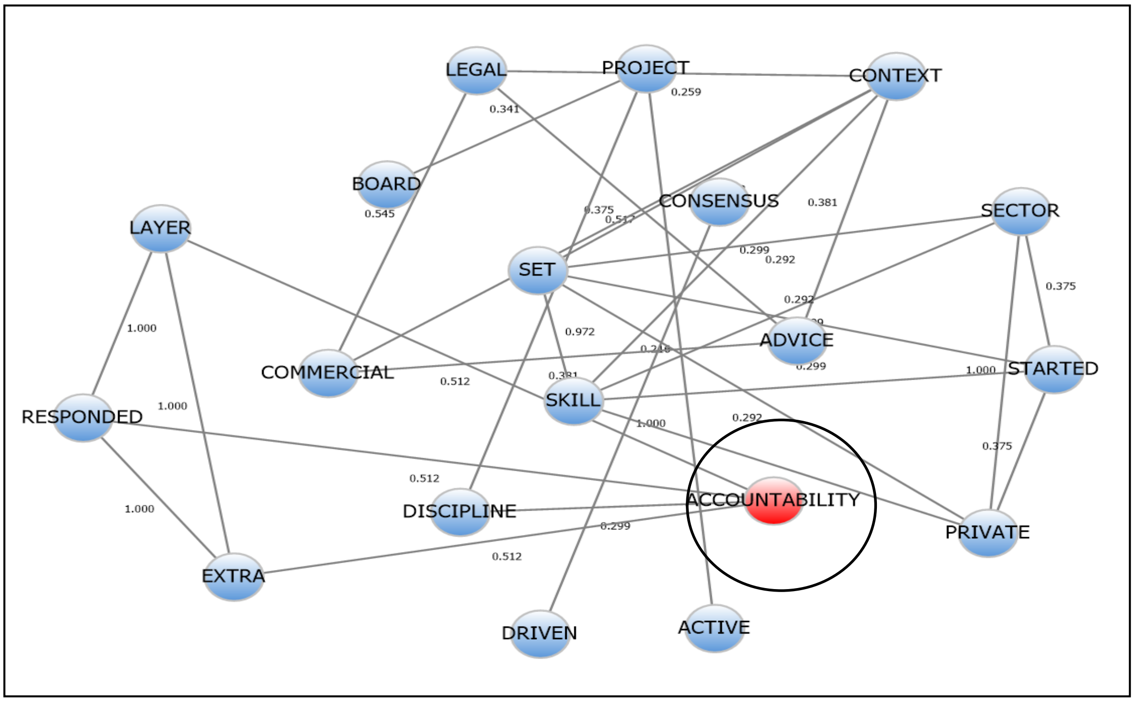
Cluster 2 - Dominant key word - Ability



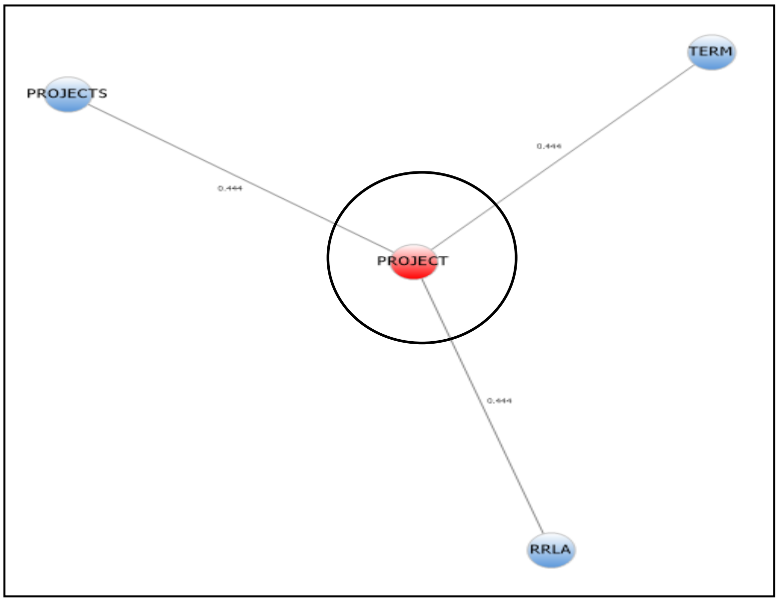
Cluster 3 – Dominant key word - Accountability



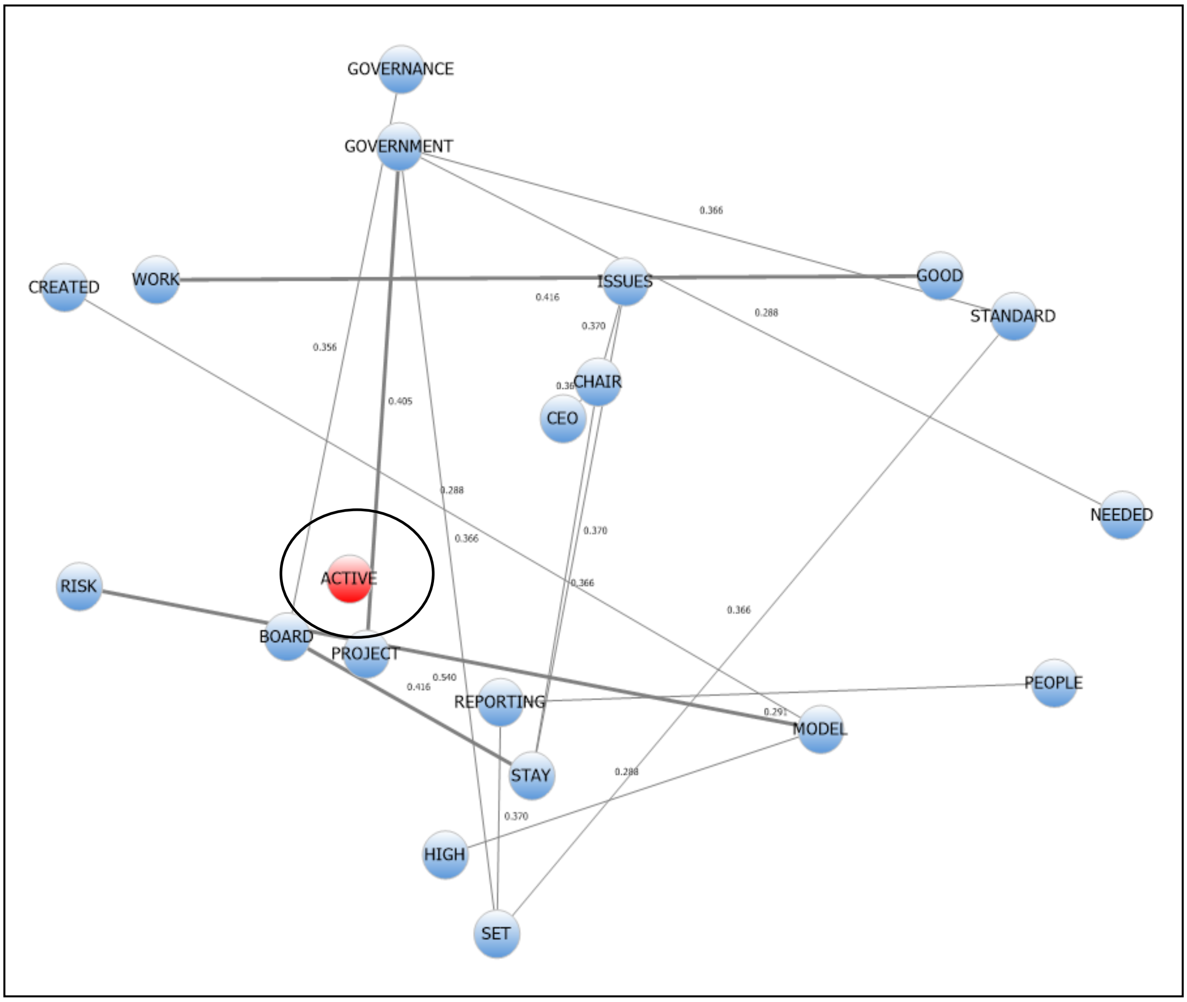
Cluster 4 - Dominant key word – Accountability



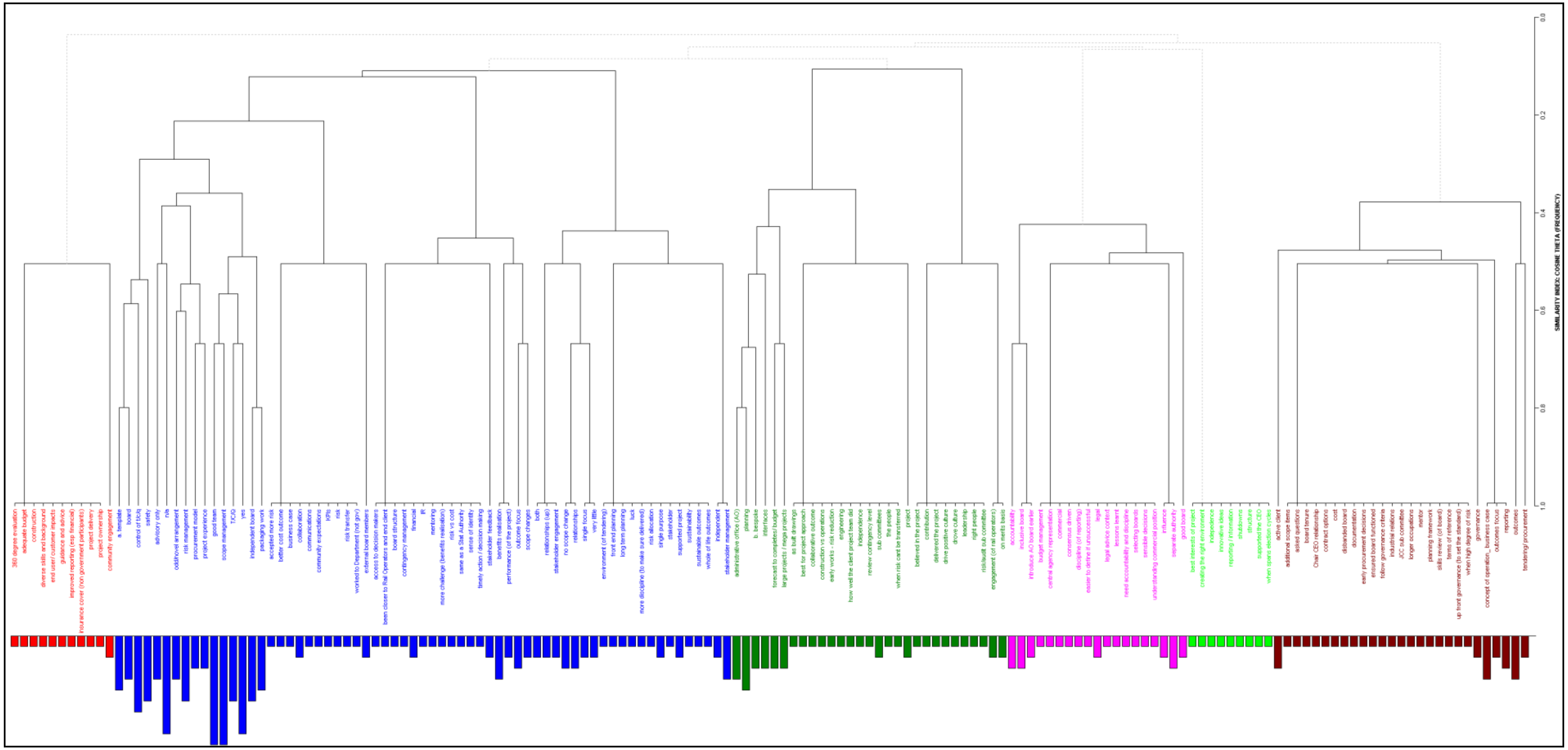
Cluster 5 – Dominant key word – Project

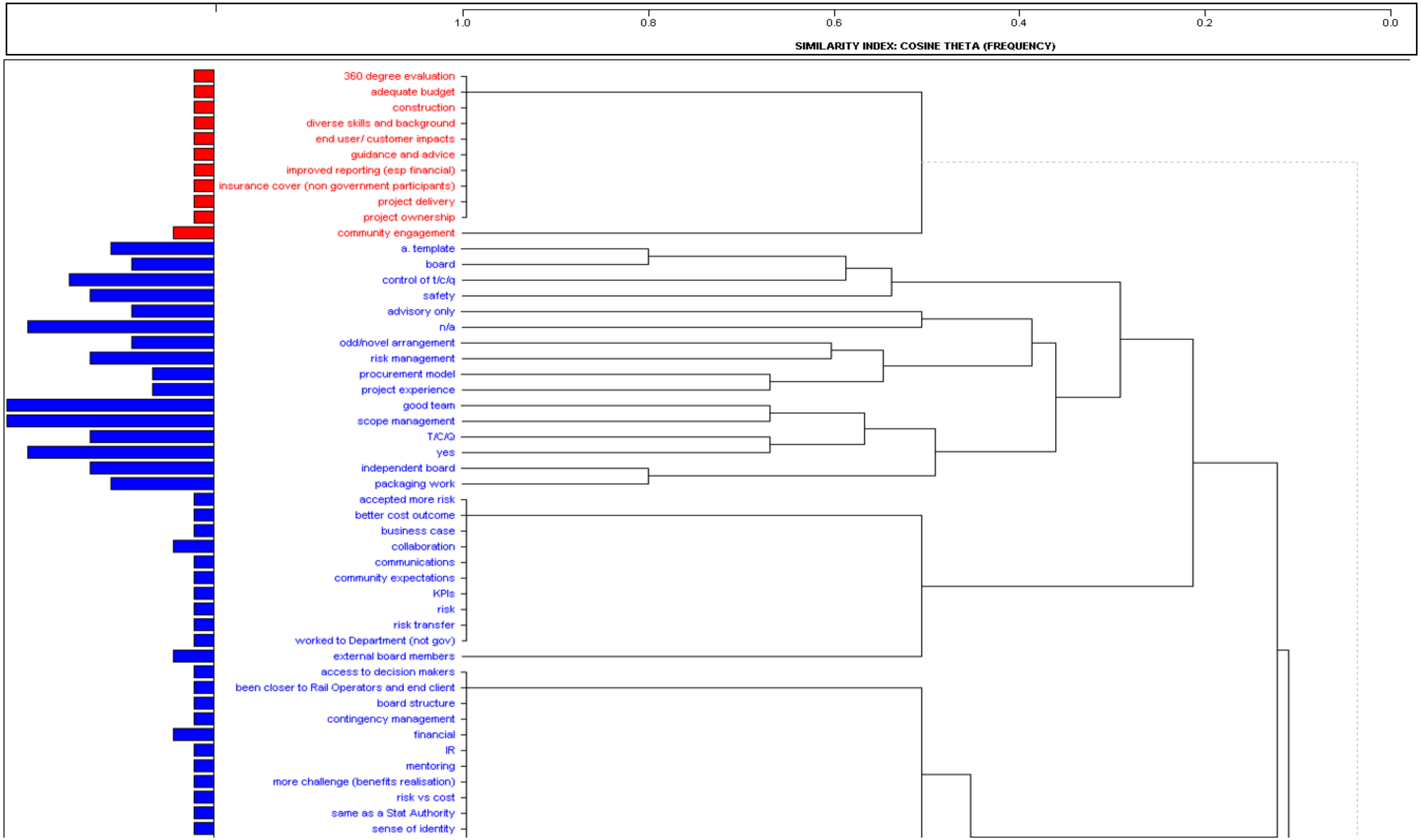


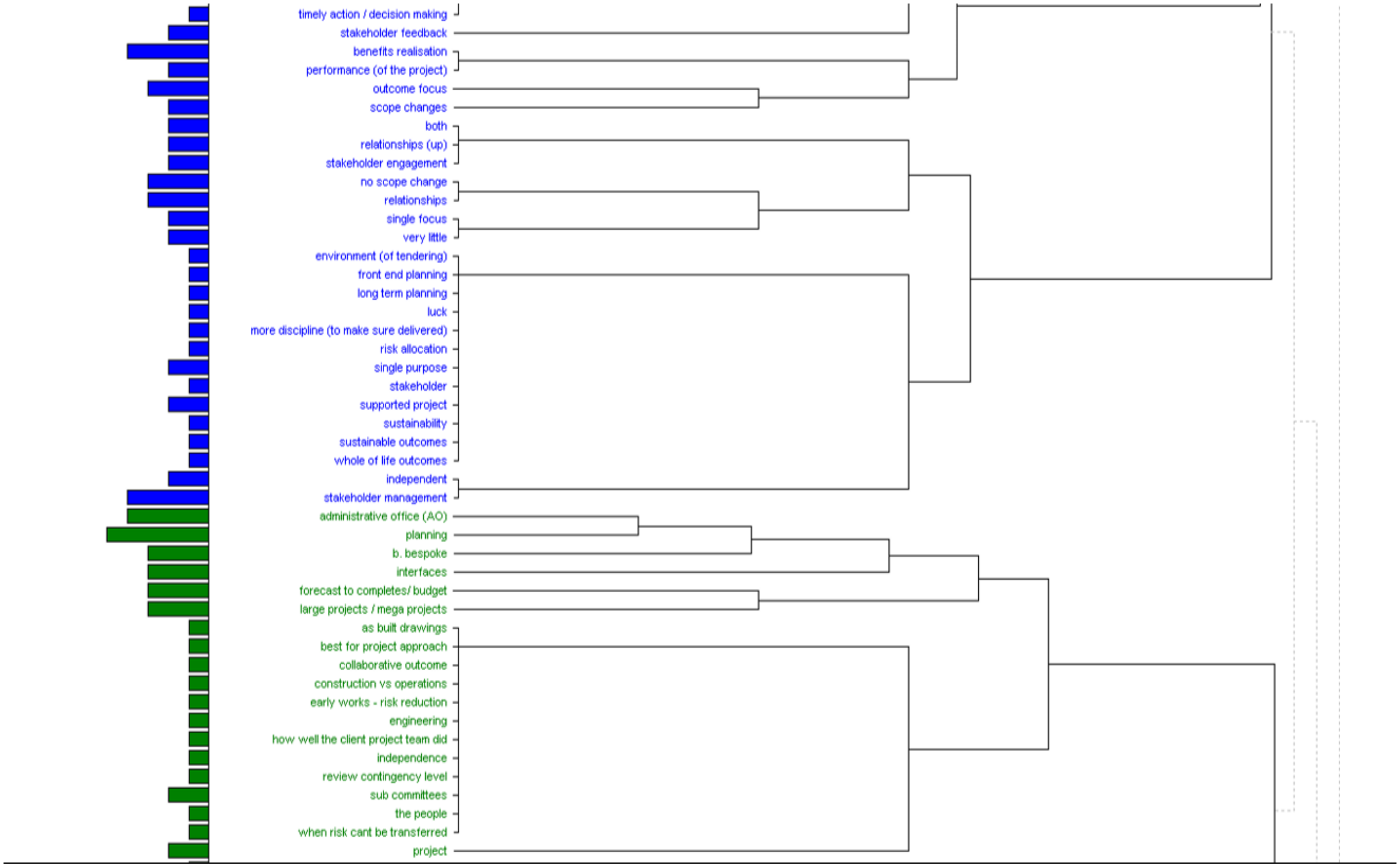
Cluster 6 –Dominant key word - Active

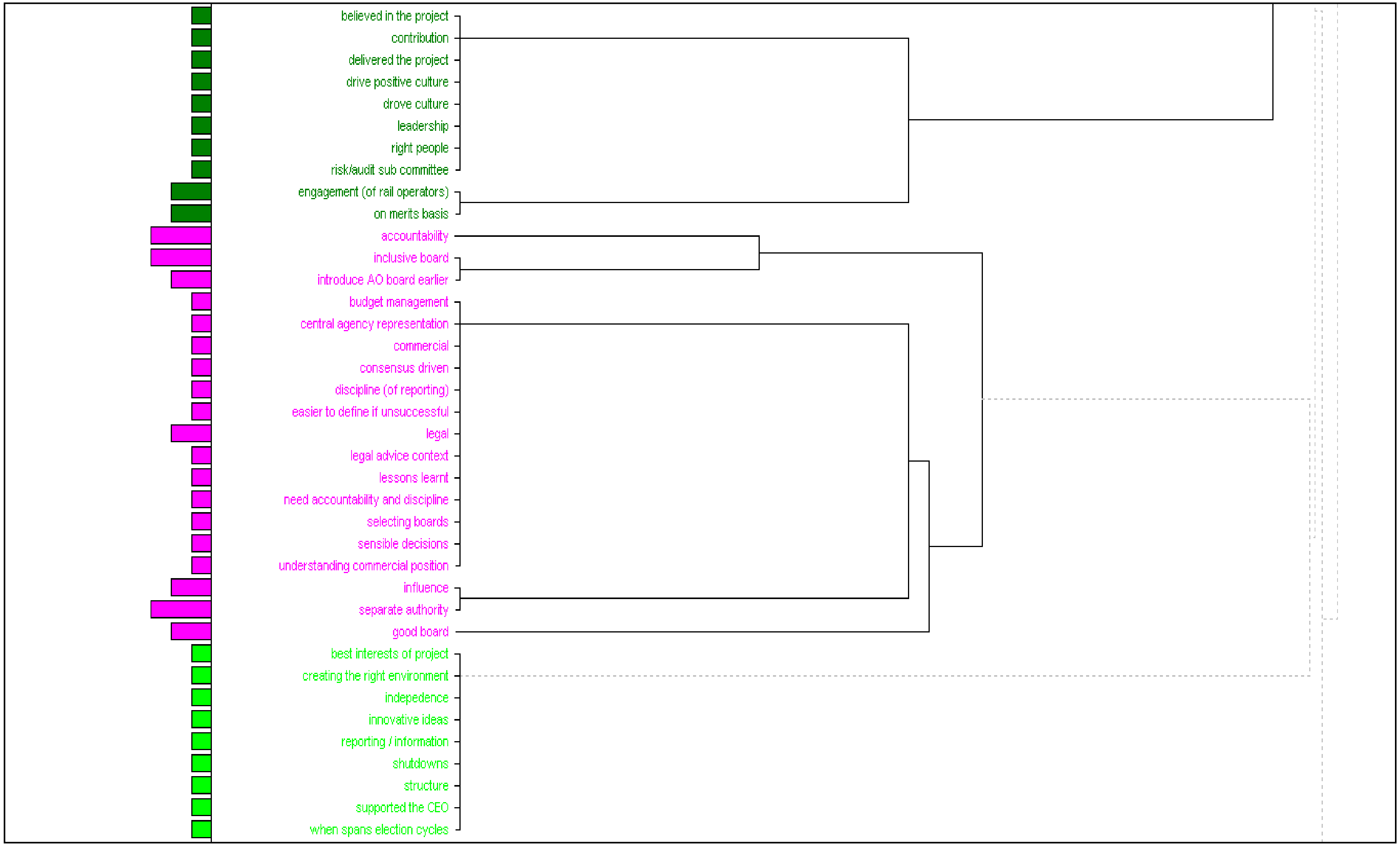


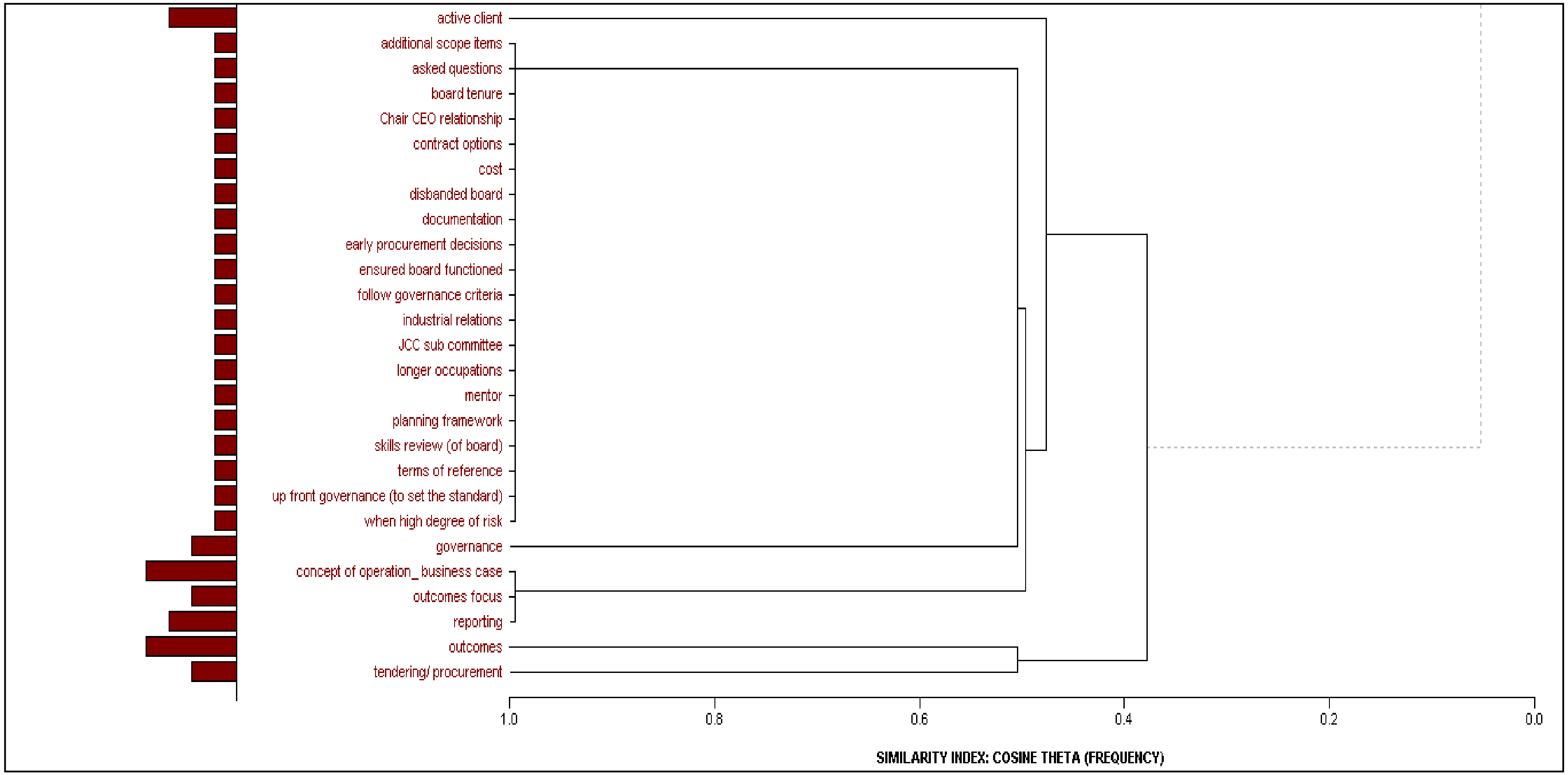
APPENDIX L – OVERVIEW AND DETAILED BREAKDOWN OF CODING CO-OCCURRENCE DENDROGRAM (COLOUR CODED, WITHIN CASE, INDEX COSINE THETA)




1.0
0.8
0.6
0.4
0.2
0.0
SIMILARITY INDEX: COSINE THETA (FREQUENCY)
360 degree evaluation
adequate budget
construction
diverse skills and background
end user/ customer impacts
guidance and advice
improved reporting (esp financial)
insurance cover (non government participants)
project delivery
project ownership
community engagement
a. template
board
control of t/c/q
safety
advisory only
n/a
odd/novel arrangement
risk management
procurement model
project experience
good team
scope management
T/C/Q
yes
independent board
packaging work
accepted more risk
better cost outcome
business case
collaboration
communications
community expectations
KPIs
risk
risk transfer
worked to Department (not gov)
external board members
access to decision makers
been closer to Rail Operators and end client
board structure
contingency management
financial
IR
mentoring
more challenge (benefits realisation)
risk vs cost
same as a Stat Authority
sense of identity


timely action / decision making
stakeholder feedback
benefits realisation
performance (of the project)
outcome focus
scope changes
both
relationships (up)
stakeholder engagement
no scope change
relationships
single focus
very little
environment (of tendering)
front end planning
long term planning
luck
more discipline (to make sure delivered)
risk allocation
single purpose
stakeholder
supported project
sustainability
sustainable outcomes
whole of life outcomes
independent
stakeholder management
administrative office (AO)
planning
b. bespoke
interfaces
forecast to completes/ budget
large projects / mega projects
as built drawings
best for project approach
collaborative outcome
construction vs operations
early works - risk reduction
engineering
how well the client project team did
independence
review contingency level
sub committees
the people
when risk cant be transferred
project


believed in the project
contribution
delivered the project
drive positive culture
drove culture
leadership
right people
risk/audit sub committee
engagement (of rail operators)
on merits basis
accountability
inclusive board
introduce AO board earlier
budget management
central agency representation
commercial
consensus driven
discipline (of reporting)
easier to define if unsuccessful
legal
legal advice context
lessons learnt
need accountability and discipline
selecting boards
sensible decisions
understanding commercial position
influence
separate authority
good board
best interests of project
creating the right environment
indepedence
innovative ideas
reporting / information
shutdowns
structure
supported the CEO
when spans election cycles


active client
additional scope items
asked questions
board tenure
Chair CEO relationship
contract options
cost
disbanded board
documentation
early procurement decisions
ensured board functioned
follow governance criteria
industrial relations
JCC sub committee
longer occupations
mentor
planning framework
skills review (of board)
terms of reference
up front governance (to set the standard)
when high degree of risk
governance
concept of operation_ business case
outcomes focus
reporting
outcomes
tendering/ procurement
1.0
0.8
0.6
0.4
0.2
0.0
SIMILARITY INDEX: COSINE THETA (FREQUENCY)

APPENDIX M – CONSOLIDATED LIST OF THE 19 OBSERVATIONS AND 8 PROJECT PERSPECTIVES

#	observation
1	4 conceptual clusters that the board focused on throughout the project lifecycle: 1). Status, 2). Administrative, 3). Outcome and 4). Obligations
2	The board's focus changed during the lifecycle of the project, but the overall bulk of the effort was on the monitoring the status of the project
3	an ongoing and consistent approach to project governance, across the lifecycle, is a core attribute of project success
4	stability of board membership across the lifecycle occurred. It is unclear, however, if this stability had a direct impact on the project governance success
5	the reporting requirements on the governance arrangement was consistent across the life of the project
6	the project governance arrangements changed to meet the needs of the project over its life. This was triggered by risk, especially the change to the project environment
7	(as identified in Observation 1), the four clusters represented the core issues the board required for the project governance, and ultimately the project, to be successful
8	Safety was one of the most significant key management metrics for the board
9	Use of a subcommittee was an effective risk control function
10	Consistent and regular risk reporting is an essential project governance function for a project board. A culture of consistent and open reporting, via escalation is a key activity of the project board
11	Regular risk review is a key project governance activity. Categorising risk as 'areas of concern' and escalating those risk that 'require attention' provided the board with different treatment options and priorities
12	Risk management is an activity that was present across the entire project lifecycle
13	Risks identified later in the delivery stage tended not to be resolved in a timely manner, and continued to require ongoing board attention
14	There is a significant overlap between principles of project governance and corporate governance. Whereas a megaproject is time bound, the project's output forms part of an organisation's new (or ongoing) corporate governance operation
15	The project governance structure adopted by this megaproject was novel. There was a Head of the organisation, and the board were engaged as a technical advisor to the Head. The board did not have traditional corporate governance responsibilities associated with a corporate governance board
16	The skill sets of the project board were diverse and addressed skills relevant to the project. Skills included construction, engineering, transport (rail) experience, government relations, financial/cost management, and stakeholder relations
17	Dominant keywords regarding the project governance resulted in 5 key areas of *Ability, Advice, Accountability, Project and Active*.

#	**observation**
18	The board members responses had a high similar index score confirming the success of the project governance, but also showed there were both divergent and complimentary responses to the 12 questions. This supports the corporate governance view that a balanced project board requires a variety of skill sets, including some with specific expertise and skillsets
19	The biggest contributions that the project board identified related to managing the cost forecast, managing stakeholders, safety and introducing a collaborative approach between all parties involved in the project
	Project perspectives
p1	An *informed client* – a project team with the right mix of public and private industry experience
p2	Adoption of a *facilitation role* in relation to issue resolution, regardless of where formal responsibility for the risk lay
p3	*Collaborative partnerships* with all stakeholders, particularly Public Transport Victoria and rail operators to agree firm functional and operational specifications to document relatively detailed preliminary design and scope of works as the basis for well defined, competitive bids.
p4	Development of *a Strategic Procurement Plan* and process that minimised risks (including market capacity, market competitiveness and industrial relations) and facilitated staged benefit realisation
p5	Leading the way for all parties in relation to *safety management*
p6	A *robust approach to risk* and change management, whilst remaining focussed on the pragmatic, timely resolution of contractual issues to ensure the focus remained on delivery of the works
p7	*Taking stakeholders on the journey* to challenge ‘business as usual’ approaches, actively developing solutions to problems which resulted in acceptance of more efficient, longer term rail occupations
p8	Development of the *Coordination & Interface Deed* for the JCC, driving a high performance and adopting a ‘*best for project*’ decision-making culture amongst all work packages

APPENDIX N – BOARD RESPONSES TO QUESTIONS

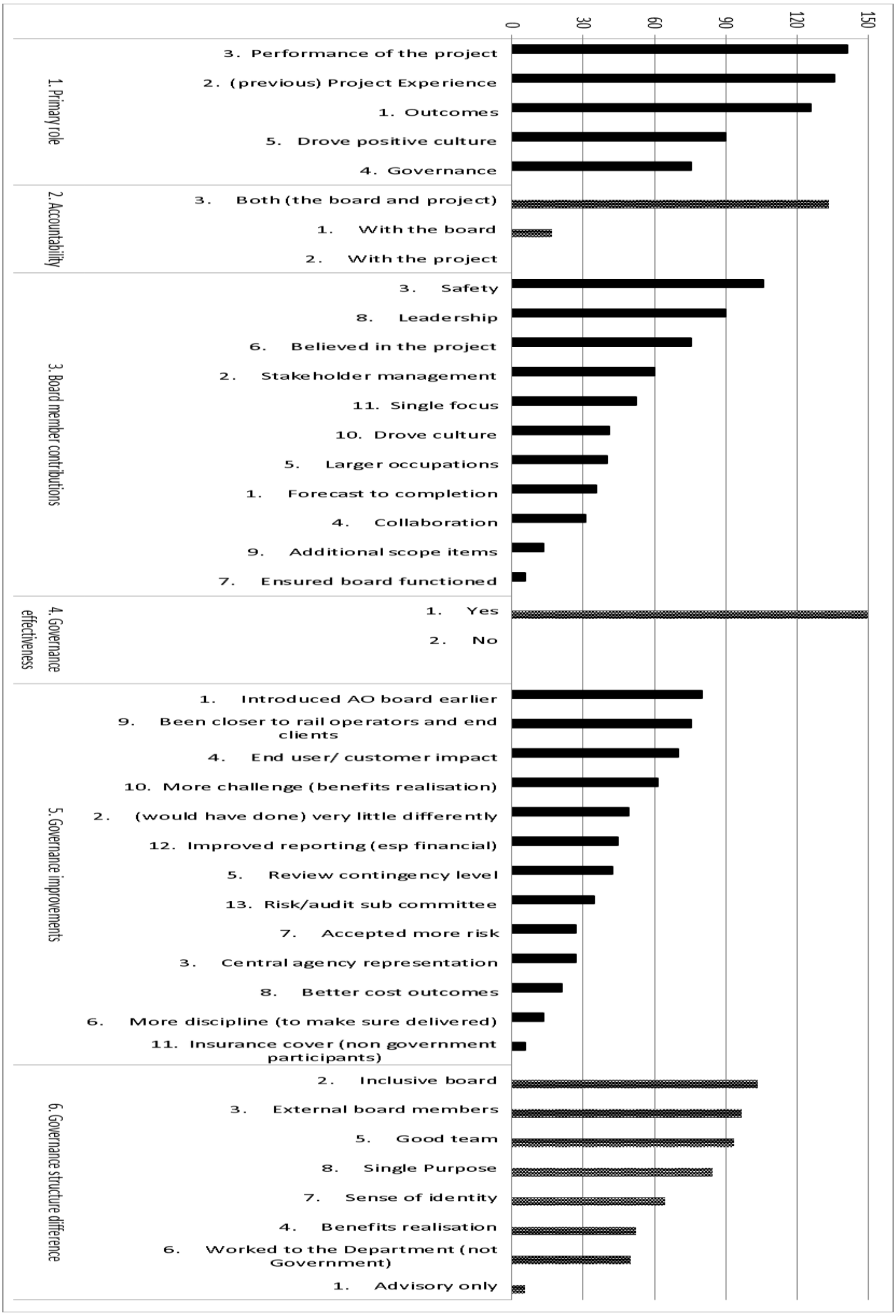
Dimension	Indicators	AVG Rating	EI (150)	VI (140)	RI (120)	SI (90)	NI (50)	Not Rated(0)
Primary role	1. Outcomes	135.56	66.67%	11.11%	0.00%	22.22%	0.00%	0.00%
	2. (previous) Project Experience	75.56	11.11%	11.11%	0.00%	11.11%	66.67%	0.00%
	3. Performance of the project	141.11	33.33%	55.56%	11.11%	0.00%	0.00%	0.00%
	4. Governance	90	22.22%	0.00%	0.00%	44.44%	33.33%	0.00%
	5. Drove positive culture	125.56	11.11%	11.11%	77.78%	0.00%	0.00%	0.00%
Accountability	1. With the board	16.67	11.11%	0.00%	0.00%	0.00%	0.00%	88.89%
	2. With the project	0	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	3. Both (the board and project)	133.33	88.89%	0.00%	0.00%	0.00%	0.00%	11.11%
Board member contributions	1. Forecast to completion	35.56	0.00%	11.11%	0.00%	22.22%	0.00%	66.67%
	2. Stakeholder management	60	22.22%	0.00%	0.00%	11.11%	33.33%	33.33%
	3. Safety	105.56	33.33%	11.11%	33.33%	0.00%	0.00%	22.22%
	4. Collaboration	31.11	0.00%	11.11%	0.00%	11.11%	11.11%	66.67%
	5. Larger occupations	40	0.00%	11.11%	11.11%	0.00%	22.22%	55.56%
	6. Believed in the project	75.56	33.33%	11.11%	0.00%	11.11%	0.00%	44.44%
	7. Ensured board functioned	5.56	0.00%	0.00%	0.00%	0.00%	11.11%	88.89%
	8. Leadership	90	11.11%	33.33%	22.22%	0.00%	0.00%	33.33%
	9. Additional scope items	13.33	0.00%	0.00%	11.11%	0.00%	0.00%	88.89%
	10. Drove culture	41.11	0.00%	11.11%	0.00%	22.22%	11.11%	55.56%
	11. Single focus	52.22	0.00%	0.00%	22.22%	22.22%	11.11%	44.44%
Governance effectiveness	1. Yes	150	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	2. No	0	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Governance improvements	1. Introduced AO board earlier	80	44.44%	0.00%	11.11%	0.00%	0.00%	44.44%
	2. (would have done) very little differently	48.89	22.22%	11.11%	0.00%	0.00%	0.00%	66.67%
	3. Central agency representation	26.67	0.00%	11.11%	0.00%	0.00%	22.22%	66.67%
	4. End user/ customer impact	70	0.00%	33.33%	11.11%	11.11%	0.00%	44.44%
	5. Review contingency level	42.22	0.00%	11.11%	22.22%	0.00%	0.00%	66.67%
	6. More discipline (to make sure delivered)	13.33	0.00%	0.00%	11.11%	0.00%	0.00%	88.89%
	7. Accepted more risk	26.67	11.11%	0.00%	0.00%	11.11%	0.00%	77.78%

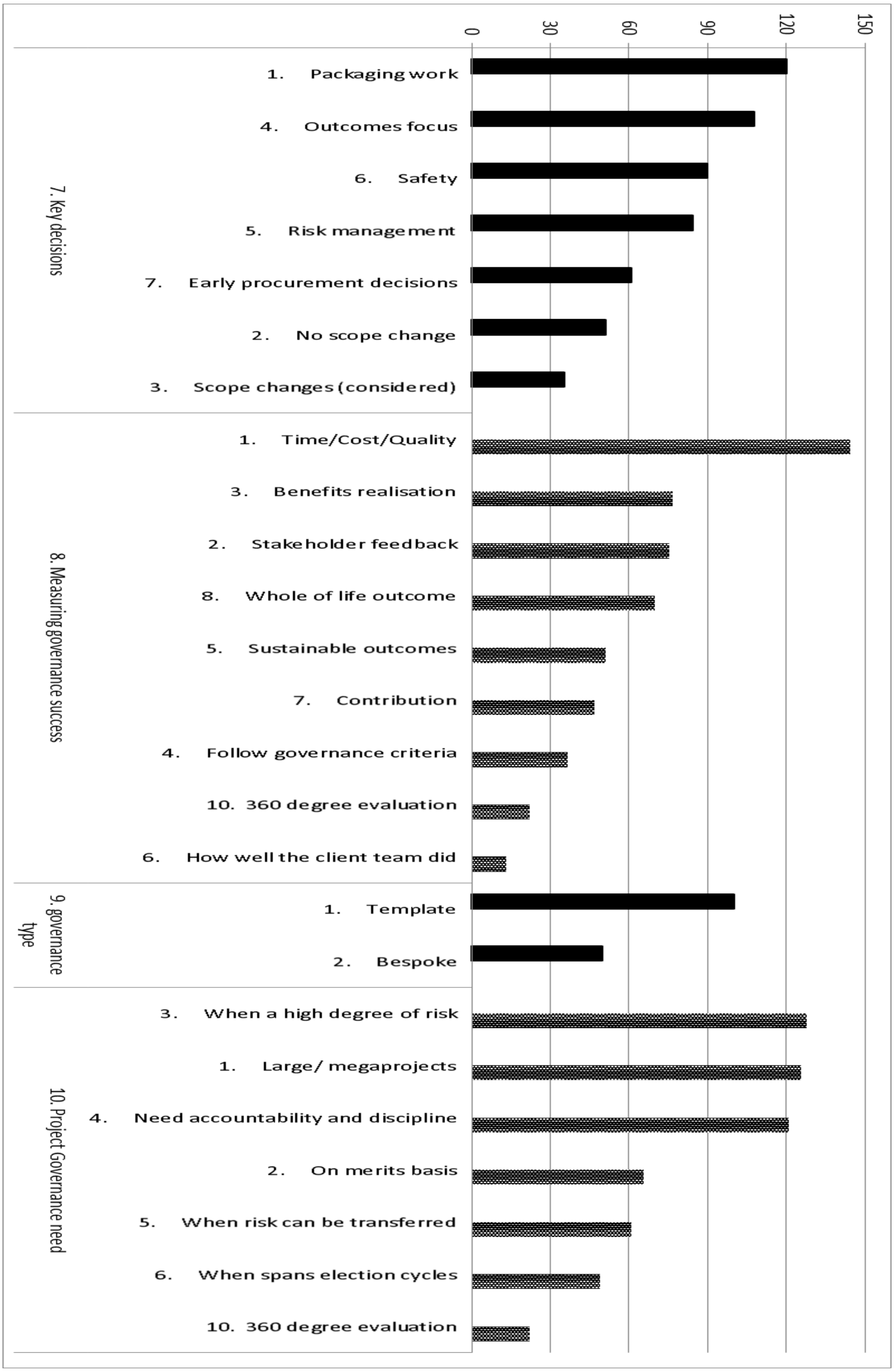
Dimension	Indicators	AVG Rating	EI (150)	VI (140)	RI (120)	SI (90)	NI (50)	Not Rated(0)
	8. Better cost outcomes	21.11	0.00%	11.11%	0.00%	0.00%	11.11%	77.78%
	9. Been closer to rail operators and end clients	75.56	11.11%	11.11%	11.11%	33.33%	0.00%	33.33%
	10.More challenge (benefits realisation)	61.11	11.11%	0.00%	11.11%	22.22%	22.22%	33.33%
	11.Insurance cover (non-government participants)	5.56	0.00%	0.00%	0.00%	0.00%	11.11%	88.89%
	12.Improved reporting (esp. financial)	44.44	0.00%	11.11%	11.11%	11.11%	11.11%	55.56%
	13.Risk/ audit sub committee	34.44	0.00%	0.00%	11.11%	11.11%	22.22%	55.56%
Governance structure difference	1. Advisory only	5.56	0.00%	0.00%	0.00%	0.00%	11.11%	88.89%
	2. Inclusive board	103.33	22.22%	33.33%	11.11%	11.11%	0.00%	22.22%
	3. External board members	96.67	22.22%	22.22%	22.22%	0.00%	11.11%	22.22%
	4. Benefits realisation	52.22	11.11%	0.00%	0.00%	33.33%	11.11%	44.44%
	5. Good team	93.33	22.22%	11.11%	11.11%	22.22%	22.22%	11.11%
	6. Worked to the Department (not Government)	50	11.11%	0.00%	11.11%	22.22%	0.00%	55.56%
	7. Sense of identity	64.44	0.00%	11.11%	22.22%	0.00%	44.44%	22.22%
	8. Single Purpose	84.44	11.11%	22.22%	22.22%	11.11%	0.00%	33.33%
Key decisions	1. Packaging work	120	22.22%	22.22%	33.33%	11.11%	11.11%	0.00%
	2. No scope change	51.11	11.11%	11.11%	11.11%	0.00%	11.11%	55.56%
	3. Scope changes (considered)	35.56	0.00%	11.11%	0.00%	22.22%	0.00%	66.67%
	4. Outcomes focus	107.78	33.33%	0.00%	22.22%	22.22%	22.22%	0.00%
	5. Risk management	84.44	11.11%	33.33%	0.00%	11.11%	22.22%	22.22%
	6. Safety	90	11.11%	11.11%	22.22%	22.22%	22.22%	11.11%
	7. Early procurement decisions	61.11	11.11%	11.11%	11.11%	11.11%	11.11%	44.44%
Measuring governance success	1. Time/Cost/Quality	144.44	66.67%	22.22%	11.11%	0.00%	0.00%	0.00%
	2. Stakeholder feedback	75.56	0.00%	11.11%	11.11%	33.33%	33.33%	11.11%
	3. Benefits realisation	76.67	11.11%	33.33%	11.11%	0.00%	0.00%	44.44%
	4. Follow governance criteria	36.67	0.00%	22.22%	0.00%	0.00%	11.11%	66.67%
	5. Sustainable outcomes	51.11	0.00%	0.00%	33.33%	0.00%	22.22%	44.44%
	6. How well the client team did	13.33	0.00%	0.00%	11.11%	0.00%	0.00%	88.89%

Dimension	**Indicators**	**AVG Rating**	**EI (150)**	**VI (140)**	**RI (120)**	**SI (90)**	**NI (50)**	**Not Rated(0)**
	7. Contribution	46.67	11.11%	0.00%	0.00%	33.33%	0.00%	55.56%
	8. Whole of life outcome	70	0.00%	11.11%	11.11%	33.33%	22.22%	22.22%
	9. Easier to define if unsuccessful	13.33	0.00%	0.00%	11.11%	0.00%	0.00%	88.89%
	10.360-degree evaluation	22.22	11.11%	0.00%	0.00%	0.00%	11.11%	77.78%
Project Governance need	1. Large/ megaprojects	125.56	55.56%	0.00%	22.22%	11.11%	11.11%	0.00%
	2. On merits basis	65.56	0.00%	11.11%	11.11%	22.22%	33.33%	22.22%
	3. When a high degree of risk	127.78	11.11%	55.56%	11.11%	22.22%	0.00%	0.00%
	4. Need accountability and discipline	121.11	11.11%	22.22%	44.44%	22.22%	0.00%	0.00%
	5. When risk can be transferred	61.11	11.11%	0.00%	11.11%	22.22%	22.22%	33.33%
	6. When spans election cycles	48.89	11.11%	11.11%	0.00%	0.00%	33.33%	44.44%
Relevant governance improvements	1. Selecting boards	133.33	88.89%	0.00%	0.00%	0.00%	0.00%	11.11%
	2. Project ownership	116.67	77.78%	0.00%	0.00%	0.00%	0.00%	22.22%
	3. Project delivery / structure	100	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%
	4. Risk vs cost	133.33	88.89%	0.00%	0.00%	0.00%	0.00%	11.11%
	5. Independent	100	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%
	6. Disband board (when not needed)	66.67	44.44%	0.00%	0.00%	0.00%	0.00%	55.56%
	7. Skills review (of board)	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	8. Chair-CEO relationship	133.33	88.89%	0.00%	0.00%	0.00%	0.00%	11.11%
	9. Front end planning	150	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	10. Long term planning	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	11. Collaborative outcome	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	Construction vs operations	100	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%
	13.As built drawings	16.67	11.11%	0.00%	0.00%	0.00%	0.00%	88.89%
	14. Reporting	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	15. Right people	116.67	77.78%	0.00%	0.00%	0.00%	0.00%	22.22%
	16. Business case	100	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%
	17. Risk transfer	100	66.67%	0.00%	0.00%	0.00%	0.00%	33.33%
	18. KPIs	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	19. Community expectations	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	20. Board structure	83.33	55.56%	0.00%	0.00%	0.00%	0.00%	44.44%
	1. Planning	90	22.22%	33.33%	0.00%	11.11%	0.00%	33.33%

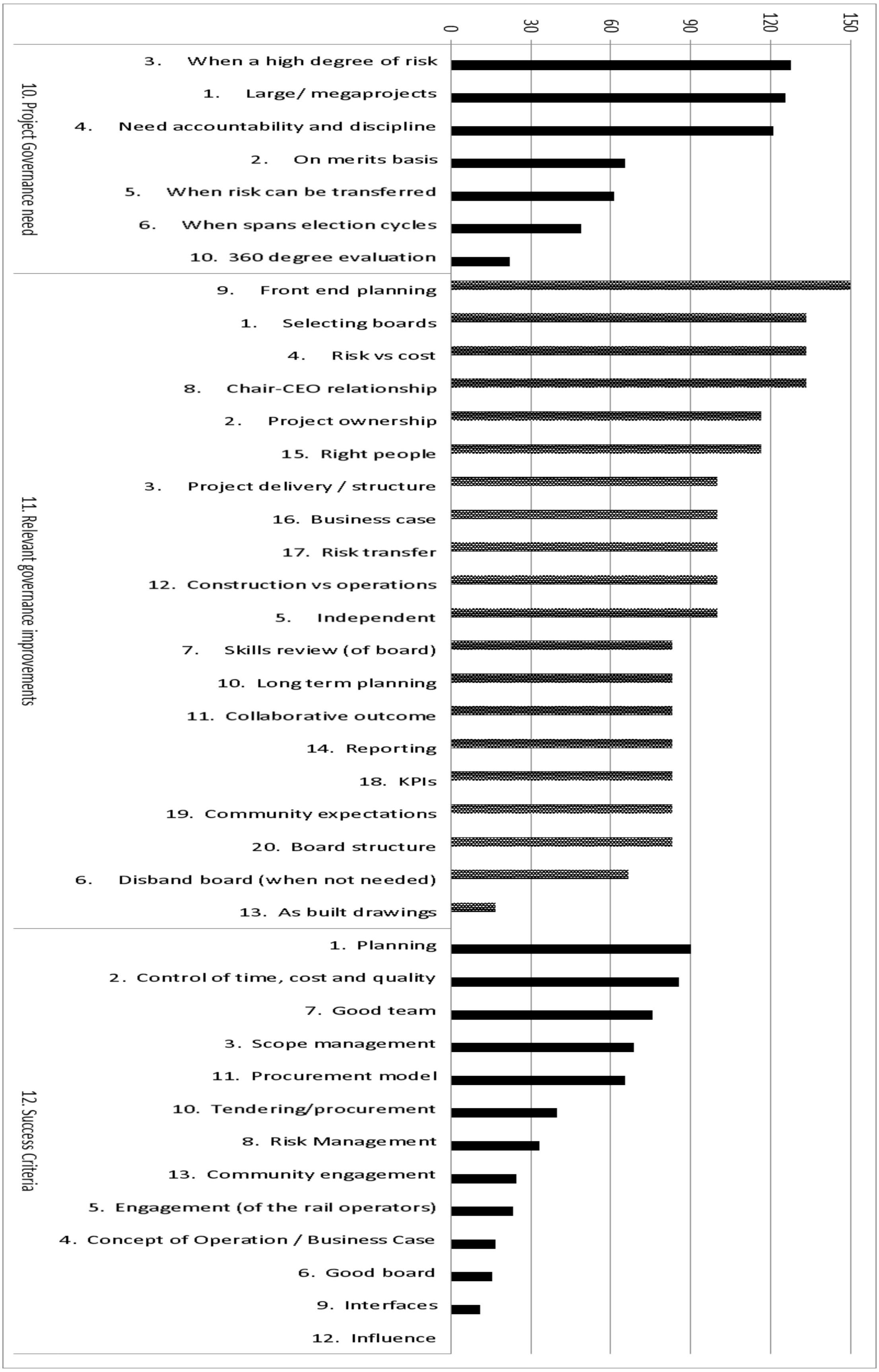
Dimension	Indicators	AVG Rating	EI (150)	VI (140)	RI (120)	SI (90)	NI (50)	Not Rated(0)
Success Criteria	2. Control of time, cost and quality	85.56	11.11%	0.00%	44.44%	11.11%	11.11%	22.22%
	3. Scope management	68.89	11.11%	33.33%	0.00%	0.00%	11.11%	44.44%
	4. Concept of Operation / Business Case	16.67	11.11%	0.00%	0.00%	0.00%	0.00%	88.89%
	5. Engagement (of the rail operators)	23.33	0.00%	0.00%	11.11%	11.11%	0.00%	77.78%
	6. Good board	15.56	0.00%	0.00%	0.00%	11.11%	11.11%	77.78%
	7. Good team	75.56	33.33%	11.11%	0.00%	11.11%	0.00%	44.44%
	8. Risk Management	33.33	0.00%	0.00%	11.11%	22.22%	0.00%	66.67%
	9. Interfaces	11.11	0.00%	0.00%	0.00%	0.00%	22.22%	77.78%
	10. Tendering/ procurement	40	0.00%	11.11%	11.11%	0.00%	22.22%	55.56%
	11. Procurement model	65.56	11.11%	11.11%	11.11%	22.22%	0.00%	44.44%
	12. Influence	0	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
	13. Community engagement	24.44	0.00%	0.00%	11.11%	0.00%	22.22%	66.67%

APPENDIX O – CQV RANKING OF INDICATOR BY DIMENSION





0
30
60
90
120
150
7. Key decisions
1. Packaging work
4. Outcomes focus
6. Safety
5. Risk management
7. Early procurement decisions
2. No scope change
3. Scope changes (considered)
8. Measuring governance success
1. Time/Cost/Quality
3. Benefits realisation
2. Stakeholder feedback
8. Whole of life outcome
5. Sustainable outcomes
7. Contribution
4. Follow governance criteria
10. 360 degree evaluation
6. How well the client team did
9. governance type
1. Template
2. Bespoke
10. Project Governance need
3. When a high degree of risk
1. Large/ megaprojects
4. Need accountability and discipline
2. On merits basis
5. When risk can be transferred
6. When spans election cycles
10. 360 degree evaluation


0
30
60
90
120
150
10. Project Governance need
3. When a high degree of risk
1. Large/ megaprojects
4. Need accountability and discipline
2. On merits basis
5. When risk can be transferred
6. When spans election cycles
10. 360 degree evaluation
11. Relevant governance improvements
9. Front end planning
1. Selecting boards
4. Risk vs cost
8. Chair-CEO relationship
2. Project ownership
15. Right people
3. Project delivery / structure
16. Business case
17. Risk transfer
12. Construction vs operations
5. Independent
7. Skills review (of board)
10. Long term planning
11. Collaborative outcome
14. Reporting
18. KPIs
19. Community expectations
20. Board structure
6. Disband board (when not needed)
13. As built drawings
12. Success Criteria
1. Planning
2. Control of time, cost and quality
7. Good team
3. Scope management
11. Procurement model
10. Tendering/procurement
8. Risk Management
13. Community engagement
5. Engagement (of the rail operators)
4. Concept of Operation / Business Case
6. Good board
9. Interfaces
12. Influence

APPENDIX P – CQV AND IMPORTANCE BY QUARTILE

	Dimension	Indicator	Consensus	Importance (Mean)
Quarter 2 - above average (CQV, Importance)	1. Primary role	5. Drove positive culture	0.00	125.56
	2. accountability	3. Both (the board and project)	0.00	133.33
	4. Governance effectiveness	1. Yes	0.00	150.00
	11. Relevant governance improvements	9. Front end planning	0.00	150.00
	11. Relevant governance improvements	1. Selecting boards	0.00	133.33
	11. Relevant governance improvements	4. Risk vs cost	0.00	133.33
	11. Relevant governance improvements	8. Chair-CEO relationship	0.00	133.33
	11. Relevant governance improvements	2. Project ownership	0.00	116.67
	11. Relevant governance improvements	15.Right people	0.00	116.67
	1. Primary role	3. Performance of the project	0.03	141.11
	1. Primary role	1. Outcomes	0.03	135.56
	8. measuring governance success	1. Time/Cost/Quality	0.03	144.44
	7. key decisions	1. Packaging work	0.08	120.00
	10. project governance need	3. When a high degree of risk	0.08	127.78
	10. project governance need	4. Need 2. accountability and discipline	0.08	121.11
	3. Board member contributions	3. Safety	0.11	105.56
	10. project governance need	1. Large/ megaprojects	0.11	125.56
	6. governance structure difference	2. Inclusive board	0.22	103.33
	7. key decisions	4. Outcomes focus	0.25	107.78
	1. Primary role	4. Governance	0.29	90.00
	1. Primary role	2. (previous) Project Experience	0.29	75.56
	8. measuring governance success	2. Stakeholder feedback	0.29	75.56
	8. measuring governance success	8. Whole of life outcome	0.29	70.00
Quarter 2 - below average (CQV, Importance)	8. measuring governance success	3. Benefits realisation	0.41	64.44
	11. Relevant governance improvements	6. Disband board (when not needed)	1.00	66.67
	12. success criteria	11. Procurement model	1.00	65.56
	5. Governance improvements	10.More challenge (benefits realisation)	1.00	61.11
	7. key decisions	7. Early procurement decisions	1.00	61.11
	10. project governance need	5. When risk can be transferred	1.00	61.11
	3. Board member contributions	2. Stakeholder management	1.00	60.00

	Dimension	Indicator	Consensus	Importance (Mean)
	3. Board member contributions	11. Single focus	1.00	52.22
	6. governance structure difference	4. Benefits realisation	1.00	52.22
	7. key decisions	2. No scope change	1.00	51.11
	8. measuring governance success	5. Sustainable outcomes	1.00	51.11
	4. Governance – template or bespoke	2. Bespoke	1.00	50.00
	6. governance structure difference	6. Worked to the Department (not Government)	1.00	50.00
	5. Governance improvements	2. would have done) very little differently	1.00	48.89
	10. project governance need	6. When spans election cycles	1.00	48.89
	8. measuring governance success	7. Contribution	1.00	46.67
	5. Governance improvements	12.Improved reporting (esp. financial)	1.00	44.44
	5. Governance improvements	5. Review contingency level	1.00	42.22
	3. Board member contributions	10. Drove culture	1.00	41.11
	3. Board member contributions	5. Larger occupations	1.00	40.00
	12. success criteria	10. Tendering/procurement	1.00	40.00
	8. measuring governance success	4. Follow governance criteria	1.00	36.67
	3. Board member contributions	1. Forecast to completion	1.00	35.56
	7. key decisions	3. Scope changes (considered)	1.00	35.56
	5. Governance improvements	13.Risk/audit sub committee	1.00	34.44
	12. success criteria	8. Risk Management	1.00	33.33
	3. Board member contributions	4. Collaboration	1.00	31.11
	5. Governance improvements	3. Central agency representation	1.00	26.67
	5. Governance improvements	7. Accepted more risk	Nil	26.67
	12. success criteria	13. Community engagement	1.00	24.44
	12. success criteria	5. Engagement (of the rail operators)	nil	23.33
	8. measuring governance success	10.360-degree evaluation	Nil	22.22
	5. Governance improvements	8. Better cost outcomes	Nil	21.11
	2. accountability	1. With the board	Nil	16.67
	11. Relevant governance improvements	13.As built drawings	Nil	16.67
	12. success criteria	4. Concept of Operation / Business Case	Nil	16.67
	12. success criteria	6. Good board	Nil	15.56
	3. Board member contributions	9. Additional scope items	Nil	13.33
	5. Governance improvements	6. More discipline (to make sure delivered)	Nil	13.33

	Dimension	Indicator	Consensus	Importance (Mean)
	8. measuring governance success	6. How well the client team did	Nil	13.33
	8. measuring governance success	9. Easier to define if unsuccessful	Nil	13.33
	12. success criteria	9. Interfaces	Nil	11.11
	3. Board member contributions	7. Ensured board functioned	Nil	5.56
	5. Governance improvements	11.Insurance cover (non-government participants)	Nil	5.56
	6. governance structure difference	1. Advisory only	Nil	5.56
	2. accountability	2. With the project	Nil	0.00
	4. Governance effectiveness	2. No	Nil	0.00
	12. success criteria	12. Influence	Nil	0.00
Quarter 4 - below average CQV, above mean importance	7. key decisions	6. Safety	1.00	100.00
	7. key decisions	5. Risk management	1.00	100.00
	6. governance structure difference	7. Sense of identity	1.00	100.00
	6. governance structure difference	3. External board members	1.00	100.00
	6. governance structure difference	5. Good team	1.00	100.00
	6. governance structure difference	8. Single Purpose	1.00	100.00
	5. Governance improvements	1. Introduced AO board earlier	0.47	96.67
	5. Governance improvements	9. Been closer to rail operators and end clients	0.47	93.33
	5. Governance improvements	4. End user/ customer impact	0.41	90.00
	4. Governance – template or bespoke	1. Template	1.00	90.00
	3. Board member contributions	8. Leadership	1.00	90.00
	3. Board member contributions	6. Believed in the project	0.41	85.56
	12. success criteria	1. Planning	0.47	84.44
	12. success criteria	2. Control of time, cost and quality	1.00	84.44
	12. success criteria	7. Good team	1.00	83.33
	12. success criteria	3. Scope management	1.00	83.33
	11. Relevant governance improvements	3. Project delivery / structure	1.00	83.33
	11. Relevant governance improvements	5. Independent	1.00	83.33
	11. Relevant governance improvements	12.Construction vs operations	1.00	83.33
	11. Relevant governance improvements	16.Business case	1.00	83.33
	11. Relevant governance improvements	17.Risk transfer	1.00	83.33

	Dimension	Indicator	Consensus	Importance (Mean)
	11. Relevant governance improvements	7. Skills review (of board)	1.00	80.00
	11. Relevant governance improvements	10.Long term planning	1.00	76.67
	11. Relevant governance improvements	11.Collaborative outcome	1.00	75.56
	11. Relevant governance improvements	14.Reporting	1.00	75.56
	11. Relevant governance improvements	18.KPIs	1.00	75.56
	11. Relevant governance improvements	19.Community expectations	1.00	70.00
	11. Relevant governance improvements	20.Board structure	1.00	68.89
Quarter 1 - above average CQV, below average importance	10. project governance need	2. On merits basis	0.29	65.56

APPENDIX Q - MAPPING OF VARIABLES AND ELEMENTS BY EACH OF THE FOUR THEORETICIAL PERSPECTIVES, BASED ON ZAHRA AND PEARCE (1989)

			Perspective			
	Variable	**Element**	**Legalistic**	**Resource dependant**	**Class hegemony**	**Agency theory**
Dimension	Attribute	composition	x	x	x	x
		characteristic	x	x	x	x
		structure	x	-	-	x
		process	x	-	x	x
	Role	control	x	x	x	x
		service	x	x	x	x
		strategy	-	x	-	x
	Strategic Outcome	approval	x	x	x	-
		review	-	x	-	-
		initiatives	-	x	-	-
	Performance	financial	x	x	x	x
		systemic	x	x	x	x
		social	x	x	-	-
	Contingency	company size (large/small)	x	-	-	-
		external environment	-	x	-	x
		company lifecycle	-	x	-	-
		type of business	-	x	-	-
		CEO style	-	-	x	-
		ruling capitalist values	-	-	x	-
		ownership concentration	x	-	x	x